The role of emerging Artificial Intelligence in the establishment of inclusive learning environments[1]

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ABSTRACT

Students with learning difficulties face significant challenges in accessing equitable education. Integrating emerging technologies like artificial intelligence (AI) can address students' diverse learning needs and promote inclusivity. This quantitative study explored the role of AI-driven technologies in fostering inclusive learning environments for students, including those with difficulties. Using random sampling, 180 South African Technical and Vocational Education and Training (TVET) college respondents completed a five-point Likert scale questionnaire. The findings showed that AI integration holds significant possibilities to enhance inclusivity but is hindered by challenges such as the digital divide, limited digital skills among instructors, and concerns over data privacy and academic integrity. The study recommended targeted investments in ICT infrastructure in underserved areas, professional development to strengthen educators' digital competencies, active stakeholder involvement in AI development, and the establishment of ethical frameworks to ensure the secure handling of sensitive data in education. Addressing these challenges is essential to fully harnessing the potential of AI as a tool for equitable, inclusive, and effective teaching and learning, thereby contributing to the development of educational systems that are responsive to and supportive of students' diverse learning needs.

Keywords: affordances, artificial intelligence, inclusive learning, learning difficulties, learning environment

INTRODUCTION

The rapid evolution of 21st century technologies, particularly Artificial Intelligence (AI) and the Internet of Things (IoT), is reshaping the educational spectrum globally. These advancements offer transformative potential for creating inclusive learning environments that accommodate the diverse needs of all students, especially those with learning difficulties (Ahmad et al., 2024). As enrolments of students with difficulties continue to rise in post-secondary education, there is an urgent need for practical, innovative strategies that support fair access to quality learning (Scheef et al., 2024).

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AI technologies, when thoughtfully integrated, can play a pivotal role in reducing learning barriers by personalising instruction, enhancing engagement, and supporting differentiated learning. Scholars highlight how AI has changed the way individuals interact with their environments, offering tools that can empower students with difficulties to overcome academic challenges (Jamal, 2023). By providing tailored support and adaptive technologies, AI can foster greater inclusion and participation in education (Song et al., 2024). However, alongside its potential, AI brings significant concerns, including misuse, ethical risks, and the reinforcement of existing inequalities. Instances of academic dishonesty, data privacy breaches, and copyright violations are well documented in the literature (Ayomide Arowolo-Ayodeji, 2025; Zhang et al., 2021; He et al., 2024).

To ensure that AI serves as a tool for inclusion rather than exclusion, educational institutions should address key challenges related to accessibility, affordability, digital literacy, and ethical use. Students with learning difficulties are particularly vulnerable to digital divides and systemic barriers that can hinder meaningful engagement with AI-based tools (Wang & Chung, 2024; Memon & Memon, 2024). Access to reliable technology, high-speed internet, and foundational digital skills are prerequisites for equitable participation in AI-enhanced learning.

This study explores the role of AI in fostering inclusive education, with a specific focus on supporting students with learning difficulties. It seeks to develop actionable strategies that educators can implement to effectively integrate AI in a manner that is ethical, equitable, and inclusive. The key objectives of this research are to:

- Identify strategies instructors can use to effectively integrate AI to support students with learning difficulties.
- Address challenges of affordability, accessibility, effectiveness, equity, and the digital divide in the educational use of AI.
- Propose solutions to mitigate ethical concerns associated with AI use in education, including academic dishonesty and data privacy.

By examining these interrelated dimensions, the study contributes to ongoing discourse on how AI can be leveraged responsibly to enhance inclusive educational practices in diverse learning contexts.

LITERATURE REVIEW

Technological affordances, especially in learning, vary as much as technology (Bray et al., 2024). Therefore, students need to understand the affordances of resources, whether hardware, software, or network capabilities. The environment where students find themselves may not be ignored, as the same environment determines their technological resource affordances. Students must also be able to use such resources to ease their learning process. Students' learning difficulties include reading and writing difficulties, attention and focus deficits, loss of memory, math challenges, and many more. These students are sometimes taught by educators who lack the required skills to respond to the inclusion of students with learning difficulties in their respective classroom settings (Yakut, 2021). Creating an environment catering to these students has concerned numerous educators. Nevertheless, innovative 21st century technologies such as AI provide multiple pedagogical affordances for teaching students with learning difficulties (Alqahtani, 2024). Yakut (2021) further articulates

that each educator's self-efficacy toward teaching is a vital construct associated with each educator's willingness to create a classroom setting that will include students with learning difficulties. Positive student attitudes toward technology may be of great benefit to students with learning difficulties, to improve their academic skills through the use of digital technology (Alqahtani, 2024). The notion got support from (Wu et al., 2022), who argue that modern technology can be an excellent fit for conventional learning and e-learning methods.

As a result of the COVID-19 pandemic in 2020, numerous educators and education establishments had to shift their method of curriculum delivery from conventional to remote learning, many without experience, expertise, and with poor information and communications technology (ICT) infrastructure (Thorne & Hellermann, 2022). This shift comprised a series of advantages and disadvantages. One of the advantages is the notion of integrating technologies such as AI in creating an inclusive learning environment to cater to all students, including those with learning difficulties (Chalkiadakis et al., 2024). This can be achieved through multiple technological affordances. According to Rusk and Ståhl (2020) computer games play a vital role in including all student participants who are motivated to communicate and collaborate with others to solve problems, such as way-finding, locating opponents, and coordination. This idea is supported by Tabuenca et al. (2021), who argue that the emergence of recent trends impacts technologies such as mobile devices, cloud services, and interconnected objects. On the contrary, however, Song et al. (2024) maintain that AI curricula often do not provide all learners with equally engaging and inclusive learning experiences. Nevertheless, broadening participation in AI education is essential to promote equality and equity in societies.

Each student acquires information uniquely, and AI can expand access to information that will benefit each student through different methods (Chen et al., 2020). This technology enables the execution of tasks typically necessitating human behaviour, such as speech recognition, decision-making, visual perception, and cross-linguistic translation (Rathipriya & Maheswari, 2024). Education today combines technologies such as image recognition, recognition of speech semantics, intelligent robots, machine learning, adaptive learning algorithms, and quantum computing to customise classroom environments (Liu et al., 2021). This transformation, accelerated by modern technologies, requires modern resources that will meet the requirements of this new method of curriculum delivery (Liu et al., 2021). The resources are computers, high-speed printers such as laser printers, data projectors, sophisticated software, and reliable connectivity with good ICT infrastructure. This calls for extended budgets in respective education establishments. The availability of such resources might automatically change each classroom environment to accommodate all students. According to Khasawneh (2023), inclusive education establishments lack the resources to successfully incorporate modern technology into the classroom.

Instructors should first understand technological affordances to apply the required and relevant skills in creating an inclusive learning environment, and transfer the Fourth Industrial Revolution (4IR) and Fifth Industrial Revolution (5IR) innovative skills to their students (Ramraj & Marimuthu, 2020). To ascertain the possibility of this, it calls for changes in the methods of teacher training (Mbambo & Plessis, 2024). It also calls for investing in human resources since technology 5.0 insists on machines collaborating with people. Educators' knowledge of their subject specialisation and their understanding of various methods in which modern technology

may be used to enhance student learning through the use of pedagogical technology, and that is the main aim of this innovation (Khasawneh, 2023). The implementation of AI-driven technologies calls for instructors with relevant digital skills, competence, and knowledge to personalise learning, enhance collaboration and improve accessibility (Adeleye et al., 2024). Personalised learning promotes flexibility and allows collaborative learning through cloud computing (Sasti & Sasti, 2021).

Even though all students can use digital devices such as laptops, iPads, and smartphones to access information from the Internet, it is also important to note that some rely on researching from Google without proper knowledge and skills to access the correct and relevant information (Tohara, et al., 2021). Some cannot verify the information they are accessing. Therefore, creating an inclusive environment through technology might be impossible without digital literacy. 'Digital literacy can be considered as independent learning as students can access, manage, and use information through technological devices' (Adeleye et. al., 2021: 71). In addition, educational establishments should incorporate digital support for their students using support services to bridge the existing gap in technology.

Ethical considerations of using generative AI in education

The integration of generative AI tools such as ChatGPT, Jenni AI, and DeepSeek into educational contexts has raised several ethical concerns, particularly around the infringement of individual and organisational rights, including copyright protection (Wu et al., 2024). While these technologies offer valuable support for academic writing, personalised learning, student assistance, and content analysis (Khosravi et al., 2023), their use must be approached with caution. Despite the potential for misuse, researchers and academic writers can utilise these tools within the boundaries of copyright laws and institutional guidelines (Kandeel & Eldakak, 2024).

One of the major ethical challenges associated with AI in education is the potential violation of rights and academic integrity. Misuse of these tools may lead to practices such as plagiarism, data misappropriation, and other forms of academic dishonesty (Mbambo & Du Plessis, 2024). For example, ChatGPT can generate extensive and coherent content, summarise complex texts, and explain intricate concepts, capabilities that, if abused, could undermine ethical standards and academic rigour (Wu et al., 2024). Furthermore, the risk of data being accessed or misused by unauthorised individuals or entities poses a significant threat to privacy and information security (Hua et al., 2024). These concerns underscore the importance of implementing safeguards to protect individuals and institutions from harmful AI-generated decisions (Bukar et al., 2024).

Educational institutions should take an active role in addressing these challenges by establishing clear policies, promoting ethical use of AI, and educating students and staff about responsible AI practices. While AI technologies hold great promise for enhancing education and societal development, their deployment needs to be guided by ethical principles and robust oversight mechanisms (Ghandour et al., 2024).

Digital divide

The digital divide is an existing gap between those who have access to and utilise digital technologies and those without access. This disparity results from socio-economic status,

education level, infrastructure and geographical location, among other things. The existence of the digital divide results from multiple reasons in African countries, including socio-economic inequality, societal levels of education, and injustices of past colonialism (Afzal et al., 2023). This digital divide is a challenge that threatens the incorporation of AI technologies. Afzal et al. (2023) further contend that this challenge is influential on education outcomes. It also remains critical in countries of India and Africa. This problem impacts socio-economic matters and the education of various countries (Gupta & Verma, 2024). The detrimental COVID-19 pandemic became a catalyst for multiple institutions to adopt remote learning, while exacerbating the existing digital divide, with an impact on marginalised societies (Golden et al., 2023; Kumi-Yeboah et al., 2023). During this pandemic, marginalised societies found it challenging to continue with education activities because of a lack of technological resources, poor ICT infrastructure, limited access to digital platforms and a lack of digital skills. This problem cannot be separated from the social exclusion of specific people or societies and is an unfair form of educational inequality (Cheshmehzangi et al., 2023). The current digitisation of communities requires a high level of digital skills (Lybeck et al., 2023). Apart from a lack of required digital skills, students and their institutions also experience a lack of technical support (Al-Mamary, 2022). This scholar argues that these are some of the factors affecting students' academic performance. As a result of the digital divide, the incorporation of AI in education remains another challenge facing multiple students.

THEORETICAL FRAMING

This study is informed by the Universal Design for Learning (UDL) framework. The framework was invented by Rose in 1984, and it bases its focus on applying a variety of methods to remove learning barriers to give all students, including those with difficulties, equal opportunities in their educational quest (Rao et al., 2021). UDL creates independence among students so that they can take responsibility for their learning activities. It allows students to assess their learning needs, monitor their progress, and take charge of the learning process. In 1990, UDL was collaboratively developed by Rose, Meyer, and their associates at the Centre for Applied Special Technology (CAST). This charitable organisation leads the global community in designing equitable and inclusive learning experiences.

The purpose was to ensure that an inclusive learning environment that is huddle-free is accomplished to accommodate students' diverse needs. UDL bases its focus on the introduction of technology that would allow instructors and students to customise their learning experiences. This framework includes identifying the lesson goals and objectives, thinking about possible barriers that might prevent students from learning, and how to engage all students in the lesson. As a result of the emergence of new technologies such as AI, this can now be accomplished by integrating technology into lessons. The motive behind the selection of UDL is that this study seeks to address and eliminate difficulties hindering students from succeeding in their education. The best method to do this is to create a learning environment that will cater to diverse students' needs. In online and blended learning environments, UDL can be used to successfully support students and eradicate their barriers to learning. This is possible when commonly available digital tools are utilised (Rao et al., 2021).

UDL is an approach to curriculum and instructional design, not a curriculum, but that creates flexible instructional goals and methods of teaching to cater to diverse students' needs, learning materials, and assignments (Smith et al., 2019). These scholars further assert that

UDL's popularity is growing in multiple national policies. Despite its flexibility and accessible learning experiences for everyone, technology remains the enabler of UDL (Bray et al., 2024). This framework guideline can be used by all education stakeholders, such as curriculum developers, educators, parents, researchers, and anyone prepared to implement the UDL framework in a learning environment (Rao et al., 2021). Since the CAST aimed to revolutionise the teaching methods for students with special needs, this aim evolved from addressing students' difficulties to addressing the school's difficulties in 1990.

The international promotion of educational policy for Special Educational Needs (SEN) students' inclusion in the general classroom of the mainstream constitutes a broad learning community and has resulted in the development of UDL (Karagianni & Drigas, 2023). The UDL framework should be commonly applied to establish communication between designers and users regarding the method to be utilised to create effective learning environments conceived, perceived, and actioned for effective teaching and learning (Young & Cleveland, 2022). Graham and Slee (2008), alluded that inclusion is an attempt to stop segregation and to create an environment that accommodates all students. These scholars further postulate that the inclusive accomplishment is not in dispute. Seemingly, the framework developers put their focus on the positive side of it in a process of inclusivity. On the other hand, Bray et al. (2024) argue that UDL literature has nothing to address the possible negative impacts of technology within the learning context. Bray et al. (2024), seem to challenge scholars to identify gaps in this framework. Students' inaccessibility to technology resulting from the digital divide is challenging since the same technology is an enabler of UDL.

Hypothesis

H_0: Students' inability to understand technological affordances does not affect their academic performance.

RESEARCH METHODOLOGY

This study employed a **descriptive research design** to examine the impact of Artificial Intelligence (AI) on the creation of inclusive learning environments within Technical and Vocational Education and Training (TVET) colleges. A **quantitative research approach** was adopted to gather empirical data and address the study's objectives and hypotheses.

A total of **180 students** from selected TVET colleges participated in the study. Respondents were selected using a **random sampling technique** to ensure the representativeness and generalisability of the findings. Empirical data were collected through a **closed-ended five-point Likert scale questionnaire,** designed to capture students' perceptions of AI's role in inclusive education. The instrument was administered manually, with support from college lecturers to facilitate data collection and ensure participant understanding.

To establish the instrument's reliability, **Cronbach's alpha** was calculated, confirming the internal consistency of the questionnaire. The collected data were analysed using **Microsoft Excel**, employing both **descriptive statistics** and **inferential statistical tests** to identify patterns, trends, and relationships within the data. Appropriate **charts and tables** were used to visualise the findings, and **frequency tables with metadata captions** were included to enhance interpretation. The study was conducted with full ethical approval granted by the **Ethics Review**

Committee of the University of South Africa, ensuring adherence to research ethics, including informed consent, confidentiality, and participant anonymity.

RESULTS

The data collection tool underwent testing to measure its reliability and internal consistency.

Table 1:

Data collection tool testing

(Measure of reliability and internal consistency)

Variables	Number of items	Cronbach's a
Demographic data	4	0.72
AI integration in education	7	
Technological affordances	5	
Ethical issues	4	
Overall	20	

Table 1 shows a 0.72 Cronbach's alpha, an acceptable questionnaire reliability test.

Demographic data analysis

Table 2:

Respondents' gender and field of study

	African	Coloured	Indian	White	Total	Percentages
Female	81	13	7	3	104	58%
Male	53	10	9	4	76	42%
Grand total	**134**	**23**	**16**	**7**	**180**	**100%**
Field of study						
	African	Coloured	Indian	White	Total	Percentages
Humanities	53	11	6	3	73	41%
Commerce	32	3	3	1	39	22%
Engineering	19	8	6		33	18%
Sciences	25	1		1	27	15%
Other	5		1	2	8	4%
Grand total	**134**	**23**	**16**	**7**	**180**	**100%**

Table 2 shows the respondents' gender and field of study per their ethnic groups. Female respondents (104) and males (76) all returned their questionnaires. Most students were enrolled in humanities-related courses (73), followed by commerce (39). Engineering and sciences followed with 33 and 27 students, respectively. African students were the majority,

134, with a minimum of seven white students. Female respondents exceeded males with 58% and 42% males.

Table 3:

Respondents' age distribution

Age category	Female	Male	Total	Percentages
19-23	33	27	60	33.34%
24-28	45	29	74	41.11%
29-33	24	18	42	23.33%
34-38	2	2	4	2.22%
Grand total	**104**	**76**	**180**	**100%**

Table 3 shows the respondents' age distribution, which ranges from a minimum of 19 to a maximum of 36, with a mean of 25.82 and a standard deviation of 3.92. Most respondents were between 24 and 28, with 41.11%, followed by those between 19 and 23, with 33.33%. The lowest age distribution of 2.22% was between 34-38.

AI integration in education

Table 4:

Artificial Intelligence integration to education

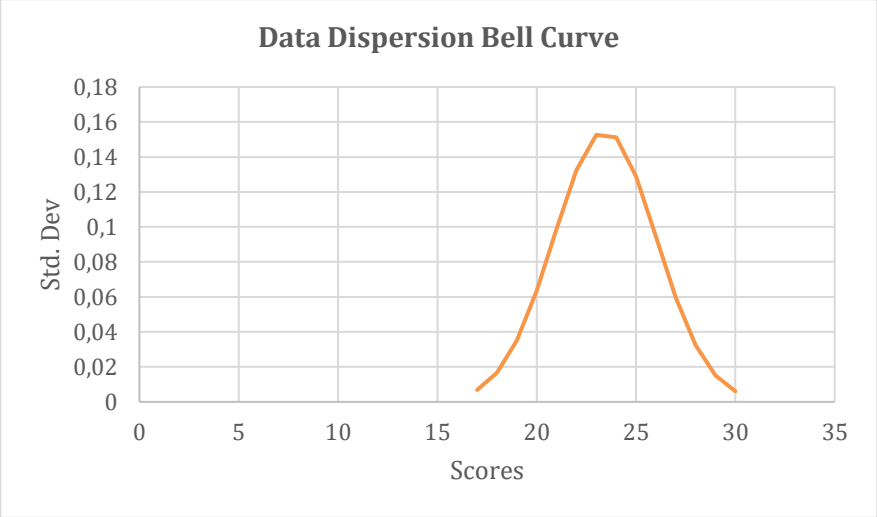
Items	n	Mean	Std. Dev
Artificial Intelligence contributes significantly to fostering inclusive learning environments.	180	4.15	0.84
Artificial Intelligence-driven technologies support collaborative learning among students.	180	4.47	0.55
Artificial Intelligence-driven technologies enhance accessibility for students with learning difficulties.	180	3.16	0.93
Artificial Intelligence promotes diversity and inclusion initiatives within educational establishments.	180	3.95	0.86
The use of Artificial Intelligence in decision-making processes ensures fair and equitable outcomes for all students.	180	3.72	1.08
Integrating AI in inclusive learning has no impact on students' academic performance.	180	2.72	0.61

Technologically empowered students with AI-driven technologies show the same academic performance as those who are technologically disempowered.	180	1.94	0.67
Strongly Disagree = 1, Disagree = 2, Neutral = 3, Agree = 4, Strongly Agree = 5			

Table 4 shows the measurement of the central tendency of 180 respondents (n =180), with the mean and standard deviations. The data distribution shows low variability as all standard deviations are far lower than the mean. This implies that the dispersion is consistent, the data is reliable and can be used for further analysis and decision-making.

Figure 1:

Data dispersion



The symmetrical bell curve shape on the scatter chart in Figure 1 supports the analysis in Table 4, as it shows the normal distribution of data. The data displayed shows neither positive nor negative skewness. In this distribution, the mean, mode, and median are located at the centre as they are all equal with no outliers. The symmetric distribution shows an equal dispersion of data on the left and right sides. Since the peak of the bell curve is neither too short nor too long, the kurtosis is mesokurtic.

Technological affordances

Hypotheses testing

H_0: Students' inability to understand technological affordances does not affect their academic performance.

Table 5:

Technological affordances

Statement	Strongly Disagree %	Disagree %	Neutral %	Agree %	Strongly Agree %	n	Var.	df	Sig.
C1. Students know more about technological affordances.	0	0	88	12	0	180	0.104	4	2.8741E-167
C2. AI technologies enhance students' engagement and motivation.	0	0	8	85	7	180	0.151	4	
C3. AI has the potential to identify each student's learning needs.	5	7	75	13	0	180	0.401	4	
C4. AI applications enhance accessibility for students with learning difficulties.	0	0	4	18	77	180	0.289	4	
C5. AI supports diverse learning styles.	3	2	6	28	61	180	0.827	4	

Table 5 shows the respondents' technological affordances. A statistical test, Analysis of variance (ANOVA), was conducted to test the hypothesis. Respondents' degree of agreement was rated in five items (C1-C5). Five-point Likert scale results are displayed in percentages in this table. The probability value of 2.8741E-167 alpha shows the significant results of this statistical test. Since the statistical test results yield the p-value ($p<0.05$), we reject the null hypothesis.

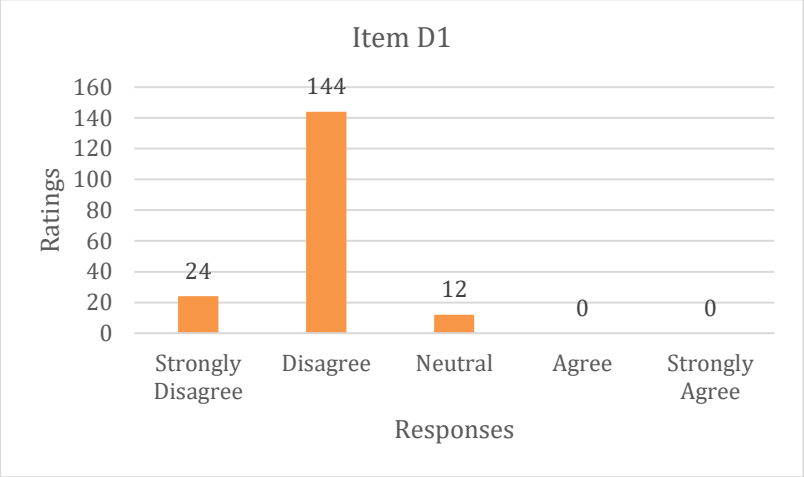
Ethical issues

Data were visualised in four-column charts in this section to display and analyse the respondents' rating responses on AI ethical issues. Likert scale items are labelled D1-D4 as per the chart titles.

D1. Artificial Intelligence-driven technologies respect individual privacy and confidentiality.

Figure 2:

Privacy and confidentiality



Out of 180 surveyed respondents, Figure 2 shows that 144 (80%) and 24 (13%) indicated that AI-driven technologies do not respect individual privacy and confidentiality, while 12 (7%) remain neutral. No one agreed with the statement.

D2. Users should be trained on the ethics surrounding the use of Artificial Intelligence.

Figure 3:

AI ethics

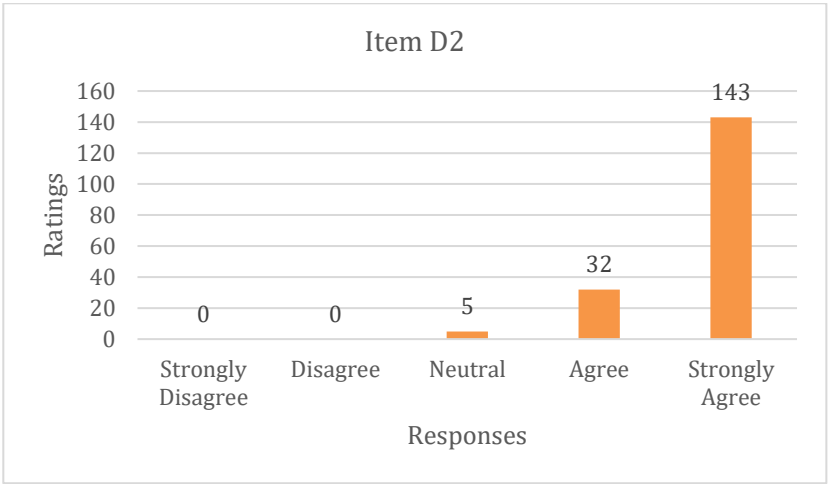


Figure 3 shows that 143 (79%) and 32 (18%) of respondents agree that AI users should be trained on how to use these technologies ethically. Only five (3%) remained neutral. This

signifies that most AI users are unfamiliar with the ethical implications of these AI-driven applications. Therefore, educating users about the potential risks attached is of cardinal importance to ensure that they comply with the laws regulating the use of AI tools.

D3. Students tend to use Artificial Intelligence unethically, such as engaging in academic cheating.

Figure 4:

Academic misconduct

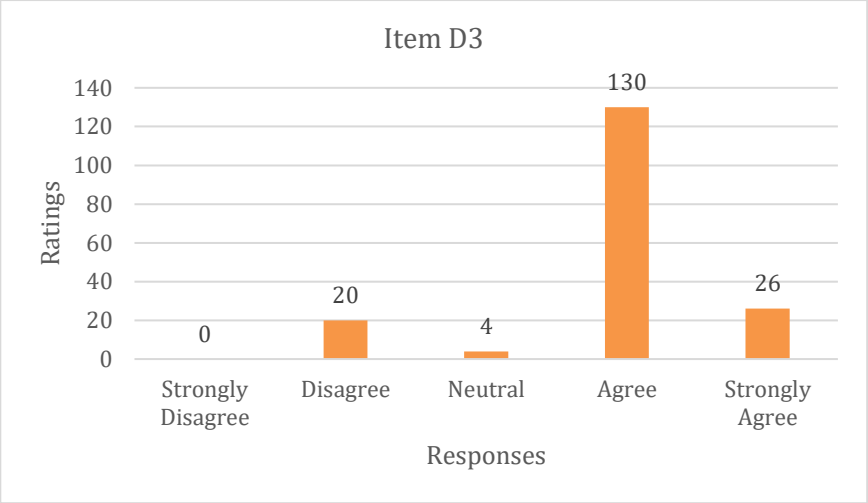


Figure 4 shows that 130 (72%) and 26 (14%) of respondents responded positively that students tend to engage in fraudulent acts in academic work with the help of AI-driven applications, while 20 (11%) and four (2%) disagreed and remained neutral, respectively.

D4. Artificial Intelligence infringes on the individual's right to privacy.

Figure 5:

Infringement of privacy

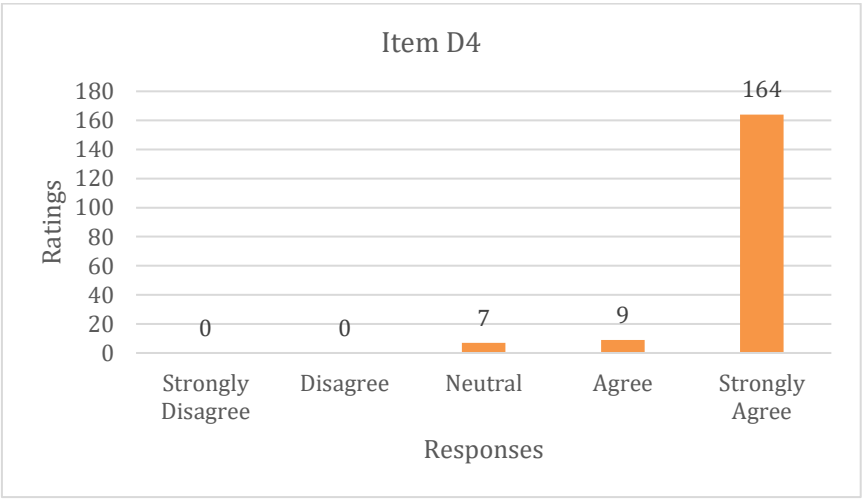


Figure 5 also shows that 164 (91%) and nine (5%) of respondents support the argument that AI-driven applications infringe on an individual's rights to privacy, and seven (4%) remain

neutral. These AI applications sometimes infer sensitive information about individuals based on the data they process, as well as their social media platform usage.

DISCUSSION

This study examined the role of AI in producing inclusive learning environments. The study got support from UDL, the framework that promotes inclusivity and creates independence among students so that they can take responsibility for their learning activities. As per objectives one and two, desktop and empirical data show that these AI-driven technologies have the potential to create learning environments that can cater to all students, also those with various learning difficulties. The results indicate that since AI-driven technologies can grade students' assignments automatically and provide automated formative assessment feedback, instructors have a reduced load, allowing them to continue with other duties. These technologies can provide individualised tutorials outside the classroom that will benefit multiple students with diverse needs and learning styles, at a pace that will accommodate each student.

It was also explicit that these flexible AI technologies can provide both synchronous and asynchronous forms of learning, which also accommodate students' diverse needs according to their learning styles. Students can access pre-loaded lessons or presentations at convenient times. Non-native speakers can get their curriculum content translated into languages of their choice to cope with their education while learning new languages. These benefits include students speaking various languages and creating inclusivity. As a result of educational games available or provided by AI, students can be engaged as they enjoy these learning methods. Although some communities face the challenge of ICT infrastructure with a very slow internet speed, AI creates virtual classrooms that promote online facilitation and e-collaboration between students and their peers and their instructors. Enhanced accessibility that provides educational support and resources is another ability of AI-driven technologies. Students can save on travel costs to campuses and enrol and access resources in the comfort of their residences. While students are engaged by subject content, they can also develop a series of technological skills as per the requirements of modern education with Industry 4.0 and 5.0. AI-driven technologies comprise endless technological affordances that benefit students of different backgrounds in their educational quest. These technologies equip them with multiple skills, such as problem-solving, e-communication, and online resource sharing. These technologies provide students with cognitive and physical affordances.

Challenges limiting the possibility of this technology were also identified. The ICT's poor infrastructure, the digital divide, the incompetence of some instructors who lack the required digital skills, and the infringement of some individuals' rights resulting from ethical issues were among the factors limiting the proper and efficient use of AI in education. As per objective number three, the empirical results revealed that most AI users are not familiar with the laws regulating the use of these technologies. It was clear that users and students do not give themselves time to read the relevant policies regulating the use of AI. Some are misusing these technologies to commit certain forms of cybercrime, such as academic fraud, when completing their education projects, such as assignments and online examinations. This is why educational institutions have incorporated plagiarism-detecting tools such as Turnitin, Copyscape, and Plagscan. This is a crucial exercise for these institutions to ascertain that the integrity of their assessments is not compromised, as that might lead to the conferment of qualifications to non-deserving recipients. When rating students' unethical use of AI, 72% and

14% of respondents 'agreed' and 'strongly agreed', respectively. In addition, AI developers were also criticised for violating the rights of some entities. This argument received support from this study's respondents, who rated 80% agree that AI-driven technologies respect individual privacy and confidentiality, while 13% disagree. As a result, the content obtained from AI can be used to commit certain criminal acts, including identity theft, plagiarism, phishing, and social engineering. About 91% of respondents strongly agreed that AI technologies infringe on individuals' rights to privacy. A hypothesis based on students' ability to utilise and understand technological affordances was tested to establish solutions to the challenges attached to affordances, the digital divide, and the lack of digital skills.

CONCLUSION

This study investigated the potential of AI-driven technologies to foster inclusive learning environments, particularly for students with learning difficulties, within the context of 21st century education. Guided by a quantitative approach and supported by the UDL framework, the findings indicate that AI has significant potential to address diverse learning needs by enabling flexible, accessible, and adaptive educational practices.

The UDL framework proved instrumental in conceptualising inclusive education, offering a structure that accommodates variability in students' cognitive, linguistic, and sensory abilities. By promoting multiple means of engagement, representation, and expression, UDL aligns closely with the functionalities of AI tools that personalise learning experiences and support differentiated instruction. The literature review reinforced these findings, illustrating how AI can assist students with a wide range of learning difficulties — such as difficulties in reading, writing, language processing, attention, memory, and speech — by offering targeted support and responsive learning interventions. However, the study also highlighted substantial barriers to effective AI integration. Chief among these are issues of accessibility and equity, particularly in underserved communities where the **digital divide, inadequate ICT infrastructure**, and **limited digital literacy** restrict access to AI-enabled learning environments. Additionally, financial constraints, resistance to change, and a lack of digital competence among instructors remain significant obstacles to inclusive implementation.

Moreover, ethical concerns surrounding AI use in education emerged as a critical challenge. AI-driven tools, while offering valuable learning support, are frequently scrutinised for facilitating academic dishonesty and compromising data privacy. Instances of plagiarism and unauthorised data sharing through platforms such as ChatGPT, DeepSeek, Jenni and other AI-driven tools raise legitimate concerns about academic integrity and personal rights. These risks underscore the need for institutions to establish robust ethical guidelines and adopt tools to monitor and manage AI use responsibly. Despite these challenges, the study concludes that AI holds substantial promise for advancing inclusive education if issues of **access, ethics,** and **digital preparedness** are systematically addressed. Educators, policymakers, and institutions should collaborate to ensure that AI is leveraged in a manner that is not only innovative but also equitable, ethical, and inclusive for all students.

RECOMMENDATIONS

Reskilling and upskilling of instructors in terms of the latest technology is recommended. The reason for this is the fact that AI-powered technology has the potential to create inclusivity in education. However, some instructors lack the required digital skills. Therefore, instructors

should acquire innovative digital skills to assist students with diverse learning needs. In addition, instructors should be equipped with advanced digital skills to understand the affordances of AI-driven technology. As a result of technological evolution, those instructors who do not possess the required skills should be reskilled to cope with the opportunities brought by 4.0 and 5.0 technologies.

Owing to these research results, this study also proposes key recommendations to address the current ethical issues surrounding the incorporation of AI in education. Within the context of ChatGPT, Jenni AI, and other such applications, this study underlines the need to develop comprehensive ethical guidelines and policies in the era of increasingly AI applications that will respect and treat individuals' confidential information.

It is also recommended that ChatGPT and other AI application developers refrain from publicising individuals' information on their platforms without the consent of those individuals. Information is the most important element in the field of ICT and should, therefore, be treated as such. In addition, the inclusion of AI stakeholders in developing these applications was also recommended to ensure that confidential information about various entities is protected.

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