ACHIEVING INCLUSIVE EDUCATION IN THE 21ST CENTURY IN NIGERIA: IMPLICATION FOR ARTIFICIAL INTELLIGENCE

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Abstract

Education who takes complete care of all categories of students in a setting or in the school system is regarded as being good to the society. Inclusive education is a model where in all students regardless of their abilities, disabilities or backgrounds learn together in the same age-appropriate classroom. This type of education promotes equal access to quality education by removing barriers and providing necessary accommodations to support diverse learning needs. It was observed that the efforts of all stakeholders in the educational sector is not enough and adequate to achieve this aim. Some less privileged students despite all the efforts of stakeholders in educational sector are still not being captured, hence the introduction of Artificial Intelligence. Despite all the special schools being established by the federal government and state, they are still not enough in the country. There are still not enough teachers in special areas, paraprofessionals, and specialist such as speech and language therapists that can assist the students with special needs. Resources and assistive technologies that can be of help to these less privileged students are not made available and where they are available they are not adequate to go round the students. It was observed that when artificial intelligence is introduced to compliment all other efforts on ground. It will go a long way in achieving the aims in inclusive education in the 21st century in Nigeria. This paper therefore examined achieving inclusive education in the 21st century in Nigeria: implication for Artificial

Intelligence. The paper therefore recommends among others that the use of Artificial Intelligence should be made compulsory in the school system, most especially in special schools. Also more specialist in special areas should be trained and more special schools should be established.

Keywords: Inclusive education, Artificial Intelligence, Century, Therapist, School

Introduction

Education is the deliberate and life long process of acquiring knowledge, skills, values and attitudes. Derived from the Latin word educare (meaning to train or mold), and educere (meaning to lead out). It encompasses everything from structured schooling to daily, informal experiences that shape human potential. According to Cambridge Dictionary (2020) sees education as the transmission of knowledge and skill and the development of character traits from one generation to another. In essence, education is the lifelong process of acquiring and transmitting knowledge, skills, values and character traits which goes beyond formal schooling to include informal and non-formal learning, aiming to develop individuals holistically and empower them to become productive members of society. There is no nation throughout the whole world that can toy with education because it is through education that the development and growth can come about to any society.

Amosun (2023) is of the opinion that no nation can rise above its level of education. It means that education is powerful and a strong instrument to make life easy for man to leave. In short no education no development, no industrialization, no innovation and life become unbearable and unpalatable to leave.

Concept of Inclusive Education

Inclusive Education According to Lindsay (2023) is an educational approach that ensures all students regardless of their abilities,

backgrounds or disabilities, learn together in the same classrooms. In essence it is a type of education that promotes equal access to quality education by removing barriers and providing necessary accommodations to support diverse learning needs. Inclusion in the context of education is based on the idea that all children should learn together, regardless of differences politically, culturally, socially, economically or in the area of disability. Inclusive education begins with the premise that all learners have unique characteristics, interests, abilities and particular learning needs and further, that learners with special education needs must have equal access to and receive individual accommodation in the general education system. We may say that, this type of education is that classroom environment that takes care of individual student based and according to their educational needs. Buttressing the above statement Graham (2020) have this to say when he said that inclusive education approaches differences and diversity affirmatively, recognising the value of such differences and the learning opportunities that such diversity offers. In essence, inclusion implies or meant transition from separate, segregated learning environments for persons with disabilities reflected in the special education approach to schooling in the general education system. Furthermore, inclusive education is more than just integrating students with special needs into mainstream classrooms, its about creating an equitable, diverse and welcoming learning environment for all. Every schools that embrace inclusivity help to shape future generations that value diversity equity and mutual respect. By implementing inclusive education, we are taking a significant step toward a better, fairer and more just society.

Anna (2022) reiterated that inclusive education is a model where in all students regardless of their abilities, disabilities or background learn together in the same age-appropriate classrooms. By this, it adapts teaching methods and environments so that every learner can actively participate, feel valued and achieve their full potential. Wikipedia Encyclopedia (2002) opined that inclusion in education refers to including all students to equal access to equal opportunities

of education and learning and is distinct from educational equality or educational equity.

Aims and Objective of Inclusive Education?

Inclusive education aims and objectives to guarantee equal access to education, eliminate discrimination and foster a supportive, diverse environment where every learners can achieve their full potential. Gorbeth (2020) highlighted the followings as the major aims and Objective of inclusive education.

1. **Promoting Equal Access and Opportunity**

(a) **Universal Access:** ensuring that marginalized groups students with disabilities and minority language speaker have unhindered access to the same educational facilities.

(b) **Tailored Support:** adapting curricula instruction methods and school environments to meet the unique learning needs of all students rather than forcing learners to adapt to a rigid system.

2. **Eliminating Discrimination and Stigma:** This is in two forms:

(a) **Combating Exclusion:** preventing the segregation ostracization or dropping out of students based on their race, gender, socio-economic status or abilities.

(b) **Value Diversity:** fostering a culture where learner differences are celebrated as classroom assets rather than challenges to be hidden.

3. **Enhancing Social Integration and Empathy:** This one is also in two forms:

(a) **Social participation:** Encouraging students to develop what we call teamwork, problem solving skills and deep empathy by learning side-by-side with peers from diverse walks of life.

(b) **Community Building:** Building stronger, more inclusive communities by breaking down prejudices from an early age.

4. **Maximizing Academic and Personal Growth:** This is also in two forms:

(a) **High expectations:** promoting the academic achievement of all learners by providing appropriate support system and accommodations

(b) **Holistic Development:** creating an environment where students would be able to thrive not just academically but also socially and emotionally.

5. **Enhancing learning for all:** The practice of inclusive education benefits all students, not just those with diverse learning needs. By encouraging a variety of teaching methods and learning strategies. Inclusive education offers a richer more engaging and more effective learning experience. Students learn to appreciate different perspectives enhancing their understanding and knowledge. From the above aims and objectives of inclusive education, as educators, it is our responsibility to champion and implement inclusive practices, ensuring every students feels valued, included and empowered to learn.

Statement of the Problem

The statement of the problem of the position paper is to examine how inclusive education could better be achieved through the Artificial Intelligence.

Theoretical Framework

Socio-metric Learning Theory

This position paper is based on the socio-cognitive framework. The proponent of sociometric theory is Dr. Jacob Levy Moreno (1889-1974). The sociometric theory of learning tends to measure the intents of human relationships. The theory lays more emphasis on interpersonal relations among the learners thereby creating a kind of forum for good relationship among them. The relevance of this theory to this paper is that since the theory strongly believes that learning can take place through observation and imitation of behaviour, attitude and emotional reaction of other people, then this position paper is very relevant to the teaching of inclusive education

through Artificial Intelligence.

Another relevance of the theory to the paper is the fact that inclusive education is a reform movement which tries to influence the schools and other educational institution orientation so that students with challenges, from diverse social-class, gender, racial, language, religion and cultural groups have an equal opportunity to learn and achieve better. This is in line with socio-metric theory because the theory intends to bring about a complete human being in the society. The sociometric theory is very relevant in achieving inclusive education through Artificial intelligence.

Achieving inclusive Education through the use of Artificial Intelligence

What is Artificial Intelligence: Artificial Intelligence is the development of computer systems capable of performing task that typically require human intelligence, such as learning, reasoning, problem-solving and decision-making. Kanekar (2023) opined that Artificial intelligence tools are specialized software and platforms designed to perform tasks that traditionally require human intelligence. These tasks range from problem-solving and decision-making to understanding natural language and recognizing patterns in data. AI tools leverage advanced algorithms, computational power and large datasets to simulate human cognitive functions, thereby enabling machines to learn from experience, adapt to new inputs, and perform human-like tasks efficiently.

John McCarthy (2020) define Artificial intelligence as a branch of computer science focused on creating systems capable of performing tasks that typically require human intellect. He went further by saying that artificial intelligence is the science and engineering of making intelligent machines, especially intelligent computer programmes. In a nutshell, it is the science of making machines do things that would require intelligence if done by men.

Wikipedia encyclopedia (2021) opined that artificial intelligence is

the capability of computational systems to perform tasks typically associated with human intelligence. In other word, it is the system that act rationally to achieve the best-expected outcome based on their environment and inputs. It is also the simple science of making machines smart.

Different Types of Artificial Intelligence (AI) Tools

Artificial Intelligence (AI) tools encompass a broad range of technologies, each designed to address specific types of tasks and problems. These can be broadly categorized into the following types:

1. **Machine Learning Tools:** These tools facilitate the creation and training of machine learning model. Machine learning (ML) is a subset of AI that involves training algorithms on data so they can make predictions or decision without being explicitly programmed for each task. M.L tools support various learning paradigms including supervised learning (where the model learns from labelled data), unsupervised learning (where the model identifies patterns in unlabeled data) and reinforcement learning (where the model learns through trial and error to achieve specific goals).

2. **Deep Learning Frameworks:** Deep learning frameworks are essential tools that facilitate the creation, training and deployment of deep learning models. They provide the building blocks and abstractions necessary to design neural networks and implement various deep learning techniques. Some of the most popular deep learning frameworks are the followings:

i. **Tensor Flow:** Under this we have Developer:
Google Brain

The features are:

- Supports a wide range of neural network architectures and deep learning algorithms
- TensorFlow Extended (TFX) provides a production-ready machine learning platform.
- TensorFlow Lite for mobile and embedded devices, TensorFlow.js for in-browser machine learning.

- **Use cases:** image recognition, natural language processing, reinforcement learning and large-scale deployment.

ii. **PyTorch**

Developer: Facebook's AI Research lab (FAIR)

The features are:

- Dynamic computation graph, which makes debugging and development more intuitive.
- Strong support for GPU acceleration.
- Extensive libraries and tools like torchvision for computer vision and torchtext for NLP.
- PyTorch Lightning for organizing and scaling complex research code.

Use cases: Research and prototyping, Natural Language Processing, computer vision and reinforcement learning.

iii. Keras

Developer: Originally by François Chollet, now part of TensorFlow

Features

- High-level API designed for quick and easy model prototyping.
- Runs on top of TensorFlow, Microsoft Cognitive Toolkit (CNTK) or Theano.
- Simplifies the creation of deep learning models with intuitive APIs.

Use cases: Rapid prototyping, educational purposes, and experimentation.

iv MXNet

Developer: Apache Software Foundation (initially developed by the University of Washington) Features:

- Supports both symbolic and imperative programming to facilitate both model training and deployment.
- Optimized for efficiency, scalability and productivity.
- Gluon API for ease of model building without sacrificing training speed.

Use cases: Scalable training of deep learning models, real-time predictions and deployment on cloud infrastructures.

3. Natural Language Processing (NLP) Libraries: Natural Language Processing (NLP) Libraries Provide tools and frameworks to process and analyze human language data. The followings are some of the most popular and widely-used NLP Libraries:

i. NLTK (Natural Language Toolkit)

Description: A comprehensive library for building Python programs to work with human language data.

Key Features:

- Tokenization, stemming and lemmatization.
- Part-of-speech tagging and named entity recognition.
- Extensive corpus support.

Use Cases: Educational purposes, Prototype development and research.

ii. SpaCy

Description: An open-source library designed for industrial-strength NLP in python.

Key Features:

- Fast and efficient tokenization.
- Pre-trained models for various languages.
- Support for deep learning integration.

Use Cases: Production-level NLP applications, information extraction and text processing pipelines.

iii. Transformers (Hugging face)

Description: A library that provides state-of-the-art pre-trained models for NLP tasks.

Key Features:

- Wide range of pre-trained models (BERT, GPT, RoBERTa, ` etc.)
- Easy-to-use APIs for model training and inference.
- Support for multiple frameworks (TensorFlow, PyTorch).

Use Cases: Text classification, machine translation, question answering and more.

iv. Gensim

Description: A library for topic modeling and document similarity analysis.

Key Features:

- Implementation of popular algorithms (Word2Vec, Doc2Vec, LDA).
- Efficient handling of large text corpora.
- Tools for similarity queries and vector space modeling.

Use Cases: Topic modeling, document clustering, and semantic analysis.

v. Stanford NLP

Description: A suite of NLP tools developed by the Stanford NLP Group, available in Java and with Python wrappers.

Key Features:

- Named entity recognition, Part-Of-speech tagging, Parsing.
- Sentiment analysis and conference resolution.
- Multi-language support. Use Cases: Academic research, educational tools and advanced NLP applications.

vi. Allen NLP Description: An open-source library built on PyTorch, for designing and evaluating deep learning models for NLP.

Key Features:

- Modular and extensible design.

- Pre-trained models and state-of-the-art research implementations.
- Comprehensive dataset support and evaluation metrics.

Use Cases: Research, custom model development and educational purposes.

vii. Flair

Description: A simple yet powerful NLP library developed by the Zalando Research team.

Key Features:

- Contextual string embeddings.
- Stacked embeddings combining multiple sources.
- Pre-trained models for various NLP tasks.

Use Cases: Named entity recognition, text classification, and sequence labeling.

viii. Core NLP

Description: A Java-based NLP toolkit developed by the Stanford NLP Group, offering a wide range of NLP tools.

Key Features:

- Tokenization, sentence splitting, and Part-of-speech tagging.
- Dependency parsing and coreference resolution.
- Integration with Python through PyCore NLP.

Use Cases: Large-scale text processing, academic research, and commercial applications.

4. Computer Vision Libraries: Computer vision involves the interpretation of visual data from the world, and libraries like OpenCV, TensorFlow, and PyTorch provide tools and algorithms for tasks such as image recognition, object detection, and image segmentation. These libraries are essential for applications in fields like medical imaging, autonomous driving and surveillance.

Some of the most widely used computer vision libraries used in

Artificial Intelligence are the followings:

i. Open CV (Open-source Computer Vision Library)

Open CV is a highly regarded library in the field of computer vision and image processing. It was originally developed by Intel and is now supported by the community. Open CV provides a wide range of tools and functions for various computer vision tasks, making it one of the most popular libraries for both academic research and industrial applications.

Key Features of Open CV:

1. **Image Processing:** Basic operations like resizing, cropping and color space conversions. Advanced techniques such as filtering, edge detection and histogram equalization.

2. **Video Analysis:** Tools for reading, writing, and processing video files. Motion analysis and object tracking capabilities.

3. **Object Detection:** Pre-trained classifiers for face, eyes, and body detection. Support for Haar cascades and more modern methods like deep learning-based object detection.

4. **Machine Learning:** Integrated machine learning algorithms including SVM, k-NN, decision trees, and deep neural networks. Tools for feature extraction and model training.

5. **3D Vision:** Functions for stereo vision, 3D reconstruction, and point cloud processing. Camera calibration and 3D object recognition.

6. **Computational Photography:**
   High dynamic range (HDR) imaging.
   Image stitching and panorama creation.
   Image denoising and inpainting.

7. **Graphical User Interface (GUI):** Simple GUI functions to create windows, display images, and handle keyboard and mouse events.
   A powerful library primarily aimed at real-time computer vision.
   Provides tools for image processing, video capture and analysis. Available in multiple programming languages including C++, Python and Java.

8. **TensorFlow:** An open-source library developed by Google. Has a module called TensorFlow lite for mobile and embedded machine learning.
   Offers TensorFlow Hub and TensorFlow model Garden for accessing pre-trained models.

9. **Keras:** A high-level neural networks API written in Python capable of running on top of TensorFlow. Simplifies the process of building and training deep learning models. Integrate well with other libraries like OpenCV for pre-processing and post-processing tasks.

10. **PyTorch:** An open-source machine learning library developed by Facebook's AI Research lab. Known for its dynamic computation graph and ease of use. Has strong community support and integrates with libraries like open CV for comprehensive computer vision tasks.

11. **Scikit-image:** Part of the larger scikit-learn library, focusing on image processing.
    Provides algorithms for segmentation, geometric transformations, colour space manipulation, Analysis and more. Easy to use with other Python scientific libraries like NumPy and SciPy.

12. **Dlib** A toolkit for machine learning and data analysis with a focus on real-world practicality. Known for its high-quality implementation of various algorithms, especially in face detection and alignment.

13. **SimpleCV:** An open-source framework for building computer vision applications. Aimed at providing a simple interface to various computer vision algorithms and techniques. Designed to be easy to use for beginners while still powerful for advanced applications.

5. **Automated Machine Learning (AutoML) Platforms:** Automated Machine Learning (AutoML) Platforms are tools that simplify the process of building machine learning models by automating various stages of the machine learning workflow. This includes data pre-processing, feature selection, model selection, hyperparameter tuning and model evaluation. The followings are some popular AutoML Platforms:

i. **Google Cloud AutoML**

Description: provides a suite of machine learning products that enable developers with limited ML expertise to train high-quality models.

Key Features:

- Automated data preprocessing
- Neural Architecture Search (NAS)
- Integration with Google Cloud services Use Cases: Image classification, natural language processing, translation and more

ii. H2O AI

Description: Offers an open-source machine learning platform and H2O Driverless AI, an AutoML product designed to automate and simplify machine learning.

Key Features:

- Automatic feature engineering
- Model interpretability tools
- Support for a wide range of algorithms

Use Cases: Credit scoring, customer churn prediction, and marketing analytics.

iii. Data Robot

Description: A comprehensive AutoML platform that automates the end-to-end process for building, deploying and maintaining machine learning models.

Key Features:

- Extensive model library
- Automated feature engineering
- Model deployment and monitoring Use Cases: Healthcare analytics, financial modeling and sales forecasting.

iv. Azure Machine Learning

Description: Microsoft's cloud-based machine learning platform offers AutoML capabilities as part of its Azure Machine Learning service.

Key Features:

- Automated model training and tuning
- Integration with Azure services
- Model interpretability and fairness tools Use cases: Predictive maintenance, anomaly detection and demand forecasting

v. Auto-Sklearn

Description: An open-source AutoML library built on top of the popular scikit-learn library.

Key Features:

- Ensemble construction
- Automated hyperparameter optimization
- Meta-learning for improved model performance

Use Cases: Academic research, prototype development, and small to medium-sized projects.

vi. TPOT (Tree-based Pipeline Optimization Tool)

Description: An open-source AutoML tool that optimizes machine learning pipelines using genetic programming.

Key features:

- Genetic programming to evolve pipelines
- Automated feature selection
- Model evaluation and selection

Use cases: Experimental projects, educational purposes, and preliminary model development.

vii. Amazon SageMaker Autopilot

Description: Part of Amazon SageMaker, Autopilot automates the process of building, training, and tuning machine learning models.

Key Features:

- Automatic data preprocessing
- Hyperparameter optimization
- Integration with AWS services

Use Cases: E-commerce recommendation systems, fraud detection, and customer segmentation.

Having examined the various types of Artificial Intelligence how do we achieve inclusive education through the use of Artificial Intelligence.

According to Albert and Gupta (2023) reiterated that education sector benefits from Artificial Intelligence through personalized learning systems that adapt to individual student needs, intelligent tutoring systems that provide customized support and administrative tools that streamline operations. AI-powered content creation and recommendation systems also enhance the learning experience by delivering relevant materials to students. Buttressing the view of Albert and Gupta, (Alzahrani, 2023) opined that when Artificial Intelligence is introduced into the inclusive classroom, all the special

students would be captured and taking care of because personalized learning system would have been introduced into the inclusive classroom system.

Crompton and Burke (2023) reiterated that Artificial Intelligence (A.I) has assisted in reshaping administrative duties within the higher education programmes most especially in tasks like grading examinations, assessing homework, and providing guidance to students. It was further stated that Academics often dedicate substantial time and efforts to those responsibilities, which can be alleviated through the implementation of automated grading systems driven by Artificial Intelligence. These systems streamline the evaluation and assessment process, allowing educators to save time and redirect their focus towards other critical tasks such as research, curriculum development or providing personalized support to students. With the emergence of Learning Management Systems (LMS) equipped with AI capabilities, educators can now have access to sophisticated tools that employ natural language processing to analyse written responses and essays, delivering consistent and accurate feedback to both educators and students as well.

Furthermore, it revolutionize the comprehensive cover of AI by focusing on the impact of teaching methodologies and learning outcome design for effective learning (Mallillin, 2023). It adopts personalized learning experiences based on the needs of students in learning and teaching it analyzes the adaptive learning power of Artificial Intelligence systems to create a customized learning path and performance of students to ensure that students have the pace of understanding level and content. It also streamlines and reshapes the personalized engagement of students improvement and approach to their academic performance (Onesi-osigagan and Oladele, 2024).

In addition Artificial Intelligence assists students in their studies to the fullest. It helps to analyze the data for the student's weaknesses and strengths. It is created to customize the plan and learning needs of students. It also provide support and guidance to achieve the full

potential of learning also it can make a difference and recieve interactive help in students learning process and the global learning approach (Chen and jensen, 2023) Chaudhry (2023) opined that Artificial Intelligence provides capability and resources for students learning such as reformation of knowledge, innovation, consciousness, collaboration competency, teaching application and technical skills. Hence, AI's effect on student performance provides systematic findings on the up-to-date learning principles and Protocols process.

Artificial Intelligence plays a crucial role in promoting advanced and effective learning. It provides benefits for the technology state of the art in learning acquisition knowledge and attention in teaching it influences the capability of students to learn to the fullest (Attememy, 2023).

In addition, A.I changes the study habits of students because it helps and guides students in the learning process. It defines Artificial Intelligence's evolving capability and interdisciplinary nature to achieve a particular task and intelligent behavior (Pertiwi, Hanifah, 2024).

In conclusion, Kelly and Kaye (2023) have this to say by saying that, Artificial Intelligence tools are revolutionizing various industries by offering innovative solutions to complex problems. The diverse range of tools includes machine learning frameworks, deep learning, NLP libraries, and computer vision, highlights Artificial Intelligence's vast potential. All these tools are making significant impacts in the area of education by enabling personalized learning and intelligent tutoring systems.

Conclusion

This position paper examined Achieving inclusive education in the 21st century in Nigeria: implication for Artificial Intelligence. The Artificial intelligence tools is a new technological innovation which are found globally and in every sectors in this dispensation and they

are being used to perform, functions, skills and operations which human being can perform. It was revealed from this paper that Artificial intelligence tools work excellently and perform very well in every sectors. In other word Artificial Intelligence has come to stay globally and if allowed to be used in educational sector, it will reduce the stress that the stakeholders in education sector faced or experienced. It will also work very well in education industry if fully incorporated into the system.

Recommendations

When the world is changing, people should also change along with it because of technological innovation and advancement in all facet of life. For sustainable development to take place in education sector and based on the findings from this position paper, the following recommendations were therefore made:

- As it has been revealed that Artificial Intelligence tools worked effectively in all sectors, such as companies and industries, health sector, offices, it should also be incorporated in the educational sector.
- Since it has also been revealed that personalized learning and tutoring system could be enhanced by adapting to individual students needs, intelligent tutoring system that provide customized support and administrative tools that streamline operations, it is therefore recommended that artificial intelligence tools should be introduced and incorporated into the school system.
- It was also discovered that Artificial Intelligence enables researchers to access a powerful and adaptable computing environment, which will allow them (the researchers) from limitations imposed by underlying infrastructure. The empowerment will foster innovation and collaboration, allowing the researchers to work seamlessly with their counterparts across the globe; it is therefore imperative to introduce Artificial Intelligence tools into the school system and education sector generally.

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