Features and patterns of teaching and learning innovations in open and distance learning universities

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Abstract:
This paper presents a study on the features and patterns of teaching and learning innovations in open and distance learning universities. The study covers 19 universities across the globe. Based on the information from their institutional websites, the teaching and learning innovations claimed by the universities were identified and categorised into five primary types: programmes or courses, teaching and learning approaches and activities, educational technologies, assessment approaches and activities, and units established in the universities to foster teaching and learning innovations. Technological innovation has been identified as a core element that shapes the formation of teaching and learning innovations, and relevant units established in the universities have been shown to serve as an incubator for technological innovation. These findings offer insights into the development and implementation of teaching and learning innovations in open and distance universities to cope with various contextual and environmental factors.

1. Introduction

Innovation has been deemed important for higher education institutions to adapt to technological developments and shifts in social and cultural values (Ahmad, 2015; Wong, 2019). It is generally understood as the successful implementation of a new idea or method, thereby producing a change (Brewer & Tierney, 2011). In the context of education, innovation is frequently associated with teaching and learning, and appears in forms such as the use of new teaching techniques and novelty in pedagogic theory, learning process, or curriculum design (Serdyukov, 2017; Bajada et al., 2019).

The concept of teaching and learning innovations (TLIs) has been interpreted and practiced in various ways, with technology often being a common element (Wong, 2019). Recent years have witnessed a wide range of technologies that contribute to TLIs. Olaniyan and Graham (2014) referred to relevant initiatives as technological innovation, i.e., inventions derived from research, technical knowledge, and tools. Examples include semantic web technology for the accurate and efficient searching of useful content for learners (Hur & Jo, 2021), artificial intelligence (AI) systems to support personalised learning (Li & Wong, 2023), and mobile applications to improve students' engagement and enrich their learning experience (Lai et al., 2022). Gabarda Méndez et al. (2023) argue that digital competence and effective use of technology are vital for teaching innovation. Based on a longitudinal case study, Zhang et al. (2023) stated that the adoption of technology promotes the knowledge creation spiral that facilitates TLIs.

TLIs are also significant for open and distance learning (ODL) universities, and even potentially crucial to their survival (Garrett, 2016; Tait, 2018). TLIs in ODL universities heavily involve the use of technology, which has been "highlighted as seminal in bridging the geographical and physical aspects of distance between students and their institutions" (Prinsloo et al., 2022). By leveraging new technologies to increase access to education and improve learning experiences and outcomes, ODL universities have been well positioned at the forefront of TLIs (Taylor, 2001; Wellburn & Eibd, 2016).

For instance, learning analytics based on technological advances has been widely implemented to design educational interventions for the purpose of enhancing student persistence and retention in ODL universities, as well as to serve as a solution to issues around TLIs (Tsai et al., 2020; Wong, 2022).

This paper aims to provide a comprehensive view of TLIs in ODL universities, revealing the current position of ODL universities in terms of TLIs and offering insights into the strategies employed by these universities to maintain their strengths. It identifies the TLIs that have been implemented in ODL universities and explores the specific elements of these TLIs in various aspects, including course types, approaches and activities, technologies and tools, assessments, and organisational structures. In particular, the study addressed the following research questions:

1) What types of TLI have been implemented in ODL universities?
2) What are the features and patterns in these TLIs?

2. Literature review

There is a broad range of work covering various aspects of TLIs, with the factors that drive TLIs being one of the aspects commonly addressed. For example, Zhou et al. (2022) surveyed university teaching staff to examine the relationship between organisational culture and teaching innovation. They found that a playful culture in a university encourages sustainable teaching innovations. Bajada et al. (2019) identified various factors and drivers which are essential to sustain TLIs, and proposed a framework for cultivating curriculum innovations in which internal factors such as leadership, management, senior executive support, staff goodwill, and values and norms contribute to determining the institutional capacity for TLIs, while external factors such as legal regulatory requirements, external stakeholders, and professional membership requirements shape the institutional environment.

The dimensionality of TLIs is another major research area. Pollock et al. (2021) synthesised three primary components of innovative teaching: the instruction of declarative knowledge, the teaching of critical thinking skills, and the use of technology for information access. Based on the questionnaire results from teachers of pre-school, primary, and secondary education, Monge et al. (2023) revealed that institutional participation (e.g., a sense of belonging to the institution, social relations, and teaching participation), psycho-pedagogical openness (e.g., teachers' attitudes, motivations, and commitments towards teaching innovation), and didactic planning (e.g., methodological and material resources) were three main factors of teaching innovation. From the students' perspectives on learning innovation, Kwangmuang et al. (2021) found that the content, multimedia, and design of learning were three elements most valued by junior high-school students to enhance their higher-order thinking skills.

Regarding innovative teaching and learning practices that incorporate technology, Batool (2022) found the positive effects of digital learning innovations with augmented reality on students' online learning in terms of boosting students' confidence, attitudes, and subjective norms. Ma et al. (2020)

adopted the peer learning strategy and machine learning techniques to develop a peer–tutor recommender system for enhancing mutual assistance amongst students and improving learning performance. Guided by constructivism and experiential learning theories, Agbo et al. (2021) employed game-based learning by leveraging virtual reality technologies to develop mini games for supporting students' understanding of subject concepts.

In the context of ODL universities, there is also related work which explored the practice of TLIs. For example, Selvaras (2020) studied the use of technology for teaching and learning of law at an ODL university in Sri Lanka, where students expressed positive attitudes towards this innovation, particularly in terms of interaction, content sharing, and communication via social media and mobile applications. Chen et al. (2020) investigated the impact of Blackboard Collaborate, a web conferencing tool that facilitates synchronous communication, on the online learning experiences of students from an Australian ODL university. The students provided positive feedback, showing that they enjoyed real-time interaction with teachers and peers. Yuan et al. (2023) proposed a smart teaching model based on virtual reality technology for English teaching at a Chinese open university, and showed that this innovation could stimulate learners' interest in English and enhance their oral skills.

The related work on TLIs has identified factors for their success, provided frameworks to promote TLIs, and highlighted the vital role of technology in TLIs. However, previous studies have not specifically focused on examining the TLI types and patterns developed and implemented in ODL universities. This paper aims to address this gap by providing an overview of the current practice of TLIs in ODL universities.

3. Methodology

3.1 Data collection

This study analysed TLIs in ODL universities and examined their patterns. ODL universities around the world were sampled and selected from the member institutions of two representative international organisations of ODL institutions: the International Council for Open and Distance Education (ICDE) and the Asian Association of Open Universities (AAOU). These two organisations cover a total of around 200 member institutions. These institutions were screened and selected based on the following inclusion criteria: (1) the institution must be an ODL university, not a faculty within a university that offers ODL courses; (2) the institution has over 10,000 students; and (3) its website provides the information in English related to the TLIs of the institution. Finally, a total of 19 ODL universities which met the inclusion criteria were selected for further analysis.

The websites of the selected universities were thoroughly examined to identify elements and practices related to the TLIs claimed by the universities. The search process included scrutinising relevant information in each page and video on the websites. Search engines were also used to gather relevant details from the websites.

3.2 Data analysis

The information related to the TLIs of the selected ODL universities was categorised into five areas: programmes or courses, teaching and learning approaches and activities, educational technologies, assessment approaches and activities, and relevant units established in the universities. The categories were based on and adapted from those developed in Li et al. (2023).

Data categorisation was carried out by two researchers. To ensure inter-rater consistency, all of the discordant cases were checked and discussed until a consensus was reached between the two researchers. The information related to specific TLIs was further analysed and generalised to identify the features and patterns under each category of TLI to address the research questions.

4. Results

4.1 Overview of the ODL universities

Table 1 presents the ODL universities covered in this study. The majority of them are in Asia, followed by North America, Europe, Africa, and Oceania. Regarding distribution by country/territory, two of the universities are located in the United States and two are in Malaysia, and the other 15 universities are in various countries/territories. The distribution reveals a balanced distribution of TLIs in representative ODL universities across the globe. Amongst the ODL universities, 68% are public institutions and the remaining 32% are private, which suggests that public institutions account for more of the TLIs in this study.

4.2 TLIs in the ODL universities

Five types of TLI were identified from the data. The following illustrates each type of TLI, as well as their features and patterns.

4.2.1 Programmes or courses

A number of TLIs were claimed by the ODL universities in the form of programmes or courses offered to expand access to education and promote lifelong learning. For example, in addition to the programme and course types commonly found in conventional higher education institutions, the Open University provides learners with a variety of standalone modules and microcredentials which are tailored to meet individual learners' needs. These standalone modules and microcredentials typically require a short period of time (i.e., from 10 weeks to 9 months) to complete the study, and are designed to develop skills that are in high demanded in the job market.

Some of the ODL universities emphasised flexibility in their programmes or courses in terms of study pace, study duration, and start date. For example, the National Open University of Taiwan claims that they support self-paced learning and there is no restriction on the length of study. The University of Phoenix allows up to 10 start dates in a year for their bachelor's programmes. The Open Polytechnic of New Zealand and the Indira Gandhi National Open University

have flexible admission policies, allowing students to enrol according to their individual needs.

4.2.2 Teaching and learning approaches and activities

Innovations in teaching and learning approaches and activities have been claimed by the ODL universities. Their instructional modes cover two main types: fully online and blended. Universities such as the University of South Africa and the Open University of Catalonia exemplify the fully online mode, from course registration to teaching and learning, as well as examination. This is facilitated by their learning management systems that provide learning resources and tutorial support. The blended mode has been applied to a single course or programme, as well as a mix of courses where some are entirely online while others require in-person, face-to-face teaching. For instance, the Korea National Open University offers blended learning that combines online and offline methods through its online learning platform and face-to-face classes at regional campuses. For the Open University of Japan, in addition to online courses, face-to-face courses, known as "schooling", which include lectures, hands-on experiments, fieldwork, and on-site observation visits, are considered crucial to the university's teaching and learning process.

To accommodate students' learning styles and preferences, and to promote peer learning and collaboration, group study has been emphasised by some ODL universities. For example, Athabasca University offers individualised study courses and group study courses. Students enrolled in individualised study courses can study online at their own pace, while those in group study courses must study together in either a traditional classroom or an online learning environment with deadlines for completing learning activities. Similarly, in Walden University, aside from tempo (competency-based) learning, which allows learners to control the length, cost, and pacing of the programme, course-based learning is also offered as an option for students who prefer an instructor-led approach and learning on a predetermined schedule.

4.2.3 Educational technologies

All of the TLIs identified in this study involved the use of educational technologies. Fig. 1 shows the educational technologies involved in the TLIs.
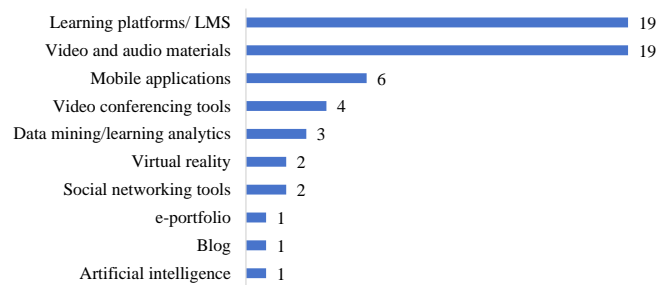

Learning platforms/ LMS	19
Video and audio materials	19
Mobile applications	6
Video conferencing tools	4
Data mining/learning analytics	3
Virtual reality	2
Social networking tools	2
e-portfolio	1
Blog	1
Artificial intelligence	1

Fig. 1. The educational technologies used in TLIs.

a) Learning platforms/learning management systems: All of the 19 ODL universities have adopted learning platforms/learning management systems. Moodle or Blackboard is commonly used in the majority of the universities. Some of the

Table 1. The ODL universities covered in this study.

Region	Name of institution	Country/territory	Type
North America	Athabasca University	Canada	Public
	University of Phoenix	United States	Private
	Walden University	United States	Private
Europe	Open University of Catalonia	Spain	Private
	The Open University	United Kingdom	Public
	The University of Hagen	Germany	Public
Asia	Allama Iqbal Open University	Pakistan	Public
	Asia e University	Malaysia	Private
	Indira Gandhi National Open University	India	Public
	Korea National Open University	Korea	Public
	National Open University	Taiwan, China	Public
	Open University Malaysia	Malaysia	Private
	Sukhothai Thammathirat Open University	Thailand	Public
	The Open University of Chinay	China	Public
	The Open University of Japan	Japan	Private
	Universitas Terbuka	Indonesia	Public
Oceania	Open Polytechnic of New Zealand	New Zealand	Public
Africa	National Open University of Nigeria	Nigeria	Public
	University of South Africa	South Africa	Public

universities have developed their own learning management systems, such as Allama Iqbal Open University and Open Polytechnic of New Zealand. For Walden University, which provides course-based learning and tempo-based learning, its learning platform includes two versions for students selecting either of the learning approaches.

b) Video and audio materials: All of the 19 universities provide video and audio didactic materials. Some of the universities have even established specific facilities for their production. For example, Korea National Open University has set up various studios for the production of TV programmes, e-learning content, and remote video lectures. Some of the video and audio materials have been provided as open educational resources, allowing free access for the public. These materials have been commonly disseminated through TV/radio programmes and online learning platforms, such as the Gyandarshan, a 24-hour educational TV channel of Indira Gandhi National Open University, and the Massive Open Online Courses (MOOC) platform of the University of South Africa.

c) Mobile applications: A broad range of mobile applications have been provided for various purposes. For example, there are mobile e-learning platforms such as IGNOU e-Content of Indira Gandhi National Open University, myOUM of Open University Malaysia, BA Digital Universitas Terbuka, and UNISA myModules of the University of South Africa. Vi-

talSource Bookshelf, used by Athabasca University, is a virtual library that gives students access to eTexts. Lerngruppen has been provided by the University of Hagen to help students find appropriate study groups. Through this app, students can find peers who desire to study together in neighbouring areas, send and receive contact requests, and exchange email addresses.

d) Video conferencing tools: Video conferencing tools, such as Zoom, Microsoft Teams, and Adobe Connect, are used to facilitate connections between students, tutors, and instructors. As indicated on the university websites, these video conferencing tools are used mainly to organise online discussions, counselling sessions, and seminars.

e) Data mining/learning analytics: Data mining/learning analytics is used by the Open University of Catalonia, National Open University Taiwan, and Open Polytechnic of New Zealand. These universities have indicated the improvement of learning experience through the use of data on learners' progress and achievements to inform the on-going design of learning resources and support, as well as decision-making processes.

f) Virtual reality: Virtual reality technologies are utilised to offer students in-person field experiences. For example, Walden University has created a field safety training experience for social work students using Google's Daydream and Cardboard products. The Open University has developed an application named Virtual Skiddaw, which uses real-world

data to replicate the visuals and sounds of the Skiddaw Mountain. This application allows students to explore map overlays, fly over the mountain, and virtually visit different sites.

    g) Social networking tools: Social networking tools are used for TLIs. For example, the Indira Gandhi National Open University has launched programmes via Facebook Live sessions. Walden University has created online communities through Facebook groups to foster peer connections, facilitate instructor–student interactions, and share learning resources and information.

    h) Other technologies: Blogs, e-portfolios, and AI are also employed in ODL universities. For example, the University of Phoenix uses PhoenixConnect, a blog that provides articles and resources on topics such as online learning and career resources. The Open University of Catalonia has developed an e-portfolio called Folio, which was recognised as a good teaching innovation practice by the Catalan Public University Association. Folio allows students to share their work with peers, boosting their self-esteem and giving them a sense of the social value of their work. Athabasca University has integrated an AI-powered chatbot into its website to provide immediate support to current and prospective students. The chatbot features an intelligent function which offers a list of options for questions with multiple answers to help students find the most suitable ones.

4.2.4 Assessment approaches and activities

Two innovative assessment approach and activity types in ODL universities were identified. First, is the use of online invigilation systems for monitoring online examinations. For instance, Athabasca University has collaborated with ProctorU, a third-party virtual invigilation service which allows students to schedule and take their examinations at home and at any time. During the examinations, ProctorU invigilators supervise students via their webcams and screen sharing. Another similar tool is the Invigilator App used by the University of South Africa. The second innovative assessment approach is the use of an online assessment system. The Open University, for example, has developed a computer-assisted assessment tool, OpenMark, and integrated it with Moodle. OpenMark offers learners multiple levels of feedback, chances for multiple attempts, and interactivity. Another example is GRAF, a visual system for competency-based assessment, introduced by the Open University of Catalonia. It provides each student with a continually updated graph report, allowing them to track their progress. It also enables graduates to demonstrate to potential employers the competencies they have gained or enhanced at the university, in addition to their academic record.

4.2.5 Units established in the universities

A small number of the ODL universities have highlighted their establishment of units, such as centres or research institutes, to promote TLIs. These units facilitate the implementation of a variety of practices, services, and research focusing on TLIs. For instance, the Open University of Catalonia has established the eLearning Innovation Centre to foster educational innovation within the university. This centre assists teachers in developing innovative initiatives and projects, provides guidance for learning design, monitors global educational trends and innovation, and supports teaching innovation through learning analytics services. The TLI technologies reported above, i.e., Folio (an e-portfolio system) and GRAF (an assessment tool), were developed by this centre. Similarly, the Open University of Japan has established the Research Institute for Learning and Education Strategies to advance TLIs in the university.

5. Discussion

The findings of this study highlight the diversity of TLIs in the context of ODL universities. They also reveal the relationship between technological innovation and TLIs, in which innovations in programmes or courses, teaching and learning approaches and activities, teaching and learning technologies and tools, and assessment approaches and activities have been promoted by technological innovation, while the university units established to foster TLIs serve as an incubator for technological innovation (Fig. 2). This relationship highlights the crucial role of technology in TLIs. Zhang et al. (2023) illustrated this relationship in terms of the diffusion of innovation theory (Rogers, 2003). Technology, as an outside-in factor, may leverage people within higher educational institutions to "learn, interact, overcome challenges, and build the capacity to fulfil digital teaching and learning innovations from the inside out", and the enhanced capacity of the institutions may, in turn, generate further technological innovation (Zhang et al., 2023).

Technological innovation has been playing a pivotal role in transforming ODL practices. The evolution of technology being a major driving force in reshaping the way education is delivered and received, making ODL more accessible, flexible, and interactive. Over the years, relevant TLIs in ODL universities have transformed their course delivery from the use of postal services for print-based materials in the early years, to radio and television broadcasts, and then multimedia and online channels, enabling real-time teacher–student interaction, immediate feedback, and access to a wealth of resources (Harasim, 2000; Simpson & Anderson, 2012; Bozkurt, 2019).

In the current stage of development, ODL universities have leveraged advanced technologies such as AI, data analytics, and social media to develop new forms of TLI. With the aid of TLIs, students studying in ODL universities can access learning materials anytime, anywhere, and foster a sense of belonging amongst them through community building. However, factors such as financial resources, technological infrastructure, and policies and regulations have been impacting the pace at which ODL universities have been able to develop and implement their TLIs (Tait, 2018).

The findings demonstrate that pedagogies adopted in relevant TLIs have also been reshaped by technologies. The transition from one-way to two-way communication technologies (e.g., online discussion forums, video conferencing tools, and social media) has facilitated social learning through interactivity (Sumner, 2000). Informed by learning theories such as constructivism (Vygotsky, 1978) and connectivism (Siemens, 2004), relevant TLIs in the ODL context have
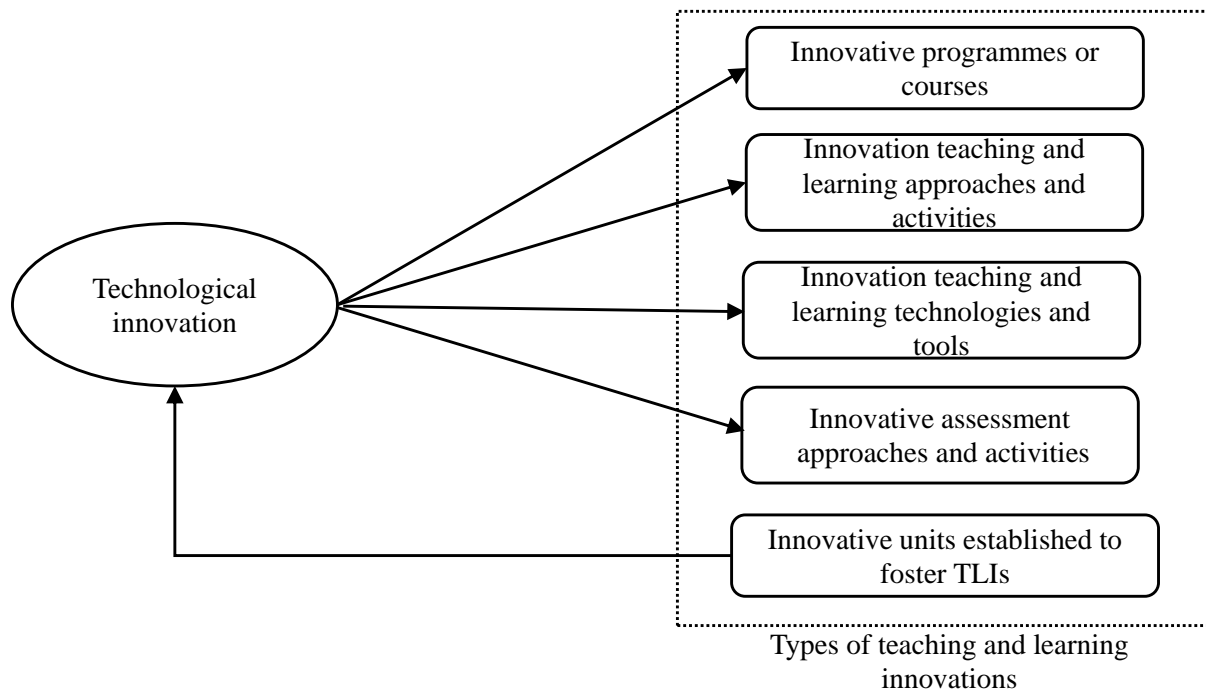
Fig. 2. Relationship between technological innovation and TLIs.

embraced diversified technology-mediated learning strategies such as collaborative learning, cooperative learning, project-based learning, and peer learning to enhance student engagement and learning outcomes.

It is worth noting that the use of technology for teaching and learning is not merely a technical issue. Rather, decisions about technology should be grounded in and subordinate to the educational goals of ODL universities (Bates, 2000). This point is highlighted in the TLIs of the selected universities, which frequently show the goals of using technology as being to provide flexible, self-directed, and personalised learning, widen access to quality education, promote lifelong learning, and reduce the costs of education.

The results also reveal the significance of having a dedicated unit in an ODL university that is responsible for driving teaching and learning innovations, as exemplified in relevant TLIs. This finding is consistent with that of the study by Bates and Sangr (2011), in which organisational structure is regarded as a key factor that influences the use of technology in higher education institutions. As shown in the current study, these units have played a role in facilitating the integration of technology into the TLIs, taking on tasks such as examining the potential of the latest educational technologies, providing training and support to faculty members, monitoring and evaluating the effectiveness of TLIs, and developing and implementing technological tools to create technology-rich innovative learning environments. As emphasised by Bates and Sangr (2011), these units should be assigned higher-level functions such as establishing priorities, setting goals and strategies for technology, allocating resources, approving projects, and evaluating the effectiveness of technology strategies.

6. Conclusion

The findings of this study contribute to providing an overview of the types and methods of TLI in ODL universities, and highlighting the patterns of these TLIs. The development and implementation of TLIs are shown to align with the educational goals of the ODL universities, and act as a pathway to accomplish the goals. Technological innovation has been identified as a core element that shapes the formation of TLIs.

Regarding the implications of this study, the findings suggest that TLIs have been implemented to address the specific contexts and needs of relevant ODL universities. When learning from the experiences of other institutions, it is important to take into account their unique contexts, characteristics, and challenges. Future work in this regard should examine the extent to which the TLIs of an institution are applicable and adaptable to other contexts. Also, a cooperative approach should be taken amongst ODL universities for sharing best practices, pooling resources, and jointly developing new TLIs which are applicable to various contexts. Doing so would enhance the effectiveness of these innovations.

Further research should be carried out to address the limitations of the current study, which only examined the TLIs in large-scale ODL universities based on data gathered from their websites. There is a need to broaden the scope of investigation to include more types of institution and diversify the data sources and categories of TLI. It would also be important to study how the effectiveness of TLIs may vary in relation to the contextual and environmental factors, thereby facilitating the improvement of their design and implementation.

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Conflict of interest

The authors declare no competing interest.

References

Agbo, F. J., Oyelere, S. S., Suhonen, J., & Laine, T. H. (2021). Co-design of mini games for learning computational thinking in an online environment. Education and information technologies, 26(5), 5815–5849.

Ahmad, T. (2015). Preparing for the future of higher education. On the Horizon, 23(4), 323–330.

Bajada, C., Kandlbinder, P., & Trayler, R. (2019). A general framework for cultivating innovations in higher education curriculum. Higher Education Research and Development, 38(3), 465–478.

Bates, T. (2000). Managing technological change: Strategies for college and university leaders. Jossey-Bass: San Francisco.

Bates, T., & Sangra, A. (2011). Managing technology in higher education: Strategies for transforming teaching and learning. John Wiley & Sons.

Batool, H. (2022). Augmented reality applications as a digital learning innovation in response to the pandemic. Frontiers in Education, 7: 937074.

Bozkurt, A. (2019). From distance education to open and distance learning: a holistic evaluation of history, definitions, and theories. In S. Sisman-Ugur, & G. Kurubacak (Eds.), Handbook of Research on Learning in the Age of Transhumanism (pp. 252–273). Hershey, PA: IGI Global.

Brewer, D. J., & Tierney, W. G. (2011). Barriers to innovation in the US education. In Wildavsky, B., Kelly, A. P., & Carey, K (Eds.), Reinventing Higher Education: The Promise of Innovation (pp. 11–40). Harvard Education Press.

Chen, J. C., Dobinson, T., & Kent, S. (2020). Students' perspectives on the impact of blackboard collaborate on Open University Australia (OUA) online learning. Journal of Educators Online, 17(1), n1.

Gabarda Méndez, V., Marín-Suelves, D., Vidal-Esteve, M. I., & Ramón-Llin, J. (2023). Digital competence of training teachers: results of a teaching innovation project. Education Sciences, 13(2), 162.

Garrett, R. (2016). The state of open universities in the Commonwealth: A perspective on performance, competition and innovation. Burnaby, BC: Commonwealth of Learning. Retrieved from http://oasis.col.org/handle/11599/2048

Harasim, L. (2000). Shift happens: online education as a new paradigm in learning. The Internet and Higher Education, 3(1–2), 41–61.

Hur, Y., & Jo, J. (2021). Development of intelligent information system for digital cultural contents. Mathematics, 9(3), 238.

Kwangmuang, P., Jarutkamolpong, S., Sangboonraung, W., & Daungtod, S. (2021). The development of learning innovation to enhance higher order thinking skills for students in Thailand junior high schools. Heliyon, 7(6), e07309.

Lai, Y., Saab, N., & Admiraal, W. (2022). University students' use of mobile technology in self-directed language learning: Using the integrative model of behavior prediction. Computers & Education, 179, 104413.

Li, K. C. & Wong, B. T. M. (2023). Artificial intelligence in personalised learning: a bibliometric analysis. Interactive Technology and Smart Education, 20(3), 422–445.

Li, K. C., Wong, B., & Chan, H. T. (2023). Teaching and learning innovations for distance learning in the digital era: a literature review. Frontiers in Education, 8: 1198034.

Ma, Z. H., Hwang, W. Y., & Shih, T. K. (2020). Effects of a peer tutor recommender system (PTRS) with machine learning and automated assessment on vocational high school students' computer application operating skills. Journal of Computers in Education, 7, 435–462.

Monge, C., Montalvo, D., Santos, F., & Torrego, J. C. (2023). Teaching innovation factors: analysis from three Iberoamerican countries. Educational Studies.

Olaniyan, M. & Graham, D. (2014). Media streaming for technological innovation in higher education. In Mukerji, S. & Tripathi, P. (Eds.), Handbook of Research on Transnational Higher Education (pp. 691–712). IGI Global.

Pollock, J. E., Tolone, L. J., & Nunnally, G. S. (2021). How innovative teachers can start teaching innovation. Educational Leadership, 78(9), 20–25.

Prinsloo, P., Slade, S., & Khalil, M. (2022). Introduction: Learning analytics in open and distributed learning—potential and challenges. In Prinsloo, P., Slade, S., & Khalil, M. (Eds.), Learning Analytics in Open and Distributed Learning: Potential and Challenges (pp. 1–13). Singapore: Springer Nature Singapore.

Rogers, E. M. (2003). Diffusion of innovations (5th ed.). New York: Free Press.

Selvaras, J. (2020). Technology usage for teaching and learning law in open and distance learning: a Sri Lankan perspective. Asian Association of Open Universities Journal, 15(1), 69–81.

Serdyukov, P. (2017). Innovation in education: what works, what doesn't, and what to do about it?. Journal of research in innovative teaching and learning, 10(1), 4–33.

Siemens, G. (2004). Connectivism: a learning theory for the digital age. International Journal of Instructional Technology and Distance Learning, 2(1), 3-10.

Simpson, M., & Anderson, B. (2012). History and heritage in open, flexible and distance education. Journal of Open, Flexible, and Distance Learning, 16(2), 1–10.

Sumner, J. (2000). Serving the system: A critical history of distance education. Open Learning: The Journal of Open,

Distance and e-Learning, 15(3), 267–285.

Tait, A. (2018). Open Universities: the next phase. Asian Association of Open Universities Journal, 13(1), 13-23.

Taylor, J. C. (2001). Fifth generation distance education. Instructional Science and Technology, 4(1), 1–14.

Tsai, Y. S., Rates, D., Moreno-Marcos, P. M., Muñoz-Merino, P. J., Jivet, I., Scheffel, M., Drachsler, H., Kloos, C. D., & Gašević, D. (2020). Learning analytics in European higher education—Trends and barriers. Computers & Education, 155, 103933.

Vygotsky, L. S. (1978). Mind in Society. Cambridge: Harvard University Press.

Wellburn, E., & Eibd, B. J. (2016). Multiple learning roles in a connected age. In Veletsianos, G. (Eds.), Emergence and innovation in digital learning: Foundations and applications (pp. 65–80). Athabasca University Press.

Wong, T. M. (2019). Teaching innovations in Asian higher education: perspectives of educators. Asian Association of Open Universities Journal, 13(2), 179–190.

Wong, T. M. (2022). The potential of learning analytics for intervention in ODL. In Prinsloo, P., Slade, S., & Khalil, M. (Eds.), Learning Analytics in Open and Distributed Learning: Potential and Challenges (pp. 15–30). Singapore: Springer Nature Singapore.

Yuan, J., Liu, Y., Han, X., Li, A., & Zhao, L. (2023). Educational metaverse: an exploration and practice of VR wisdom teaching model in Chinese Open University English course. Interactive Technology and Smart Education, 20(3), 403–421.

Zhang, X., Chen, S., & Wang, X. (2023). How can technology leverage university teaching & learning innovation? A longitudinal case study of diffusion of technology innovation from the knowledge creation perspective. Education and Information Technologies, 28, 15543–15569.

Zhou, F., Zhang, N., & Mou, J. (2022). Universities as incubators of innovation: The role of a university playfulness climate in teachers' sustainable teaching innovation. The International Journal of Management Education, 20(3), 100693.