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APPLICATION OF AI TOOLS IN MEASURING STUDENTS ACHIEVEMENTS IN BUSINESS EDUCATION.

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Abstract

This paper explores the application of AI tools in measuring students achievements in Business Education. The paper focuses on: benefits of using AI tools in measuring achievements in Business Education, measurement of quality of achievement of students in Business Education, dimension of quality achievement, integration of AI tools into existing Business Education curriculum, limitation of application of AI tools in measurement achievement in Business Education, solution to the limitations, challenges of application of AI in measurement of students achievement in Business Education, recommendations and conclusion.

Key words: *Measuring, students, achievements and Business Education*

Introduction

The integration of Artificial Intelligence tools in Business Education has transformed the measurement of students achievement. Artificial Intelligence (AI) refers to the simulation of human intelligence in machines that are programmed to think and learn like humans (Kurzweil, 2005). The term Artificial Intelligence was coined by McCarthy in 1956. Infact, the development of Artificial Intelligence began with the Dartmouth Summer Research project on Artificial Intelligence in 1956, led by John McCarthy, Marvin Musks, Nathaniel Rochester and Claude Shannon (McCarthy et al, 1955 "A proposal for the Darthmouth Summer Research project on Artificial Intelligence). According to Russell & Norvig (2010) Artificial Intelligence is the science and engineering of making intelligent machines, especially computer programs. They refer to AI as intelligent machines that can perform tasks that typically require human intelligence. For example; A self driving car that navigates through traffic. Artificial intelligence is the science and engineering of making machines intelligent, especially intelligent in the way that humans are (John, 2004). Artificial Intelligence according to Andrew (2016) is a field of study that gives computers the ability to learn without being explicitly programmed.

According to Nick Bostrom (2014) Artificial Intelligence is the development of computer systems able to perform tasks normally requiring human intelligence, such as visual perception, speech recognition, decision making and translation between languages. Artificial Intelligence is the study of agents that perceive their environment and take actions that maximize their chances of achieving their goals according to Stuart Russel and Peter Norvig (2010). Artificial Intelligence is new electricity. Just as electricity transformed industries and revolutionized the way businesses operate, AI will do the same according to Andrew Ng (2016). According to Nick Bostrom (2014) Artificial Intelligence is a machine or program that can think, learn and act like a human being or that can think, learn and act in ways that are beyond human capabilities.

In the context of this paper the researcher refers AI as a machine that possesses human-like intelligence, reason, acts, interprets, solve problems, draw inferences, exhibits knowledge, show super intelligence and perform intellectual tasks. The integration of AI in Business Education has transformed the learning landscape, offering innovative solutions for

teaching, learning and assessment. AI tools have the potentials to enhance student outcomes, improve educational efficiency, and reduce costs according to Kaplan (2016). The application of tools in measuring student achievement in Business Education is a rapidly growing field that holds promise for improving assessment, accuracy, efficiency, and effectiveness. The integration of AI tools in Business Education has transferred the measurement of students achievements. This paper explores the application of AI tools in assessing students performances, identifying gaps, and providing personalized feedback. Despite the benefits of AI-driven assessments, limitations such as technical issues, data privacy concerns and potential bias in AI algorithms exist. To address these limitations, comprehensive solutions including regular software updates, robust data protection measures and ongoing teachers training are proposed. Guiding policies for AI development including data protection policies and algorithmic transparency are also discussed. By acknowledging the limitations and implementation solutions and policies, AI tools can be effectively and efficiently applied to enhance students learning outcomes in business Education – hence Al tools refers to software applications that utilize Al technologies to perform specific tasks, enhance productivity, and improve decision making according to Kurzweil (2005).

Benefits of AI Tools

Artificial Intelligence has numerous benefits which includes:

- Increased productivity
- Improved accuracy
- Enhanced Decision-making
- Cost savings
- Improved customer experience

Increased Productivity: AI tools automatic repetitive and mundane tasks, freeing up human resources for more strategic and creative work. This leads to:

- Enhanced efficiency: AI processes data faster and more accurately than humans.
- Reduced workload: AI takes over tasks such as data entry, bookkeeping and document management.
- Improved focus: Humans can concentrate on high-value tasks like decision-making, innovation, and customer engagement.
- Scalability: AI can handle increased workloads without additional staffing.

Examples:

- Virtual assistants (eg, siri, Alexa) manage schedules and tasks
- Chatbots handle customer inquiries and support.
- Al-powered project management tools optimize workflows.

Improved Accuracy: Al tools reduce errors and improve precision in various tasks.

- Data analysis: AI identifies patterns and anomalies more accurately than humans.
- Predictive maintenance: AI detects potential equipment failures.
- Decision-making: AI provides data-driven insights
- Quality control: AI inspects products and detects defects

Examples:

- Al-powered accounting software minimizes errors in financial reporting
- Medical diagnosis: Al assists doctors in identifying diseases.
- Al-driven quality control system detect defects in manufacturing

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Cost Savings: Al tools reduce expenses in various areas:

- Labour costs: Automation replaces manual tasks
- Operational efficiency: Al optimizes resources allocation
- Energy consumption: Al-powered smart girds manage energy usage
- Reduced waste: Al-driven supply chain management minimizes excess inventory

Examples:

- Al-powered customers service chatbots reduce support staff.
- Al-driven energy management systems lower utility bills.
- Al-optimized logistics reduce transportation costs

Improved Customer Experience: Al tools enhance customer interactions and satisfaction:

- Personalization: Al-driven recommendation systems suggest relevant products.
- 24/7 support: Al-powered chatbots provide instant assistance
- Sentiment analysis: AI monitors customer feedback
- Omnichannel engagement: Al integrates customer interactions across channels.

Examples:

- Al-powered virtual assistants (eg. Seri, Google assistants) provide personalized recommendations.
- Chatbots offer instant support and resolve issues efficiently
- Al-driven sentiment analysis improves customer service responsiveness

By implementing Al tools, business can reap these benefits leading to increased competitiveness, revenue growth, and customer loyalty because Al tools have the potential to transform industries and improve lives, but it also raises important ethical and societal concerns according to Brynjolfsson & McAfee (2014).

Application of Artificial Intelligence Tools in the Measurement of Students Achievements in Business Education

Al tools can be applied in Business Education in many ways:

Natural Language Processing (NLP) Tools: Enable computers to understand, interpret, and generate human language. Example: virtual assistants like Siri, Alexer and Google Assistant.

Machine Learning (ML) Tools: Enable computers to learn from data without being explicitly programmed. Example: Image recognition software, Netflix's personalized movie recommendations.

Expert Systems: Mimic human decision-making processes. Example: Medical diagnosis software.

Robotics Process Automation (RPA) Tools: Automate repetitive tasks. Examples: Automated customer service chatbots.

Computer Vision Tools: Enable computers to interpret and understand visual data. Example: Facebook's facial recognition feature.

Predictive Analytics Tools: Analyze data to predict future outcomes. Examples Weather forecasting software

Chatbots: Interactive software that simulates human conversation. Example: customer service chatbots.

Virtual Assistants: perform tasks, provide information, and answer questions. Examples: Amazon's Echo, Google Home.

Decision support systems: Analyze data to support decision making. Example: Business intelligence software.

Neural Networks: AI models inspired by the human brain's structure and function. Example: Image recognition software.

NLP Analyzers: Analyze text to extract insights. Example: Sentiment analysis software. It analyses text to identify linguistic elements.

Clustering Tools: group similar data points together. Example Customer segmentation software.

Recommendation systems: Suggest products or services based on user behaviour. Example: Netflix's personalized movie recommendations.

Text Analytical Tools: Analyze text to extract insights. Example: sentiment analysis software. That is, it analysed text to identify patterns, trends and relationships.

Speech Recognition Tools: Enable computers to recognize spoken language. Example: virtual assistants like: Siri, Alexa.

Image Recognition Tools: Enable computers to recognize images.

Natural Language Generation (NLG) Tools: Generate human-like language. Example: chatbots

Deep Learning Tools: AI techniques that uses neural networks to analyse complex data. Example: Image recognition software.

Artificial General Intelligence (AGI) Tools: Posses human-like intelligence. Example: Science fiction movies. AI tools have the potential to transform industries and improve lives, but also raises important ethical and societal concerns.

Characteristics of Artificial Intelligence Tools:

- Automation: It performs tasks without human interventions.
- Intelligence: It stimulate human intelligence.
- Learning: It learn from data and experience.
- Adaptability: It adapt to changing environments.
- Scalability: AI tools handle large amounts of data.

Ways of Measuring Students Achievements in Business Education Using AI Tools

- Automated Quizzes: AI-powered quizzes assess students' knowledge and understanding
- Adaptive Assessments: AI adjusts difficulty levels based on student performance.
- Natural Language Processing (NLP): AI evaluates writing skills and comprehension.
- Chatbot-Based Assessments: AI-powered chatbots engage students in interactive assessments.
- Game-Based Assessments: AI-powered games evaluate problem-solving skills.
- Real-Time Feedback: AI provides immediate feedback on student performance
- Student-portfolio Analysis: AI evaluates student work and progress over time.
- Social Network Analysis: AI assesses student collaboration and engagement
- Emotional Intelligent Analysis: AI evaluates students' emotional intelligence.
- Personalized Learning Analysis: AI creates customized learning plans.
- Student Engagement Tracking: AI monitors students engagement and motivation.
- Content Analysis: AI evaluates student-created content.
- Collaborative Filtering: AI assesses student collaboration and teamwork.
- Virtual Reality (VR) Assessments: AI evaluates students performance in VR environments.
- Simulation-Based Assessments: AI evaluates students performance in simulations.
- Audio Analysis: AI evaluates student-created audio recordings
- Video Analysis: AI evaluates student-created videos

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- NLP-Based Feedback: AI provides feedback on writing and communication skills.
- Predictive modelling: AI predicts student performance and outcomes.
- Learning Analytics: AI analyses student learning behaviour
- Clustering Analysis: AI groups students by skill level or interest.
- Recommender systems: AI suggests personalized learning resources

Various areas AI tools can measure students achievements in Business Education

- Accounting skills: AI tools assess accounting knowledge and skills.
- Business plan development: AI tools evaluate business plan, writing and presentation skills
- Financial Analysis: AI tools assess financial analysis and interpretation skills
- Marketing strategy: AI tools evaluate marketing strategy development and implementation.
- Management decision-making: AI tools assess management decision-making skills.
- Communication skills: AI tools evaluate written and verbal communication skills.
- Teamwork and collaboration: AI tools assess teamwork and collaboration skills
- Leadership skills: AI tools evaluate leadership skills and potential.
- Entrepreneurship skills: AI tools assess entrepreneurship skills and knowledge.

Other areas AI tools can measure students achievements in Business Education are in; business ethics, International business, human resource management skills, operations management, knowledge skills, business law knowledge and application, statistics and data analysis and interpretation skills, Business research methods knowledge and skills, organizational behaviour knowledge and skills, strategic management knowledge and skills, assessment of chain management knowledge and skills, evaluation of business intelligence knowledge and skills, assessment of digital marketing and skills, evaluation of financial management knowledge and skills, assessment of global business knowledge and skills, evaluation of innovation and entrepreneurship skills and assessment of business analytics knowledge and skills.

Measurement of Achievements in Business Education Using Al Tools

It has been noted that the integration of Artificial Intelligence tools in Business Education has transformed the measurement of student achievements given it a new shape. AI tools provide accurate, efficient and personalized assessments, enabling educators to track student progress and identify areas for improvement – hence measurement of achievements refers to the process of evaluating and quantifying individual or organizations progress toward specific goals, objectives and outcomes. It involves tracking and assessing performance metrics, Key Performance Indicators (KPls) and other relevant data according to Huang et al (2018).

The Benefits of Using AI Tools in Measuring Achievements Makes for:

- Improved program quality
- Enhanced student learning
- Increased accountability
- Better career outcomes
- Stronger industry partnerships
- Increased accreditation recognition
- Data-driven decision making
- Continuous improvement

Measurement of Achievements in Business Education by Artificial Intelligence

- Knowledge acquisition: AI tools assess students' knowledge of business concepts
- Skill Development: AI tools evaluate students' skills in areas like financial analyses and marketing strategy

The Benefits of Using AI Tools in Business Education is for:

- Personalized learning: AI tools provide customized learning experiences
- Improved accuracy: AI tools reduce errors in grading and assessment
- Enhanced Engagement: AI tools increase student engagement and motivation

Measurement of Quality Achievements of Students in Business Education

AI tools have revolutionized the measurement of quality achievements in business education. By leveraging AI tools, educators can provide personalized, efficient and accurate assessments, enhancing students learning outcomes and more so, it has been noted that AI tools have transformed the measurement of quality achievements in Business Education. AI tools provide accurate, efficient, and personalized assessments, enabling educators to track student progress and identify areas for improvement according to Huan et al (2018).

Dimensions of Quality Achievements

AI tools measure quality achievements in Business Education across various dimensions:

- Knowledge acquisition: Ai tools assess students' knowledge of business concepts. Eg. Automated quizzes.
- Skill Development: AI tools evaluate students skills in areas like financial analysis and marketing strategy
- Critical thinking: AI tools assess students' critical thinking and problem-solving skills.
- Communication skills: AI tools evaluate students' written and verbal communication skills, for e.g. natural Language Processing (NLP) analysis, speech and language processing according to Jurafsky & Martin (2009).

Integration of AI Tools into Existing Business Education Curricula.

The ways it can be integrated are as follows:

Curriculum Design

- Incorporate AI related courses: Offer elective or mandatory courses on AI, machine learning and data science.
- Integrate AI concepts into existing courses: Infuse AI related topics into business courses, such as marketing, finance, and operations management.
- Develop case studies and projects: Use real-world business cases to illustrate AI applications.

Teaching and Learning

- AI-powered simulations: Utilize simulations to teach business concepts, such as supply chain management and financial analysis.
- Virtual teaching assistants: Implement AI-powered chatbots to support student inquires and provide feedback.
- Adaptive learning systems: use AI-driven adaptive learning platforms to personalize student learning experiences

Assessment and Evaluation

- Automated grading: Implement AI-powered grading systems to reduce grading time and improve accuracy.

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- Performance analytics: Leverage AI-driven analytics to track student performance and identify areas of improvement
- AI-generated assessments: Use AI tools to create customized quizzes and exams

Experimental Learning

- AI-powered business projects: Encourage students to work on AI-related projects such as developing chatbots or predictive models.
- Industry partnerships: Collaborate with businesses to provide students with real-world AI applications experience.
- Hackathons and competitions organize AI-themed hackathons and competitions to foster innovation and creativity.

Faculty Development

- AI training for faculty: Provide professional development opportunities for faculty to learn AI concepts and integrate them into teaching
- AI-focused research: Encourage faculty to conduct AI-related and publish papers
- Collaboration with AI experts: Invite AI experts to share knowledge and best practices with faculty.

Infrastructure and Resources

- AI infrastructure investment: Invest in AI-related hardware and software infrastructure.
- AI labs and centres: establish dedicated AI labs and centers for research and innovation
- Data access and partnerships: Establish partnerships with data providers to support AI-related research.

Ethics and Responsibility

- AI ethics courses: offer courses on AI ethics and responsible AI development
- AI-related policy development: Develop policies guiding AI use in business education
- AI impact assessments: Conduct assessments on the social and economic impact of AI in business.

By integrating AI tools into Business Education curricula institutions can prepare students for the evolving business landscape and provide them with skills and knowledge needed to succeed in an AI-driven world.

Bias and Fairness Assessment

Bias and fairness assessment evaluates AI tool impartiality:

- Bias Detection: Identify and mitigate biases in AI tools for example: Bias detection methods according to Siegel (2016).
- Fairness Evaluation: Ensure AI tools treat students fairly. For instance; Fairness metrics according to Hardt et al (2016).

The Purposes of the Application of AI Tools in the Measurement of Students Achievements in Business Education

The application of AI tools in measuring students' achievements in Business Education serves various purposes, including: enhancing assessment validity, improving efficiency, personalizing learning, supporting teacher professional development, identifying knowledge gaps, giving immediate real-time feedback for improved learning, providing alignment with learning objectives as to ensure assessment measure intended for learning outcomes, gives room for automated grading which reduces grading time and errors, helps for adaptive learning paths as it tailors learning to individual needs, reveals assessment analytics, that is, it

reveals areas where students struggle, for example: Learning analytics software according to Siemens (2013). AI tools enhance students engagement; it diagnoses knowledge gaps (Intelligent Diagnostics systems, AI tools use Game-Based learning to incorporate game design elements. It incorporate gamification in education. AI tools makes use of simulations and models which offers immersive learning experiences.

More so, one of the purposes of the application of AI tools in the measurement of students' achievements in Business Education is for intelligent mentoring systems which provides teacher support.

The Limitations of the Application of AI Tools in the Measurement of Student's Achievements in Business Education

Technical Limitations

Insufficient infrastructural, outdated hardware, and software compatibility issues can hinder effective implementation.

- Data quality issues: Inaccurate or incomplete data can lead to biased assessments.
- Algorithmic Bias: AI models may perpetuate against certain groups.
- Limited context understanding: AI may struggle to understand nuances and context specific factors
- Dependence on Historical Data: AI models rely on past data, which may not reflect current trends
- Technical debt: Integration and maintenance of AI tools can be resource-incentive

Ethical Limitations

Concerns over data privacy policy implementation, intellectual property, and potential biases in curriculum content restrict inclusivity.

- Data privacy concerns: AL tools may compromise student data privacy
- Potential for manipulation: Al-driven assessments may be vulnerable to manipulation.
- Lack of transparency: AI decision-making process may be opaque.
- Unintended consequences: AL-driven assessments may inadvertently create unintended consequences.
- Inequitable Access: AI tools may exacerbate existing inequities in access to technology

Methodological Limitations

Inadequate research design, sampling biases, and unreliable data collection methods comprise study validity.

- Oversimplification: Complex learning outcomes may be oversimplified by AI metrics
- Lack of Human judgement: AI may miss subtle cues and qualitative aspects of students performance
- Limited Generaliability: AI models may not generalize well across diverse student populations
- Ignoring Non-Cognitive skills: AI focuses on cognitive skills, neglecting essential non-cognitive skills.
- Overemphasis on standardization: AI-driven assessments may prioritize standardization over individuality.

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Pedagogical Limitations

Inflexible teaching approaches, inadequate teacher training, and neglect of diverse learning styles impede students engagement.

- Teaching to the Test: AI-driven assessments may encourage teaching to specific metrics rather than holistic learning.
- Limited feedback: Al-generated feedback may lack debt to and context.
- Neglecting soft skills: AI focuses on technical skills, potentially overlooking essential soft skills
- Inadequate support for diverse learners: AI may struggle to accommodate diverse learning needs.
- Over reliance on quantitative metrics: AI-driven assessments prioritize quantitative metrics over qualitative aspect.

Solutions

Technical Solution

Implementing cloud-based services, upgrading hardware, and investing in IT support enhance digital infrastructure.

- Data preprocessing: Ensure data quality, accuracy, and completeness.
- Regular Algorithm Audits: Monitor and address algorithmic bias
- Hybrid Approaches: Combine AI with human judgement
- Continuous Model Training: Update AI models with new data
- Cloud-Based infrastructure: Enhance scalability and security

Ethical Solutions

Establishing clear strong data protection and security, policies, obtaining informed consent and incorporating diverse perspectives ensure ethical standards.

- Transparency and Explainability: Provide clear AI decision making processes.
- Data Governance: Establish robust data protection policies
- Fairness and Bias Detection: Regularly monitor AI-driven assessments
- Student Concert: Obtain informed consent for Al-driven assessments.
- Accountability Mechanisms: Establish accountability for AI-driven decisions

For best practices for the solutions it is proper to:

- Align AI-driven assessment with learning objectives.
- Monitor AI-driven decision for bias.
- Provide transparent feedback mechanisms
- Ensure data security and privacy
- Continuously evaluate and improve AI-driven assessments

Methodological Solutions

Employing rigorous research designs, stratified sampling and triangulation methods ensure reliable and generalizable findings.

- Multi model Assessments: Combine AI-driven metrics with human evaluation
- Context Aware Assessments: Incorporate contextual information
- Adaptive Assessments: Adjust difficulty and content based on student performance
- Holistic Feedback: Provide comprehensive, qualitative feedback
- Validity and Reliability studies: Regular evaluate AI-driven assessments

Pedagogical Solutions

Adopting inclusive teaching methods, providing ongoing teacher training and learning, and leveraging technology for personalized learning foster effective education-hence pedagogy focuses on the art, science or profession of teaching.

- AI-Enhanced Teaching: Leverage AI for personalized learning
- Human-AI collaboration: Combine AI insights with human teaching.
- Soft Skill Development: Incorporate non-cognitive skills assessments
- Inclusive Design: Ensure AI tools accommodate diverse learners.
- Teacher Training: Educate instructors on AL-driven assessments

Recommendations/Suggestions for Improvement

There has to be a design and development as to collaborate with educators and industry experts to develop AI models, ensure AI tools align with learning objectives and outcomes, incorporate diverse data sources and metrics, and develop contextual understanding of business education challenges.

- There also has to be implementation and integration of AI tools with existing Learning Management Systems (LMS).
- There has to be provision of training for educators on AI tool usage and interpretation, also ensure seamless data exchange between AI tools performance and adjust as needed.
- There should be ethics and fairness to ensure data privacy and security, address algorithmic bias and ensure fairness, provide transparency in Al decision making processes and regularly audit AI tool performance
- Furthermore, there should be feedback and support in other to provide actionable feedback to students and educators, also offer personalized learning recommendations, support diverse learning needs and styles, and foster collaborative learning environments.
- Similarly, there also should be a continuous improvement. This will be through: regularly update Al models with new data, refine AI tools based on educator feedback, conduct ongoing evaluation and research encourage innovation and experimentation
- Furthermore, there should be Human AI collaboration which is to combine AI insights with human judgement, leverage AI for data analysis, not replacement of human educators, also foster critical thinking and problem solving skills
- There should be standard and accreditation. This is to help to align AI tools with accreditation standards. It will help to ensure compliance with industry recognized certifications.
- There should be establishment of AI specific standards for business education
- Finally, there should be research and development. This will help to: investigate AI's impact on learning outcomes, explore alternative assessment methods, develop Al-driven simulations for business education and there should be continuous research on Al's effect on diverse student populations.

Conclusion

The application of AI tools in measuring student achievements in Business Education have shown promising potential, but also raise important considerations. Al can enhance assessment efficiency, accuracy, and personalization, but its limitations, biases, and ethical concerns must be addressed. By acknowledging both the benefits and limitations of AI tools in measuring student achievements. Business education can harness Al's potentials to

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enhance teaching, learning and assessment, while ensuring a student-centered and equitable approach.

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