HARNESSING ARTIFICIAL INTELLIGENCE FOR PROMOTING 21ST CENTURY SKILLS ACQUISITION AND UNDERGRADUATES' PREPAREDNESS FOR SUSTAINABLE LIFELONG LEARNING IN NIGERIA.

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Abstract

The 21st century has brought education great opportunities hence schools need to ensure students have the expected life skills and knowledge in order to fit into the work environment upon graduation. Academic knowledge content alone is not sufficient to prepare students for the world of work. With increasing global competitiveness, undergraduates need energetic drive for skills that are challenging and inspiring to thrive in today's world. The study examined harnessing artificial intelligence for promoting 21st century life skills acquisition and Undergraduates preparedness for sustainable lifelong learning in Nigeria. Descriptive survey design was adopted for the study, four purposes of the guided study, four research questions were raised and four hypotheses were tested at 0.05 level of significance. A structured questionnaire was used for data collection titled "harnessing artificial intelligence for promoting 21st century skills acquisition and Undergraduates preparedness for sustainable lifelong learning "Harnessing Artificial Intelligence for promoting 21st Century Skills Acquisition and Undergraduates preparedness for Sustainable Lifelong Learning". The instrument was validated by two experts and a reliability coefficient of 0.81 was obtained. Population comprised of 250 (99 males and 151 females) respondents used for the study. Multi-stage sampling procedure was used for data analysis using mean, standard deviation and independent t-test. Findings revealed that undergraduates' awareness of available AI technology was moderately low. Moreover, it was observed that undergraduate's preparedness with learning skills, exposure to literacy skills and acquisition of skills for sustainable lifelong learning were moderate. Findings further showed that males have more awareness of AI technology and preparedness in 21st century skills than females. Based

on the findings of the study, it was recommended among others, that there should be concerted effort by government and tertiary institutions management to organize awareness and training programmes on new and emerging technologies, especially AI in teaching and learning so as to keep students informed about and improved skills and knowledge in the utilization of AI technologies.

Keywords: Harnessing Artificial Intelligence (AI), Promoting 21st Century Skills Acquisition, Undergraduates Preparedness for Sustainable Lifelong Learning.

Introduction

Modern students thrive on challenges, inspirations and autonomics to leverage technologies, collaborate with peers and develop self-directed learning. It is increasingly clear that theoretical knowledge alone cannot guarantee acquisition of practical skills required for world of work. The 21st century is moving at an unprecedented pace and technology is driving rapid changes in various sectors to transform industries including business, healthcare, and military organizations. Education must adapt to these changes for individual and societal growth focusing on equipping learners with adaptable skills and competencies. UNESCO 2019published the Beijing Consensus on artificial intelligence (AI) and education on how best to harness AI technologies for achieving Education 2030 agenda.

AI in education can address major challenges, innovate teaching and learning and help achieve sustainable development goal for (quality education) which is tailored towards education for individual needs, efficient teaching and improved learning outcomes (Shiohira & Keevy, 2019). Sustainable development goal-4 (SDG-4) focused on ensuring inclusive and equitable quality education and promoting lifelong learning opportunities for all by the development of skills to ensure that individuals can continue learning throughout their lives, as well as address inequality and gender disparities in education. The consensus called for support to use AI technologies to offer lifelong education and training which enables personalized learning anytime, anywhere for anyone and prepare the next generation of existing workforce with values and skills for life and work most be relevant in this AI and 21st century skills era, as well as promote equitable use of AI irrespective of the gender and ensures that AI technologies are used to empower teachers and develop appropriate capacity building programs for teachers to work alongside AI systems. (Dhara et al., 2022).21st-century skills are crucial for thriving in the modern workplace. As AI advances, skills like critical thinking, problem-solving, creativity,

emotional intelligence and adaptability are in high demand. It automates routine tasks, shifting focus to uniquely human skills Alimi et al (2021**Artificial Intelligence in Education.**

Conceptual Review

AI is a technology tech framework enabling computers to perform tasks typically requiring human intellect like problem-solving, learning and decision-making (Aina et al., 2023), According to IDRA (2018), AI is a computer program/software that can transform teaching and learning. Applications include: Personalized learning, adaptive learning, special needs, bilingual education, gamification, virtual tutor and immersive learning. According to Asomugha in Chatterjee et al (2022) other usefulness of AI technologies include: Personalized /Adaptive Platforms: This creates educational contents based on individual students' performance and learning style example Knewton. Dreambox. AI technologies offer various benefits such as Personalized/Adaptive Platforms that tailors content to individual students' performance and learning style (e.g., Knewton, Dreambox), language learning, content creation tools generating study materials and quizzes based on learning ability and memory retention.AI supports learners and creators in various ways such as content generation, AI helps with writing, designing, creating content (marketing, social media, blogging, graphics, videos), virtual assistance, google assistant aids homework, answers questions, and assists educational tasks, interactive learning, smartboards provide real-time feedback, chatbots offer guidance and answers. According to Ibrahim, (2023), AI fosters essential 21st-century skills such as   personalized learning, critical thinking &problem solving, collaboration & communication Virtual environments enable group work and feedback creativity and innovation, information Literacy. Tertiary institutions face pressure to produce graduates with relevant skills for the evolving job market with relevant curriculum aligning education with workplace needs, 21st-century skills, equipping graduates with skills for success and lifelong learning, survival skills for preparing students for a changing job landscape. American Association of Colleges of Teacher Education (AACTE-2010) grouped these skills into three categories: learning skills which is essential for problem solving,   critical thinking, analysis, evaluation, creativity & Innovation   idea generation, design thinking, experimentation, collaboration & communication Teamwork, feedback, effective communication. These skills help students thrive in modern work environment.

Literacy skills focus on digital comprehension, information literacy, understanding facts, figures, stats, and data, media literacy knowing info publication methods and outlets, technology literacy using tech like computers, cloud, and mobile devices.

Life Skills (FLIPS) empower students to adapt to change (Flexibility), motivate teams (leadership), take charge (Initiative) manage time and learn continuously (productivity) and build connections (social skills).

In spite of the great opportunities 21st century skills present, a wide gap still exists in knowledge-deployment of these skills among students in Nigeria's tertiary institutions.

Concept of Sustainable Lifelong Learning

Sustainable lifelong learning is continuously developing skills and knowledge to fit into a rapidly changing world. With AI and tech evolving fast, adapting and learning becomes a lifelong journey.

Lifelong learning is the ability to adapt to societal needs, contributes to development, builds skills and knowledge over a lifetime and transfers experience into growth. (Kaplan, 2016). Uko and Nnaji (2016) posited that sustainable lifelong learning is a comprehensive and visionary concept which includes formal and non-formal learning extended throughout the life span of an individual to attain the fullest development in personal, social, vocational and professional life. Alimi et al (2021) submitted that the objectives of lifelong learning include active citizenship, employability, social inclusion and personal fulfilment. These objectives when properly integrated and harnessed through science education teaching will enable learners accomplish life goals for sustenance. Uko & Nnaji (2016), further stated that promoting lifelong learning in Nigeria requires giving tertiary education a facelift in the areas of infrastructure and institutional facilities, pedagogy, curricula, general administration and manpower. These will enable learners develop needed skills for global competitiveness to survive in the 21st century.

Education in the 21st century is evolving rapidly hence tertiary education is focusing on equipping graduates with practical and intellectual skills for self-reliance and societal contribution and use of technology shapes education and skill acquisition. Despite the benefits tertiary institutions in Nigeria is still faced with challenges in fulfilling their role as lifelong education centers due to inadequate infrastructures, outdated curricula and skill gaps leading to unmet aspirations and limited employability.

Based on the above, the study sort to find out how Artificial Intelligence (AI) can be used to enhance 21st-century skills acquisition and prepare business education students for sustainable lifelong learning. Specifically, the study sought to;

1. Examine the level of business education student's undergraduate s awareness of available AI technologies.

2. Determine the extent of business education undergraduates preparedness in learning skills for lifelong learning harnessing AI technologies.

3. Examine the extent of exposure of business education undergraduates preparedness in the acquisition of literacy skills for sustainable lifelong learning using AI technology.

4. Determine the extent of preparedness of business education undergraduates on the acquisition of life skills for lifelong learning harnessing AI technology.

1. What are the level of business education student's undergraduate s awareness of available AI technologies.

2. To what extent are business education undergraduates prepared for learning skills for lifelong learning harnessing AI technologies.

3. To what extent are business education undergraduates exposed for preparedness in the acquisition of literacy skills for sustainable lifelong learning using AI technology.

4. To what extent are business education undergraduates prepared for acquisition of life skills for lifelong learning harnessing AI technology.

1. There is no significant difference between male and female business education undergraduates level of awareness on the availability of AI technology.

2. There is no significant difference between male and female business education undergraduates preparedness in learning skills for lifelong learning harnessing AI technology.

3. There is no significant difference between male and female business education undergraduates exposure to literacy skills for lifelong learning using AI technology.

4. To what extent are business education undergraduates prepared for acquisition of life skills for lifelong learning harnessing AI technology.

Methods

Descriptive survey design was adopted for the study and was conducted in delta state. The population of the study comprised 253 business education, 253 students was randomly selected. Four purposes guided the study, four research questions were raised and four hypotheses were tested at 0.05 level of significance. The 34-item questionnaire on 'Harnessing AI for 21st Century Skills Acquisition for Sustainable Lifelong Learning was used for data collection. The instrument was in two parts. Part A consisted of four items that elicited information from respondents on name of school, area of specialization, sex and year of study. Part B comprised of 34-items on awareness of AI and undergraduates' preparation on 21st century skills for sustainable lifelong learning using AI technologies. The designed questionnaire was trial-tested on 30 students who were not part of the original sample. The aim of the pre-test was to check the validity and reliability of the instrument and a reliability coefficient of 0.81 was obtained using Cronbach alpha index based on the observation of some experts in business education and the questionnaire

was reviewed accordingly and defects were corrected before administration. The questionnaire was administered physically in hard copies and electronically through Google form (a link was created) to respondents through a WhatsApp group created specifically for the study. 253 copies of the instrument were administered and 250 copies were retrieved, which gave 99 % return rate.

Data obtained were analyzed using mean and standard deviation to provide answers to the research questions, while independent t-test was used to test the hypotheses at .05 level of significance. In order to take decisions as regard research questions 1 which was designed on a two point rating scale, if the cluster mean score falls between:1.00-1.49 and 1.50-2.00, it was taken to indicate low extent and high extent respectively. For research questions 2,3 and 4 which were designed on a four point scale, whenever the cluster mean score falls between: 1.00-1.49, 1.50-2.49, 2.50-3.49 and 3.50-4.00, it was taken to indicate: Low Extent (LE), Moderate Extent (ME), High Extent (HE), Very High Extent (VHE). For the hypotheses, when the probability value(p-value) was less than .05 level of significance, the null hypotheses were rejected and also when the probability value (p-value)was greater than .05 level of significance, the null hypotheses were retained.

RESULTS

Research Question One

1. What are the level of business education student's undergraduate s awareness of available AI technologies?

Table 1: Respondents mean ratings and standard deviation on the level of business education undergraduates awareness of available AI technologies.

S/N	Level of awareness of business education undergraduates of available AI technologies	-X	SD	Remarks
1	Have you heard and seen Artificial Intelligence (AI) tools	1.85	0.35	Yes
2	Do you know the meaning of AI	1.95	0.22	Yes
3	Do you have knowledge of AI technologies	1.52	0.50	Yes
4	Have you used any of these AI tools in learning process:			
A	Virtual classroom	1.46	0.50	No
B	Smartboard	1.45	0.50	No

C	ChatGPT		1.62	0.49	Yes
D	Virtual Assistance		1.40	0.49	No
E	Charttbots		1.36	0.48	No
F	Cerego		1.12	0.33	No
G	Knewton		1.01	0.11	No
H	Dreambox		1.10	0.31	No
I	Video streaming		1.62	0.49	Yes
J	Google assistant		1.90	0.31	Yes
K	Google Cloud AI		1.45	0.50	No
	Cluster Mean		1.49	0.40	**Low Extent**

Table1.1 showed that items 1, 2 and 3 falls between 1.50-2.00, which means that the respondents agreed they have heard and seen Artificial Intelligence (AI); they know the meaning of AI; and they have knowledge of AI technologies. The mean score on item 4 indicated that the responses of the undergraduates on 4a, b, d, 4e, 4f, g, h and k fell between 1.00-1.49, indicated that the respondents disagreed on the usage of virtual classroom, smart board, virtual assistance, charttbots, cerego, knewton, dream box and Google cloud AI. Responses on 4c, i and j falls between 1.50-2.00agreed that they have used ChatGPT, video streaming and Google assistant. It was also observed that the standard deviation scores of the respondents range from 0.01 to 0.50, the scores are small which means that the spread of scores are not wide apart. The cluster mean of 1.49 for all the items showed that to a low extent business education undergraduates education undergraduates are aware of available AI technologies.

Research Question Two

2. To what extent are business education undergraduates prepared for learning skills for lifelong learning harnessing AI technologies.

Table 2: Mean and standard deviation of the extent business education undergraduates are prepared for learning skills for lifelong learning harnessing AI technologies.

S/N	Extent business education undergraduate are prepared for learning skills for sustainable lifelong learning using AI technologies.	Mean	SD	Remarks
5	Ability to find solutions to solve problems	2.48	0.83	ME
6	Think beyond a situation in your environment	2.48	0.95	ME
7	Apply different strategies in solving a problem.	2.42	0.95	ME
8	See things differently from the way others view them.	2.58	1.07	HE
9	Try out some new ideas or things.	2.53	1.03	HE
10	Collaborate with others.	2.44	0.96	ME
11	Share your ideas with others.	2.48	0.99	ME
12	Adopt others' ideas.	2.39	0.84	ME
	Cluster Mean	**2.48**	**0.95**	**ME**

The result in Table 2 showed the mean ratings on the responses of business education undergraduates on the extent they are prepared with learning skills for sustainable lifelong learning using AI technologies. The result in Table2 indicated that the mean range of items 5,6,7, 10,11 and falls between 1.50-2.49 which shows that to a moderate extent business education undergraduates are able to use AI technologies to find solutions to problems, think beyond a situation in their environment, they apply different strategies in solving a problem, collaborate with others, share their ideas with others and adopt others' ideas. The result in Table 2 also showed that the mean range of items 8 and 9 falls between 2.50-3.49, which showed that to a high extent the respondents see things differently from the way others view them and they try out some new ideas. It was observed that the standard deviation scores of the respondents range from 0.83 to 1.07, the scores are small which means that the spread of scores are not wide apart. The cluster mean of 2.48 for all the items implies that to a moderate extent business education undergraduate are prepared with learning skills for sustainable lifelong learning using AI technologies.

Research Question Three

3. To what extent are business education undergraduates exposed for preparedness in the acquisition of literacy skills for sustainable lifelong learning using AI technologies.

Table.3:   Mean and standard deviation of the extent business education undergraduates are exposed to preparedness in the acquisition of literacy skills for sustainable lifelong learning using AI technologies.

S/N	Extent of exposure of business education undergraduate to preparedness in the acquisition of literacy skills for sustainable lifelong learning using AI technologies.	Mean	SD	Remarks
13	Are interested in knowing the fact and truth of a situation	2.41	1.11	ME
14	Are interested in collecting data	2.56	1.22	HE
15	Read any materials that you come across	2.35	1.14	ME
16	Look for information online on areas of interest.	2.46	1.16	ME
17	Can operate the computer efficiently.	2.25	1.05	ME
18	Have the competence to use digital and other technologies.	2.41	1.03	ME
	Cluster Mean	**2.41**	**1.12**	**ME**

The result in Table 1.3 reveals the mean range for the responses of the students on the extent of exposure of science education undergraduate students to literacy skills for sustainable lifelong learning using AI technology. The result in Table 1.3 reveals that the mean range of items 13, 15, 16, 17 and 18 falls between 1.50-2.49, which indicates that to a moderate extent: they are interested in knowing the fact of a solution, they read any materials that they come across, they look for information online on areas of interest, they can operate the computer efficiently and they have the competence to use digital and other technologies. Result of item 14 falls between 2.50-3.49; which is to a high extent they are interested in collecting data. It is also observed that the standard deviation scores of the respondents range from 1.03 to 1.22, the scores are small which means that the spread of scores are not wide apart. The cluster mean of 2.41 for all the items implies that there is moderate extent of exposure of science education undergraduate students to literacy skills for sustainable lifelong learning using AI technology.

Research Question Four

To what extent are business education undergraduates prepared for acquisition of life skills for lifelong learning harnessing AI technology.

Table 1. 4: Mean and standard deviation of the extent business education undergraduates are prepared for acquisition of life skills for lifelong learning harnessing AI technologies .

S/N	Extent business education undergraduates are prepared for acquisition of life skills for lifelong learning harnessing AI technologies	Mean	SD	Remarks
19	adapt to changing circumstances	2.70	1.07	HE
20	listen to other people's opinions	2.70	1.03	HE
21	learn from others	2.82	1.14	HE
22	motivate others to accomplish a task	2.51	1.12	HE
23	take decisions on behalf of others.	2.04	1.01	ME
24	Using previous knowledge to solve current problems	2.52	1.16	HE
25	Being able to takelead role in activities without guidance	2.16	0.94	ME
26	are able to start a project on your own	2.40	1.20	ME
27	work on tasks outside regular official hours.	2.29	1.12	ME
28	venture into new businesses	2.32	1.16	ME
29	can complete a set task on time	2.32	1.11	ME
30	make friends with students who help you in your studies	2.48	1.17	ME
31	socialize with other students	2.30	1.12	ME
32	do other business like (trading, sewing and hair making, shoe making) alongside your studies	2.40	1.15	ME
33	want to be your own boss after graduation	2.53	1.19	HE
34	want to get a paid job after graduation	2.68	1.25	HE
	Cluster Mean	**2.45**	**1.12**	**ME**

The result in Table 1.4 revealed the mean ratings for the responses of the students on the extent business education undergraduates are prepared for acquisition of life skills for lifelong learning harnessing AI technologies. The result in Table 1. 4 revealed that the mean ratings of items 19,20,21,22, 24, 33 and 34 falls between 2.50-3.49, which means that to a high extent, the respondents: adapt to changing circumstances, listen to other people's opinions, learn from others, motivate others to accomplish a task, bring your previous knowledge to solve current problems, want to be their own boss after graduation and want to get a paid job after graduation. Responses for 23, 25,26,27,28,29,30,31 and 32 falls between 1.50-2.49, the result implies that to a moderate extent, the respondents: take decisions on behalf of others, always volunteer to take the lead role in activities, are able to start a project on your own, work on tasks outside regular official hours, venture into new businesses, make friends with students who help you in your studies, can complete a set task on time, socialize with other students and do other business like (trading, sewing and hair making, shoe making) alongside your studies. It was also observed that the standard deviation scores range from 0.94 to 1.25, the scores are small which means that the spread of scores are not wide apart. The cluster mean of 2.45 for all the items implies that there is moderate extent of acquisition of life skills by business education undergraduates for lifelong learning using AI technologies.

Hypothesis One

There is no significant difference between male and female business education undergraduate's awareness of available AI technologies.

Table 1.5: Independent t-test of the difference between male and female business education undergraduates' awareness of available AI technologies.(N=250)

Gender	N	Mean	SD	t-value	Sig.	Decision
Male	99	1.53	0.20	2.94	0.00	Significant
Female	151	1.46	0.16			

The result in Table 1.5 showed the t-value of   2.94 while the corresponding probability level of significance is .00 alpha at 248   degrees of freedom. This level of significance is less than .05 in which the decision is based. With this result, the null hypothesis was rejected. This result implies that there is a significant difference between male and female business education undergraduates' awareness of available AI technologies.

Hypothesis Two

There is no significant difference between male and female business education undergraduates' preparedness in learning skills for lifelong learning harnessing AI technologies.

Table 1.6: Independent t-test of the difference between male and female business education undergraduates' preparedness in learning skills for lifelong learning harnessing AI technology (N=250)

Gender	N	Mean	SD	t-value	Sig.	Decision
Male	99	2.87	0.70	6.20	0.00	Significant
Female	151	2.21	0.89			

The result in Table 1.6 showed the t-value of 6.20, while the corresponding probability level of significance is .00 alpha at 248   degrees of freedom. This level of significance is less than .05 in which the decision is based. With this result, the null hypothesis was rejected. This result implies that there is a significant difference between male and female business education undergraduates' preparedness in learning skills for lifelong learning harnessing AI technology.

Hypothesis Three

There is no significant difference between male and female business education undergraduate exposure to literacy skills for lifelong learning using AI technology.

Table 1.7: Independent t-test of the difference between male and female science education undergraduate exposed to literacy skills for lifelong learning using AI technologies (N=250)

Gender	N	Mean	SD	t-value	Sig.	Decision
Male	99	2.91	0.78	6.77	0.00	Significant
Female	151	2.07	1.07			

The result in Table 1.7 shows the t-value of 6.77, while the corresponding probability level of significance is .00 alpha at 248   degrees of freedom. This level of significance is less than .05 in which the decision is based. With this result, the null hypothesis was rejected. This result implies that there is a significant difference between male and female business education undergraduates exposure to literacy skills for lifelong learning using AI technologies.

Hypothesis Four

There is no significant difference between male and female business education undergraduates in the acquisition of life skills for lifelong learning using AI technologies.

Table 1.8: Independent t-test of the difference between male and female business education undergraduates in the acquisition of life skills for lifelong learning using AI technologies (N=250)

Gender	N	Mean	SD	t-value	Sig.	Decision
Male	99	2.83	0.70	5.63	0.00	Significant
Female	151	2.20	0.97			

The result in Table 1.8 showed the t-value of 5.63, while the corresponding probability level of significance is .00 alpha at 248 degrees of freedom. This level of significance is less than .05 in which the decision is based. With this result, the null hypothesis was rejected. This result implies that there is a significant difference between male and female business education undergraduate students in the acquisition of life skills for lifelong learning using AI technologies.

Discussion of Findings

The result of analysis on the extent of business education undergraduates' awareness of available AI technologies revealed that to a low extent business education undergraduates are aware of available AI technologies; and there is significant difference between male and female business education undergraduates' awareness of available AI technologies.The finding is line with that of Alimi et al (2021), whose findings on university students' awareness and use of artificial intelligence for learning Kwara State showed that majority of the students are not aware of artificial intelligence for learning and do not have access to AI. This was attributed to the fact that AI is relatively new to the Nigerian learning environment. Findings is also in consonant with the observation of Afonughe et al., (2021) who reported that universities and tertiary institutions are still faced with the traditional approach of teaching and learning, delivering content in the face-to- face setting; making the integration and implementation of AI in educational institution rather scarce and almost not available. The findings is still in line with that of Ping & Issa (2011), whose findings showed that the level of awareness and knowledge of students using web 2.0 technology were low and also males have more knowledge of web 2.0 technologies than do females. Also, Etiubon et al (2018) and Akpanet.al (2023) attributed the low level of awareness to lack of both digital and human resources, inability of teachers to adapt to the new technologies and prepare students for a sustainable future.

The result of the analysis of the extent business education undergraduates are prepared with learning skills for sustainable lifelong learning using AI technologies revealed that to a moderate extent business education undergraduates are prepared with learning skills for sustainable lifelong learning using AI technology; and that there is a significant difference between male and female business education undergraduates' preparedness in learning skills for lifelong learning harnessing AI technology. The moderate extent in skill acquisition may be attributed to their previous knowledge and competence from the use of other digital technologies. The findings lend credence to the observation of Ibrahim, (2023) who alleged that AI harnessing can inspire students to generate ideas and solutions, fostering creativity and innovation, essential 21st century skills in today's completive and evolving job market. The finding contradicts with that of Aina et al., (2023) whose study showed that greater proportion of female students showed positive perception on the use of AI (medical chatbots) in learning. As well as Qazi et al (2022) findings on female superiority over males on acquisition of ICT skills.

The result of the analysis of the extent of exposure of business education undergraduates to literacy skills for sustainable lifelong learning using AI technology revealed that there is high extent of exposure of business education undergraduates to literacy skills for sustainable lifelong learning using AI technology; and that there is a significant difference between male and female science education undergraduate exposed to literacy skills for lifelong learning using AI technology. The findings agreed with the observation of Fahrurrozi et al (2019) that AI (Google classroom) has improved students digital literacy and 21st century skills acquisition. It is also in line with Osaro (2014) who maintained that undergraduates need to be provided with opportunities to upgrade and expand existing skills, acquire new skills to keep them in a better position to face new challenges in the society and the world. The finding contradicts with that of Qazi et al., (2022) whose study on ICT-based applications for male and female students indicated that the girls showed positive behaviour towards computers than boys at secondary education.

The result of the analysis of the extent of acquisition of life skills by business education undergraduate students for lifelong learning using AI technology revealed that there is moderate extent of acquisition of life skills by business education undergraduates for lifelong learning using AI technology. This moderate extent could be attributed to Ogbonna&Asukwo (2023) that AI tools and other digital apps easily installed in simple hand-on phones are available to the students. There is a significant difference between male and female business education undergraduate students in the acquisition of life skills for lifelong learning using AI technology. The findings corresponds with Aguboshim et al (2022) that about 16% fewer Nigerian women than men use ICT and 46% of boys use the internet, compared to 27% of girls. The overall significant difference between male and female students in the acquisition of 21st century skills

in favour of males supports the findings of Etiubon & Akpan (2017) that men were more inclined to the use of ICTs and internet compared to women.

CONCLUSION

Findings from the study have shown that students have low awareness of artificial intelligence technology and are moderately prepared with 21st century skills for sustainable lifelong learning. It was found that males have more awareness of AI technology than females. Many undergraduates in tertiary institutions in Nigeria face serious challenges of acquiring relevant skill, fostering creativity and innovation essential in today's 21st century competitive world and evolving job market. Based on the findings of the study, it was concluded that, harnessing artificial intelligence in teaching and learning will enhance undergraduate students' 21st century skills acquisition and preparation for sustainable lifelong learning in Nigeria.

RECOMMENDATIONS

Following the findings and conclusion of the study and in line with best practices, recommendations were made that:

1. Government should intensify efforts in the provision of ICT facilities and resources, as well as the improvement of power supply in the universities.

2. Teachers should organize lessons and other activities bothering on the use of AIs to keep students abreast of, raise awareness and improve skills and knowledge in the utilization of these emergent technologies.

3. Universities should create awareness and utilization of the different AI technologies in teaching and learning activities. University authorities should put into practice user education programmes for students to encourage them learn how to use AI and other technologies for academic purposes and other activities.

4. The university curriculum should be reviewed, so that 21st century skills be adequately integrated into the curriculum to prepare science education undergraduate students for the world of work and lifelong learning.

5. Tertiary institutions administrators and managers should device effective strategies to attract, motivate and retain the learning population of unskilled, inactive and unemployed citizens in Nigeria in order to enable the development of skills and knowledge that will make them active and functional in the society.

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