APPLICATION OF ARTIFICIAL INTELLIGENCE IN EFFECTIVENESS OF ADULT LEARNING IN ADULT EDUCATION CENTRE CALABAR SOUTH

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Abstract

The study examined application of artificial intelligence in effectiveness of adult learning in adult education centre in Calabar South Local Government Area of Cross River State. Three research questions guided the study. Ex-Post Facto research design was adopted for the study. The population of the study comprised of 120 respondents in adult education centre, Calabar South. All the 120 respondents formed the sample of the study. The instrument for data collection was a structured questionnaire tagged "Application of Artificial Intelligence in Effectiveness of Adult Learning Questionnaire" (AAIEALQ). The reliability of the instrument was established with Cronbach Alpha Reliability Method with an internal consistency of 0.80. Data collected was analyzed using descriptive statistics (mean and standard deviation). The result revealed that the extent of application of narrow artificial intelligence and limited memory artificial intelligence in adult learning is very low with average mean and standard deviation of 1.90 and 1.87 respectively below the criterion mean of 2.50. The result also revealed that the level of effectiveness of adult learning is low. Based on this result, it was recommended that the Government should equip adult education centres with infrastructures that will enhance the application of artificial intelligence in adult learning for improved learning effectiveness.

Keywords: Artificial Intelligence, Adult Learning, Effectiveness, Education.

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Introduction

In today's globalized world of digital technology, it is becoming increasingly important for everyone to learn how to navigate the ever evolving personal, social and professional environment. This is because the development of any nation is hinged upon the level of knowledge acquired by the citizens. Learning refers to relatively permanent changes in behavior, skills, knowledge, attitudes resulting from identifiable psychological or social experiences. It can be physical, social or emotional. Furthermore, learning is also the process of acquiring new knowledge, understanding, behaviors, skills, values, attitudes, through study, experience or being taught (Mazur, 2015).

Jarvis (2012) suggested that Adult Education plays a pivotal role in preparing adults to become useful citizens for a nation's development because it is tailored towards national development and its main aim and objective is to get the adults either as individuals or as a group to learn and through learning change their attitudes and contribute meaningfully towards national development.

Adult learning remains an important component of any educational system because it contributes to improving social cohesion, promote active citizenship, promote social inclusion and participation which are essential for building more resilient and equitable societies. Adult learning refers to the entire range of formal, non-formal and informal learning activities undertaken by adults and out of school youths which results in the acquisition of new knowledge, skills and attitude. (Borkowsky,2013).

Wyatt (2021) defined Adult Learning as the process of acquiring knowledge, skills and competences by individuals beyond the traditional age of formal education, unlike the structured curriculum of childhood schooling, adult learning is characterized by its voluntary nature and diverse learning pathways. It encompasses a spectrum of educational pursuits from professional development courses to personal enrichment endeavors geared to meet the unique needs and interest of mature learners. Adult learners are driven by a thirst for practical knowledge, seeking relevance and applicability in their learning endeavors. They exhibit autonomy and self-direction in their education, advocating for learner-centered instructional strategies that empower individuals to take charge of their learning journey.

The need for effectiveness of Adult learning cannot be over-emphasized in the quest for the attainment of meaningful growth and national development as it is a practical tool for knowledge acquisition, knowledge creation, knowledge integration, knowledge utilization and social reconstruction. Adult learning is effective when adult learners are exposed to a blend of activities that promote the three learning domains: cognitive, affective and psychomotor or behavioral. Cognitive refers to knowledge or a body of subject matter, affective has to do with attitudes and beliefs and psychomotor involves practical application of what is learnt. Effectiveness of adult learning can also be measured in terms of the learning style adopted by adult educators that makes a lesson interesting and relevant. The learning style can be visual, auditory or kinesthetic depending on the learning content which should be designed to suit the adult learners' needs. (Rockmore, 2015).

Gadner (2016) identified four components of Adult Learning that makes Adult learning effective: motivation, reinforcement, retention and transference. Adult learners are interested in learning what they feel will bring some benefits or values to their lives. Positive reinforcement that encourages good behavior, makes adult learning effective. Effectiveness of adult learning also include acquiring and retaining knowledge or skills in an efficient and lasting way and being able to practice what has been learnt for problem solving. Therefore, effectiveness of adult learning involves active engagement and participation of the adult learner.

Gruber (2015) maintained that adult learning is effective when adult learners' progress are effectively monitored and evaluated to ascertain the level of comprehension, cognition, retention and achievement of the learning goals. Furthermore, provision of adequate educational facilities, technologies, conducive learning environment and adult educator's commitment to their instructional roles also contribute to effectiveness of adult learning.

Israel (2015) affirmed that the effectiveness of adult learning can be seen in terms of the ability of an adult learning program to achieve its intended learning outcomes and to produce desired results. It focuses on the quality of learning and on the application of that learning to impact performance through skills development and meaningful learning. These skills need to be applied in real world contexts. Essentially, the goal is to enable adult learners transfer what they have learnt to their work or daily lives. This is done by keeping adult learners engaged, motivated and participative. Where this is not obtainable, it results in ineffectiveness of adult learning.

The level of effectiveness of adult learning in adult education centre in Calabar South Local Government Area of Cross River State seems to have declined and fallen below expectation. The researcher observed that some adult learners exhibit nonchalant attitude towards attendance to classes,there is lack of facilities, lack of educational materials, inappropriate

learning styles that make lessons boring and uninteresting, dearth of functional skills and indiscipline among adult educators.
The issue of ineffectiveness of adult learning in this centre has resulted in high rate of drop outs and slow pace of learning by adults. This has been a disturbing trend and several efforts have been put in place to address this issue.

However, to tackle this problem of ineffectiveness of adult learning in this centre, the application of artificial intelligence in adult learning may contribute significantly to the effectiveness of adult learning because adults need to update their knowledge, skills and competences to fill the gap between their education, training and the demands of a rapidly changing world. Artificial intelligence is a term used to describe machines with the ability to stimulate human intelligence. It has become increasingly prevalent in many fields and the field of Adult Education is not excluded. It has penetrated the learning process with great ease precisely because of the benefits it brings and the technology developed that has increased the efficiency of using it.

Artificial intelligence tools that can enhance effectiveness of Adult learning include:

a. **Intelligent User Interface (IUI)**: This is a software interface that uses artificial intelligence techniques to adapt to the changing needs of the user. It helps to simplify the interaction with online course materials and automate routine tasks, thereby freeing and reducing cognitive load of the adult learner for other tasks.
b. **Intelligent Tutoring System (ITS)**: This is a computer- based teaching system that attempts to stimulate a human tutor. It assesses the learners' knowledge of a subject and provide tailored instruction and feedback which enable adults learn at their own pace.
c. **Net Tutors Active Lab (NTAL)**: This improves learners' critical thinking process by reading learners' responses to various activities in order to pin point any misconception the learner may have, then respond by offering personalized assistance to the learner.
d. **Virtual Reality and Simulations**: This optimizes learning experiences for adult learners and potentially increases completion rates for online courses. It seeks to dynamically respond to a learners' affective state and adds extra dimension to agent interactivity.
e. **Chat bots and Voice Assistant**: This makes informal interaction with adult learners, so they don't rely on educators. It performs different tasks like mentoring, motivating, answering to doubts and conducting assessments. This enable adult learners learn from anywhere at any time (Jarret,2013).

Shubbam et al (2021) classified types of Artificial Intelligence into two types:

Type 1 (Based on capabilities)

a. **Narrow Artificial Intelligence (weak AI)**: This performs dedicated tasks which require intelligence. It is trained for specific tasks only and cannot perform other operations. Examples include; Apple Siri, voice recognition and image recognition.
b. **General Artificial Intelligence**: This performs any intellectual task with human-like efficiency. It is smarter and think by its own just like a human.

c. **Super Artificial Intelligence (Strong AI)**: This surpasses human intelligence and can better perform tasks like thinking, reasoning, solving, judging, planning, learning and communication better than humans.

Type 2 (Based on functionalities)

a. **Reactive Machines**: Memories or experiences are not stored by these AI systems for future actions. It only focuses on the current scenario. Examples include; translation tools powered by machine learning which enable learners participate in global classrooms and learn in their language.
b. **Limited Memory AI**: Past experiences or memories can be stored for a short period of time. This is used for automatic grading.
c. **Theory of Mind AI**: This understands human emotions and beliefs. It interacts socially
d. **Self-Awareness AI**: This is a machine with its own consciousness, sentiments and self- awareness. It recognizes emotions and has sense of self and human level of intelligence.

The most commonly used types of Artificial Intelligence are Narrow Artificial Intelligence and Limited Memory Artificial Intelligence. These are discussed in relation to their contributions to the effectiveness of Adult learning.

Ong and Ramachandran (2003) posited that Narrow Artificial Intelligence refers to AI tools designed to complete specific actions or commands that serve and excel in one cognitive capability. It utilizes machine learning and neural network algorithms to complete specified tasks. Examples include natural language processing, image recognition, speech recognition, etc. This stimulates human cognition and automates time consuming tasks for adult learners by analyzing data in ways that humans sometimes cannot which makes adult learning very easy and enhances effectiveness of adult learning. It also facilitates retention and impactful learning experience that inspire, empowers and transform adult learners in their quest for knowledge and growth.

Similarly, Salas et al (2022) supported that Narrow Artificial Intelligence is the cornerstone of a transformative educational experience where engagement, relevance and personalization converge to ignite the spark of curiosity and empower adult learners to reach their full potential. Furthermore, it is applied in many domains such as voice assistant to assist adult learners. This is designed to respond to voice commands, perform tasks like setting alarms, making phone calls and answering questions. This reduces human error, ensures availability of educational resources which enhances personalized learning experience, fosters collaboration which results in effectiveness of adult learning.

Johnson (2015) conducted a study on the impact of Artificial Intelligence on academic performance of adult learners in Europe. The study adopted the descriptive research design. The population consists of 150 respondents. Frequency distribution table was used to analyze the data collected. The result indicated that the application of Narrow Artificial Intelligence in adult learning contributed 80% to the improvement in academic performance of adult learners and recommended that adult learners should be exposed to the application of AI in their learning experiences as this will enhance their academic performance.

Tahir (2023) stated that Limited Memory Artificial Intelligence can store knowledge and use it to learn and train for future tasks. It is designed to store past data and use that data to make predictions. This means that it actively builds its own limited short term knowledge base and perform tasks based on knowledge. Limited Memory Artificial Intelligence assists adult

learners improve in their learning by granting access to stored information and knowledge which can be recalled and used during learning. This improves learning. It also assist adult educators in using the information stored about adult learners' performance for grading during assessment and evaluation which contributes to effectiveness of adult learning.

Vandewaetere and Clarebout (2011) pointed out that the core of Limited Memory Artificial Intelligence is deep learning which imitates the function of neurons in the human brain. This allows a machine to absorb data from experiences and learn from them, thereby helping it improve the accuracy of its actions over time. It can be applied in adult learning in a broad range of scenarios such as Chat bots and Virtual Assistants. It uses deep learning to mimic human conversation. As adult learners interact more with this system, they learn from this and remember in details what was learnt. This motivate adult learners, enable them learn at their own pace and allows them provide relevant and personalized responses when required. Limited Memory Artificial Intelligence also assist adult educators in tailoring lesson contents to learners' needs which encourages active participation, provide opportunities for reflection and application of what is being learnt in solving problems. This enhances effectiveness of adult learning.

Stuart (2010) in a study on the influence of Limited Memory Artificial Intelligence in adult learning found out that the application of Limited Memory Artificial Intelligence in adult learning plays a pivotal role in adult learning by offering adult learners flexible access to educational materials, enhances their career development, personal development, increases self-confidence, skill development and allow adult learners adapt to technological advancements, stay relevant in their professions and pursue lifelong passions.

Ian (2017) highlighted the role of Artificial Intelligence in adult learning to include: Artificial Intelligence enhances personalized learning for adults by tailoring contents and learning methods to the individual needs of adults. It increases accessibility and facilitates access to educational resources for adults. It also facilitates access to educational contents for adults with disabilities and language background through the use of technologies such as speech recognition machine and machine translation. It ensures efficient and effective learning through real-time assessment and monitoring of the learning process. Through voice assistant technology and chat bots, AI can quickly respond to adult learners questions and provide individualized support. It facilitates collaboration between adults and encourage group interaction and discussions which make learning interesting. It offers better assessment of skills and help adult educators keep their teaching skills up to date as a result of new resources and training opportunities. AI help adult educators save time by automation of repetitive work and standardization of results.

Verhagen (2021) listed some factors militating against the application of Artificial Intelligence in adult learning to include the following: High cost of technology, poor supply of electricity, poor infrastructure for the implementation of Artificial Intelligence, non-implementation of Adult learning programs in line with recent development in digital technology that are relevant to adult learners' needs, inadequate resources, poor funding, lack of maintenance of facilities, virus attack of the software and the computer, lack of AI skills by adult educators and adult learners, inaccessibility of AI tools by adult learners in rural communities, lack of awareness on the use of Artificial Intelligence in adult learning, etc.

Statement of the problem

The purpose of adult learning is to empower adults through the acquisition of knowledge and skills that brings about improvement in their behavior, attitude, skills, understanding, help them make informed decisions in their personal lives, achieve their professional goals which enable them contribute meaningfully towards national development. But contrary to this, the level of effectiveness of adult learning in adult education centre in Calabar South Local Government Area of Cross River State has fallen below standard thereby resulting in ineffectiveness of adult learning which has been an enduring phenomenon, a trend that has aroused the attention and interest of the Government and other stakeholders.

The researcher observed that some adult learners do not turn up for classes on time perhaps as a result of their tight schedules, their academic performance in internal examination is very poor, lack of facilities, lack of educational materials and technologies to aid effective teaching and learning, the learning environment is not conducive as adult learners sit on broken chairs and overcrowded classrooms not well ventilated. It was also noted through interaction with the adult learners that some adult educators are not committed to their jobs, some adopted learning styles that were not suitable thereby making lessons boring, disengaging, irrelevant and not interesting.

The effect of this is very devastating as it results in high rate of drop out, slow pace of learning, dearth of functional and transferable skills, high rate of poverty, reduction in the level of attention and retention of adult learners which result in their poor performance. Some researchers attribute this problem to high rate of indiscipline on the part of the adult educators while others linked the issue to poor funding. The managers of this centre in an attempt to curb this ugly situation have applied various management techniques, organize seminars, workshops and conferences to enhance effectiveness of adult learning. The Government on its part have constituted a monitoring and supervision team but the problem still persists.

It is against this background that the researcher examined to what extent the application of artificial Intelligence predict effectiveness of adult learning in adult education centre in Calabar South Local Government Area of Cross River State, Nigeria?

Purpose of the study

This study was designed to examine the extent to which the application of artificial Intelligence predict effectiveness of adult learners in adult education centre in Calabar South Local Government Area of Cross River State, Nigeria.

Specifically, the study aimed at examining:

i. The extent of application of Narrow Artificial Intelligence in Adult learning
ii. The extent of application of Limited Memory Artificial Intelligence in Ault learning
iii. The extent of effectiveness of Adult learning in Adult Education centre

Research questions

The following research questions guided the study:

i. What is the extent of application of Narrow Artificial Intelligence in Adult learning?
ii. What is the extent of application of Limited Memory Artificial Intelligence in Adult learning?
iii. What is the extent of effectiveness of Adult learning in Adult Education centre?

Methodology

Expost- Facto research design was adopted for this study. The population of the study comprised of 120 respondents in adult education centre in Calabar South Local Government Area of Cross River State. All the 120 respondents formed the sample of the study. Three research questions were posed and answered in this study. The instrument for data collection was a structured questionnaire tagged 'Application of Artificial Intelligence in Effectiveness of Adult Learning Questionnaire (AAIEALQ)'. The instrument was subjected to face validity by two experts in the Department of Continuing Education and Development Studies and two experts in Measurement and Evaluation, University of Calabar. The instrument was subjected to reliability test using Cronbach Alpha Reliability Coefficient and was found reliable at 0.80 r-value. The questionnaire was administered to the 120 respondents. The instrument was designed using a modified four-point Likert scale of High Extent (HE), Moderate Extent (ME), Low Extent (LE) and Very Low Extent (VLE). All positive worded items were reversed for negatively worded items. Mean and Standard Deviation were used to answer the research questions.

Result

Research question 1: What is the extent of application of Narrow Artificial Intelligence in Adult learning? The responses of this research question are presented in Table 1

Table 1: Mean and Standard Deviation of the responses on the extent of application of Narrow Artificial Intelligence in Adult learning

S/N ITEMS	X	SD	DECISION
1. Machine learning is used to complete specified tasks	2.46	.500	LE
2. Neural network algorithms is used to enhance learning	1.92	.574	VLE
3. Clear objectives for all lessons are established	1.63	.473	LE
4. Lessons objectives are communicated to adult learners	1.42	.661	LE
5. Assist in knowledge acquisition and application	2.09	.501	LE
Average Mean & Standard Deviation	1.90	.533	VLE

The result of the analysis in Table 1 revealed that all the items have mean scores below the criterion mean of 2.50. Given that the average mean is 1.90 which is below the criterion mean and average standard deviation is .533 which showed that the responses clustered around the mean, there is high degree of disagreement that there is application of narrow artificial intelligence in adult learning. However, given an average low mean of 1.90, it means that the extent of application of narrow artificial intelligence in adult education centre in Calabar South, Cross River State is to a very low extent.

Research Question 2: What is the extent of application of Limited Memory Artificial Intelligence in adult learning?

The responses to this research question are presented in Table 2.

Table 2: Mean and Standard Deviation of the responses on the extent of application of Limited Memory Artificial Intelligence in adult learning

S/N	ITEMS	X	SD	DECISION
6.	Stores knowledge for performance of tasks	1.80	.420	VLE
7.	Adult learners have access to stored know-ledge and information	1.94	.537	VLE
8.	Information stored can be recalled during learning	2.40	.530	LE
9.	Encourages deep learning	1.54	.538	VLE
10.	Assist adult educators during assessment and evaluation	1.70	.531	VLE
	Average Mean & Standard Deviation	1.87	.531	VLE

The result of the analysis in Table 2 indicated that all the items have mean scores below the criterion mean of 2.50. Given that the average mean is 1.87 which is below the criterion mean and average standard deviation is .531 which showed that the responses clustered around the mean, there is high degree of disagreement that there is application of Limited Memory Artificial Intelligence in adult learning. Given an average low mean of 1.87, it means that the extent of application of limited memory artificial intelligence in adult education centre in Calabar South, Cross River State is very low.

Research question 3: What is the extent of effectiveness of adult learning in Adult Education centre?

The responses to this research question are presented in Table 3]

Table 3: Mean and Standard Deviation of the responses on the extent of effectiveness of adult learning

S/N	ITEMS	X	SD	DECISION
11.	There is adequate evaluation of adult learners' progress	2.26	.641	LE
12.	There is periodic assessment of adult learners' Performance through tests	2.30	.566	LE
13.	Adult learners perform effectively in tests and assignments	2.32	.681	LE
14.	There is adequate monitoring of learning outcome	2.05	.398	LE
15.	Adult educators adopt visual and auditory learning styles	2.21	.579	LE
16.	There is active engagement and participation of adult learners	2.40	.755	LE
17.	Knowledge acquired is adequately applied to solve problems	2.06	.550	LE

18. Adult educators are committed to their roles	2.04	.486	LE
19. Adult learners acquire functional skills	2.14	.556	LE
20. There is provision of learning materials and facilities	2.11	483	LE
Average Mean & Standard Deviation	2.18	.551	LE

The result of the analysis in Table 3 revealed that all the items have mean scores below the criterion mean of 2.50. Given that the average mean is 2.18 which is below the criterion mean and average standard deviation is .551 which indicated that the responses clustered around the mean, there is high degree of disagreement with the fact that adult learning in adult education centre in Calabar South, Cross River State is effective. This means that the extent of effectiveness of adult learning in this centre is low.

Discussion of findings

The result of the first research question revealed that the extent of application of narrow artificial intelligence in adult education centre in Calabar South, Cross River State is very low. This implies that narrow artificial intelligence is not applied in adult learning in this centre which has resulted to ineffectiveness of adult learning. This supports the submission of Ong and Ramachandran (2003) who stated that the application of narrow artificial intelligence in adult learning contributes immensely to improvement in academic performance of adult learners and makes adult learning very easy as it stimulates human cognition which facilitates retention and impactful learning experience that inspire, empower and transform adult learners in their quest for knowledge and growth. Furthermore, when the cognitive ability of adult learners is not stimulated, it makes adult learning very boring and uninteresting which results in its ineffectiveness.

The result of the second research question revealed that there is high degree of disagreement that there is application of limited memory artificial intelligence in adult education centre in Calabar South, Cross River State. The result also revealed that the application of limited memory artificial intelligence in this centre is to a very low extent which has resulted in ineffectiveness of adult learning. This result corroborates with the opinion of Tahir (2023) who agreed that the application of limited memory artificial intelligence assists adult learners improve in their learning by granting access to stored information and knowledge which can be recalled and used during learning. It also assists adult educators in grading during assessment and evaluation which contributes to effectiveness of adult learning. The result of this findings is also in line with the views of Vandewaetere and Clarebout (2011) who stated that the application of limited memory artificial intelligence in adult learning assists adult educators in tailoring lesson contents to learners needs which encourages active participation, provides opportunities for reflection and application of what is being learnt in solving problems. The absence of this makes adult learning ineffective.

The result of the third research question revealed that the extent of effectiveness of adult learning in adult education centre in Calabar South, Cross River State is low. This implies that the level at which effective teaching and learning is attained in this centre is low. Adult educators are not committed to their jobs, the learning environment is not conducive for effective teaching learning, educational materials and facilities are not provided. This contributes to ineffectiveness of adult learning. This result is in agreement with the findings of Gruber (2015) who maintained that adult learning is effective when adult learners' progress are effectively monitored and evaluated to ascertain the level of comprehension and

achievement of learning goals. Also, provision of adequate educational materials and adult educators' commitment to their instructional roles contribute to effectiveness of adult learning. However, where this is not obtainable, it becomes difficult to achieve effectiveness of adult learning. The findings of this study implies that the extent of application of narrow artificial intelligence and limited memory artificial intelligence in adult education centre in Calabar South, Cross River State which is very low may be responsible for the low extent of effectiveness of adult learning in the centre.

Conclusion

Adult learning is more than acquiring knowledge and skills. It plays a crucial role in achieving personal growth. The application of artificial intelligence in adult learning offers a more efficient way to learn and brings innovation. Its effectiveness provides a more accessible learning environment tailored to the individual needs of adults. It addresses the challenges of time constraints, the demand for relevant learning and engagement which makes education accessible, impactful and personalized. Based on the result of this study, it is concluded that the extent of application of narrow artificial intelligence and limited memory artificial intelligence in adult education centre in Calabar South, Cross River State is very low. Also, the extent of effectiveness of adult learning in this centre is low.

Recommendations

Based on the findings of this study, the following recommendations were made:

1. Adult Education curriculum developers should ensure the integration of artificial intelligence into existing Adult Education curriculum.
2. Adult Education Agencies should create adequate awareness on artificial intelligence and its importance in adult learning.
3. Adult learners should be exposed to the application of artificial intelligence in their learning experiences to enhance their academic performance.
4. Adult Education planners should ensure that Adult Educators and Adult learners are well trained on the skills required for the application of artificial intelligence in teaching and learning.
5. The Federal and State Government should provide adequate funding of Adult Education Agencies by providing infrastructures to implement artificial intelligence for effectiveness of adult learning.
6. Adult Education administrators should upgrade teaching methodologies for adults with artificial intelligence technologies in order to enhance effectiveness of adult learning.

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