

POTENTIALS AND CHALLENGES OF ARTIFICIAL INTELLIGENCE-DRIVEN ASSESSMENT AND FEEDBACK IN TECHNICAL AND VOCATIONAL EDUCATION AND TRAINING IN NIGERIA

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Abstract

Artificial intelligence is changing the way instructors assess and give feedback to learners in education and especially in the area of Technical and Vocational education in the world. In Nigeria, Technical and Vocational Education and Training is an important subsector of education in developing the workforce of nations. Artificial intelligence driven assessment systems can help automate evaluation, give feedback and track how well learners are doing. These systems use machine learning, natural language processing, computer vision and learning analytics to make assessment and provide feedback to learners. In Nigeria there are some challenges facing the use of AI in evaluation of learners, like not having good infrastructure concerns about data privacy and teachers not being ready for the use. This article examines the possibilities and challenges of the use of AI-based evaluation and feedback in Technical and Vocational Education and Training institutions in Nigeria. The literature search was used to qualitatively discuss the potentials and the challenges of AI in evaluation of learners and providing feedback to the students in Technical and Vocational Education.

Keywords: Artificial intelligence, Vocational Education, competency-based assessment, automated feedback.

Introduction

Technical and Vocational Education and Training plays crucial roles in Nigeria's initiatives to improve people's employment preparedness by helping individuals start their enterprises, and increase the efficiency of employees in different sectors of the economy. The conventional approach of assessing students and providing feedback is dependent on the teachers grading assignments by hand, which face considerable challenges. These problems according to Romero and Ventura (2024) consist of inequality, delayed feedback provision, and burdening teachers with too many responsibilities. It is the view of the researchers that AI-driven assessment tools can resolve the above challenges by making evaluations personal and using data analysis to augment any lapses that may be inherent in the process. The above discourse is the reason for exploring the possibility of using AI driven assessment to provide feedback to students in TVET programmes.

In Technical and Vocational Education and Training there is the need to check if students really get it right and apply it with their hands. In the view of Wu et al (2025) Artificial intelligence systems can analyze written answers, simulations and performance data, which can help in the assessment methods. In Nigeria, problems like, not having enough digital infrastructures, not having enough resources and not being fair to all students, are the challenges in the use of AI in evaluation of students as well as in making feedback available to the learners.

In this article the authors made effort to explore how artificial intelligence driven assessment and feedback systems work, how they provide evidence on how they work and discussed about the problems faced in Nigerian Technical and Vocational Education and Training institutions in the use of AI in evaluation of learners. Some recommendations on how to implement the intelligence driven assessment and feedback were made.

The Concept of Artificial Intelligence Driven Assessment Systems

Artificial intelligence driven assessment systems use different technologies to make assessment and feedback automatic. In using AI for students' evaluation and feedback, Machine Learning and Predictive Analytics are very helpful in this regard. Cabatiza et al. (2020) characterized machine learning as a statistical approach that utilizes various algorithms to analyze data and make inferences, distinguishing it from traditional direct coding. Machine learning algorithms are used to identify patterns in student data and assist educators in forecasting student results. This is the core of the use of AI in the evaluation of students' achievement and possible feedback to guide students' future progress. Another technology used in support of machine learning is natural language processing. In Natural Language Processing, Technical, Vocational Education and Training (TVET) practices are better used in learners' assessment and feedback. Gillis et al. (2025) illustrated that natural language processing is the ability of a computer program to understand human language as it is spoken and written. Natural language processing can help evaluate essays, reports and journals and give feedback that is structured and useful. The TVET instructional approach benefits maximally from the natural language processing activities to support the TVET learners in improving their skill acquisition. Computer Vision and Sensor Data is another way AI can help learners improve their skill acquisition. To know when the learners have achieved after an instruction, Zhu et al. (2025) stated that computer vision can focus on the automatic extraction, analysis, and comprehension of valuable information from an individual image or a series of images which the learners display. In another related component, Learning Analytics

Dashboards can be a useful approach in assessing learners' achievement and possible feedback. In their view, Masiello et al. (2024) stated that learning analytics dashboards are adjustable panels intended to display components that can be updated according to learning activities, featuring real-time refreshes. By the above exercises, learners can be made to identify their areas of strengths and weaknesses. Another important component of the use of AI in evaluation of students in TVET programmes is Responsive Feedback Systems. Bauer et al. (2025) showed that adaptive feedback tailors responses to highlight areas for improvement, increasing both specificity and accessibility. These systems offer feedback to learners based on their answers and adjust recommendations according to each student's learning advancement. With the use of AI in the evaluation of TVET activities by students especially in tertiary institutions, the above components work together to make assessment better, more personalized and useful for students in TVET Institutions.

In Nigerian Technical and Vocational Education and Training schools, the evaluation process usually adopted include: Continuous assessment, like tests and assignments, practical demonstrations and project work, supervised industrial training and reporting and final exams and presentations. Even though there is a framework for student assessment, the quality of assessment can vary a lot. There are problems with the above grading systems, monitoring students when they are on workplace attachments and giving feedback that is delayed. According to Huang et al (2025), Artificial intelligence systems can help make assessment fairer and more useful for tracking how well students are doing especially in the area of Technical Vocational Education and Training (TVET). The present article explores the potential benefits of the use of AI in evaluating students in TVET institutions.

Potential Benefits of Artificial Intelligence Driven Assessment in Nigerian Technical and Vocational Education and Training

The potential benefits of the use of AI in assessment of students in TVET cannot be over emphasized and are presented below:

Personalized feedback is one of the benefits of artificial intelligence driven assessment in technical vocational education and training because as Baver et al (2025) asserts, it turns assessment from a one-time judgment into a continuous coaching process tailored to each learner's skilled level. One of the best things about artificial intelligence systems according to the authors is that they can give feedback that is fast and personalized. In Technical and Vocational Education and Training, getting feedback quickly can help students learn faster and correct mistakes when they are doing practical work.

From available literature, one other benefits of the use of AI in evaluation of TVET students and possible feedback is that, it is fair and objective. According to Huang et al (2025) one good thing about using Artificial Intelligence for checking and giving feedback in vocational education and training is that it can tell us how well students will do. This changes the focus from looking at what students have done before to thinking about what they can do in the future, which is really important for helping them at the right time and teaching them new skills. The authors believe that Artificial Intelligence can find students who might have trouble and help teachers give them the help they need. The use of AI is important in the assessment of students' performance in TVET programmes as according to Masielo et al (2024), AI is able to handle a lot of work at a time. Handling a lot of work (scalability) is another benefit of artificial intelligence-driven assessment and feedback in Technical Vocational Education and Training. In systems with large enrollments and limited instructors, (Masielo et al 2024), artificial intelligence allows assessment to expand in volumes without sacrificing speed and quality. Artificial intelligence can automate routine assessments, like multiple choice tests and simulations which can help teachers focus on more important things like mentoring students. The use of AI in evaluation of students and providing feedback can help in anticipating students performance levels.

One advantage of AI-based assessment and feedback in technical vocational education and training according to Huang et al (2025) is the ability to predict students' performance levels. Such efforts shift the emphasis from merely evaluating past students achievements to anticipating their potential future successes, which is essential for timely intervention and skill development. The authors asserted that predictive analytics can pinpoint students who may encounter challenges and help educators provide them with support. One other potential of the use of AI is that it helps in tracking industrial training better than using conventional approach.

Tracking industrial training better is a benefit of artificial intelligence-driven assessment and feedback in technical vocational education and training which cannot be ignored as Zhu, et al (2025) reported that it improves how students' real work place experience is monitored, evaluated, and aligned with industrial standards. Digital logbooks and artificial intelligence assisted monitoring tools according to the authors can help track students when they are on workplace attachments, which can make things more transparent and accountable. Such tracking of students industrial training can help to support competency based education.

Using artificial intelligence to evaluate students is really helpful in technical vocational education and training as in the words of Cabitza, et al (2020) it helps teachers see what students can actually do, not just what they know from a book. Therefore, teachers can tell if students

are ready to work which is the goal of technical vocational education and training. Artificial intelligence can also help teachers keep track record of how students are doing throughout the course of their study and not just at the end when they take a final test. This advantage of artificial intelligence in technical vocational education and training in the view of the authors can make students learn skills that will be useful to them, in the workplace. Maximizing the above benefits are constrained due to some avoidable limitations when TVET programmes are pursued. Some of the limitations are discussed below.

Limitations and Challenges of Artificial Intelligence Driven Assessment in Nigeria

The challenges limiting the potentials of the use of AI in the evaluation and feed-back of TVET students are discussed as follows:

According to Romero, et al (2024), one of the deficiencies in using AI for TVET evaluation is insufficient infrastructure. According to the authors, insufficient infrastructure is one of the most serious limitations of artificial intelligence-driven assessment and feedback in Nigeria, especially in technical vocational education and training because there is no reliable electricity, good internet and adequate hardware for artificial intelligence systems to work. In many Nigerian Technical and Vocational Education and Training institutions the researchers have observed that in rural areas these things are not available, making the use of AI in the assessment and feedback to students a recurring challenge. Besides insufficient infrastructure, there is the digital divide and equity problem.

The digital divide and equity problems are also limitations of artificial intelligence-driven assessment and feedback in technical vocational education and training, especially in countries like Nigeria where access to digital tools is uneven. In their view, Wu et al (2025) noted that these challenges affect who benefits from artificial intelligence and who is left behind. Observation from the researchers has shown that students from poor backgrounds might not have devices or internet access which cannot favour the students if artificial intelligence systems are used.

Besides digital divide and equity issues, algorithmic prejudice and cultural compatibility can pose significant threat in the use of Artificial Intelligence in the assessment and feedback of TVET students in institutions of higher learning. Algorithmic prejudice is problem for artificial intelligence systems that try to assess and give feedback in technical schools and training programs. This is especially true in places like Nigeria because the people who make these systems use information and rules are not really about the local area. For example artificial intelligence systems that are tailored towards using information from

different countries according to Cabitza et al (2020) might not understand the way people talk and express themselves in a specific region. This according to the authors is a problem because Algorithmic prejudice and Cultural Compatibility are important for artificial intelligence systems to work properly in vocational education and training. The above therefore, limit the application and use of AI in the evaluation of TVET students in institutions of learning. Another constraint in the use of AI for TVET students' evaluation is ethical and data privacy considerations.

Ethics and data privacy are really important when artificial intelligence are used to assess students in vocational education and training. This is because in the view of Wu et al (2025) artificial intelligence systems collect, look at and keep a lot of students' data. If there is no safeguards of data in place, artificial intelligence can cause problems that affect how much it can be trusted, if it is fair and follows the rules. It is therefore in the opinion of the researchers that it is very important to keep students data safe and respect the privacy of students who use artificial intelligence systems. The researchers are of the view that artificial intelligence systems should handle students' data in a way that's fair and safe to guarantee trustworthiness and to make the result valid especially in psychomotor skill assessment.

Validity in psychomotor skill assessment according to Masielo et al (2024) is a crucial concern when using artificial intelligence-driven assessment and feedback in technical vocational education and training. This is because technical vocational education and training according to the authors focuses heavily on hands-on, performance-based skills such as welding, machining, automobile diagnostics, electrical installations and other technical tasks. While simulations and computer vision can assess some skills, the above authors averred that many vocational skills require human judgment and cannot be assessed by artificial intelligence alone. The above concern shows that AI and conventional approach be explored in the assessment of TVET students and possible feedback be provided.

During the last decade, AI tools have attracted high interest of teachers as educators in the use of AI in the evaluation of TVET students and possibly providing feedback to the learners. Educator readiness and digital skills are essential components for the successful execution of AI-driven assessment and feedback in technical vocational education and training. Are the educators ready to utilize AI in TVET assessment and how digitally do they possess the digital skills to implement the use of AI in evaluation of TVET students. Artificial intelligence integration can fail even when tools and infrastructure are available but educators are not equipped to utilize them effectively. Educators must receive training on utilizing intelligence tools and analyzing data. According to Romero et al (2024) many Technical and

Vocational Education and Training institutions teachers do not have the digital skills they need to execute the use of AI in the evaluation of TVET students and in the giving of feedback to the learners.

Apart from the above limitations in the use of AI in evaluation of TVET students, limited monetary availability pose significant threat in the use of artificial intelligence in the assessment of TVET programmes and possibly providing feedback to students. Financial limitations are therefore a problem for using artificial intelligence-based assessment and feedback in technical vocational education and training. This is especially true in developing areas like Nigeria where it was stated by Zhu, et al (2025) that inadequate funds limits the use, growth and sustainability of artificial intelligence-based assessment and feedback even though this technology works well as there is little or no resources to buy artificial intelligence software, improve infrastructure and train teachers. These limitations make it hard to integrate artificial intelligence-based assessment and feedback in vocational education and training.

Recommendations for Action

From the above discussions, one can infer that Artificial Intelligence assessment and feedback can be useful in many ways if not for the identified bottlenecks. It is therefore recommended that:

1. A combination of human feedback with artificial intelligence feedback model be adopted since the combination of the two work better. This model uses the strengths of intelligence while keeping judgment and expertise.
2. There should be acceptable guidelines which are clearly issued to ensure National Standards by the National Board for Technical and Vocational Education and Federal Ministry of Education for using AI in TVET assessment.
3. More funds should be allocated to the current infrastructure of Polytechnics and Technical Colleges, for the assessment of TVET Programmes and possible feedback to the students.
4. Professional Development of the teachers on the use of AI in the assessment of TVET Programmes should be pursued. Without structured training, artificial intelligence tends to be used superficially like just grading faster. Educators need training to utilize artificial intelligence tools in analyzing data.
5. There should be Inclusive Access Strategies for the students regardless of their background. Inclusive access strategies will ensure that artificial based assessment and feedback in technical vocational education and training is usable, fair and beneficial for

all learners, not just those with strong digital access or abilities. There is need to make sure that all students have access to artificial intelligence driven assessment regardless of their background or location.

Conclusion

Artificial intelligence driven assessment and feedback systems can help improve Technical and Vocational Education and Training Programmes in Nigeria. They can make assessment more fair, timely and useful for students. There are constraints that have been identified which face the use of AI in the assessment of TVET programmes which are not having enough infrastructure and making sure that artificial intelligence driven assessment in a responsible way should be implemented. With increased investment, policy guidance and capacity building, artificial intelligence can help make Technical and Vocational Education and Training better and contribute to Nigeria's development goals.

References

- Bauer, E., Sailer, M., Kiesler, N., Stadler, M., Fischer, R., & Fischer, F (2025). Effects of AI-generated adaptive feedback on statistical skills and interest in statistics: A field experiment in higher education. *British Journal of Educational Technology*, 56(5), 1735-1757.
- Cabitza, F., Locoro, A., & Banfi, G. (2020). Machine learning and artificial intelligence: Definitions, applications, and future directions: Current Reviews in Musculoskeletal Medicine, 13(4), 455-462.
- Gillis, A. S., Lutkevich, B., & Awati, R. (2025, October 28). What is natural language processing (NLP)? TechTarget.techtarget.com
- Huang, J., Spector, J. M., & Yang, L. (2025). Predictive Learning Analytics for early intervention in higher education. *Educational Research Review*, 44, 101678.
- Masiello, I., Mohseni, Z., Palma, F., Nordmark, S., Augustsson, H., & Rundquist, R. (2024). A current overview of the use of learning analytics dashboards. *Education Sciences*, 14(1), 82.
- Romero, C., & Ventura, S. (2024). Educational data mining and learning analytics in AI-driven assessment: Trends and challenges. *Journal of Educational Data Mining*, 16(1), 1–35.
- Wu, J., Tlili, A., Salha, S., Mizza, D., Saqr, M., López-Pernas, S., & Huang, R. (2025). Unlocking the potential of artificial intelligence in improving learning achievement in blended learning: A meta-analysis. *Frontiers in Psychology*, 16, 1691414.
- Zhu, H., Yao, R., & Tang, L. (2025). Editorial: Advances in computer vision: From deep learning models to practical applications. *Frontiers in Neuroscience*, 19, Article 161526.