

Artificial intelligence systems and their role in enhancing academic performance

Senoussi Soumaya ¹, and Amina Bouaffane ²

¹ Professor B, Echahid Cheikh Larbi Tebessi University, Tebessa, Algeria.

Email: soumaya.senoussi@univ-tebessa.dz

² Professor B, Echahid Cheikh Larbi Tebessi University, Tebessa, Algeria.

Email: amina.bouaffane@univ-tebessa.dz

Abstract---This research seeks to investigate the function of artificial intelligence systems in improving students' academic performance through the analysis of AI mechanisms utilized in educational settings. The study examines the interplay of machine learning tools, learning analytics systems, and intelligent assistants in monitoring student learning progress and providing tailored educational assistance. The study looks at how these systems make formative assessment better and help teachers come up with better ways to teach. The research examines academic performance through psychological and institutional aspects while demonstrating how AI technology improves student-teacher communication and creates personalized educational settings. The study concludes that the incorporation of AI into education significantly enhances the quality of academic performance and facilitates more efficient personalized learning.

Keywords---Systems, Intelligence, Artificial Intelligence, Performance, Academic Performance.

Introduction

The digital revolution has led to substantial changes which create various transformative effects across multiple sectors with education standing as the primary field that underwent major changes because of technological progress. Educational institutions need to adapt to these changes by combining digital media into their teaching methods and developing fresh approaches that use AI technology to transform educational practices.

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Academic institutions now base their educational policy development on AI after learning that this technology processes big data through predictive modeling which produces adaptable learning solutions for various student learning approaches. The development of educational technology has surpassed basic programming functions to build intelligent learning systems which deliver customized academic support through student interaction.

Academic achievement serves as the primary educational goal which teachers and educational policy makers together with research professionals consistently target. The educational system's success and student achievement of learning objectives become visible through this single measure which also shows how well the system produces quality results. The traditional assessment systems which depend on tests and scheduled evaluations fail to provide a total assessment of student development because of the growing number of students who come from diverse cultural and social backgrounds while having different learning abilities.

AI systems operate as sophisticated instruments which resolve these challenges by creating precise real-time learning path data and analyzing student actions to deliver immediate feedback. The new educational approach enables teachers to create improved teaching methods which result in better student success rates and enhanced academic achievement. Machine-learning algorithms detect students who require assistance at an early stage through their academic performance tracking systems. The educational recommendation systems use this information to develop customized learning paths which help students achieve their academic goals.

AI systems provide educational benefits to students and teachers and schools through their ability to deliver advanced analytical tools which enable teachers to monitor student progress and identify learning obstacles and select appropriate teaching methods. The integration of these systems into educational settings represents a major breakthrough which creates learning environments that adapt to different students while delivering better academic results.

The research of AI systems for academic performance improvement produces vital scientific and practical knowledge because it demonstrates how educational methods have evolved and shows the requirement for new evaluation approaches in digital learning environments.

Research Problem

AI technology development at an accelerated pace has resulted in organizations and educational institutions to completely transform their operational frameworks and learning approaches and educational resources. AI operates as an educational system which transforms every educational component through its management of content development and classroom instruction and assessment and learning organization. Students need to understand how artificial intelligence systems affect their academic results because higher education requires students to achieve academic success through the combination of different cognitive and psychological and contextual elements.

AI technology has transformed educational media tools and fundamental learning theories through its implementation. The system now manages self-directed learning and formative assessment and data-driven learning and student-teacher interaction improvement. The educational sector faces multiple challenges when it comes to digital learning platform effectiveness because students and teachers experience different levels of technological proficiency and digital access and schools maintain unequal infrastructure systems.

AI systems make problem solving harder because they introduce two different challenges for users to solve at the same time. The systems include advanced features which allow teachers to track student activities while they create academic performance predictions and learning plans for each student. The

systems create reliability and bias problems for educational purposes because they use automated processes which eliminate human interaction and hands-on learning experiences. The evaluation process is complicated when these systems connect with student academic results through multiple elements which include psychological factors and educational environment quality and family support levels.

The current research focuses on studying AI educational tools by examining three separate components which include personalized learning and automated grading systems and learning analytics. The research fails to develop a unified framework which shows how these tools influence student academic achievement through various mechanisms. The present situation requires an immediate detailed study which should investigate the link between AI systems and academic performance through a theoretical model that unites mental operations with psychological elements and environmental conditions while assessing AI systems' ability to create lasting educational improvements.

From this perspective, the central research problem emerges in the following question:

To what extent do AI systems contribute to improving students' academic performance in higher education, and what is the nature of the mediating factors that influence this relationship?

Research Objectives

This study aims to analyze and interpret the role of AI systems in enhancing students' academic performance, particularly in higher education institutions, by achieving a set of integrated objectives:

- The research seeks to understand AI systems as educational tools through their development process and various learning environment applications.
- The study will examine different AI systems used in education through their categories which include intelligent tutoring systems and adaptive assessment systems and digital learning assistants and predictive learning analytics to define their individual attributes.
- The study aims to understand how AI usage affects student academic results through the measurement of their cognitive achievements and their learning motivation and engagement levels.
- The research aims to study AI effects on educational methods through evaluation of its development from a supportive resource to a fundamental teaching strategy.

1. Defining the Concepts of the Study:

1.1 Definition of Academic Performance:

Academic performance represents the level of success achieved by educational institutions and their staff members and students when they meet their academic goals during specific time periods. Academic achievement is typically measured through continuous assessments and the cumulative grade point average (CGPA) attained by the student (Hellas et al., 2018). Researchers discovered that students who perform well academically will find better job opportunities along with higher salaries and career development possibilities and enhanced workplace advantages (Tentama & Abdillah, 2019). Students who achieve academic success develop better self-esteem and confidence while they experience fewer depression symptoms and anxiety and build stronger social relationships which protect them from drug use and alcohol addiction and other social problems (Rusol Adil Naji Al-Tameemi, 2023, p. 01).

The review of available literature shows that scholars have not reached any agreement about what student academic performance means. The term reflects a wide diversity of perspectives, resulting in variation in how it is defined. According to Morales Díaz and Escribano (2015) academic performance arises from the combined effects of psychological elements and social factors and economic conditions which shape student development in multiple dimensions.

The following summary presents the different categories of elements which have influenced the development of academic performance as a concept through history (Singh, 2021, p. 3094).

Definition	Reference	Type of Factors Used to Define Academic Performance
Academic performance is how much a student has grown, either in terms of their studies or their mind.	Pascarella & Tarrenzini (1980)	Focus on skills and abilities
The quality of job offers, the status of the job, the satisfaction it brings, and the level of commitment the student shows in their professional life all define academic performance.	Colarelli et al. (1991)	Focus on professional life
Academic performance is the state in which acquired education enables students to cultivate their skills, fulfill their ambitions, advance in their professional trajectories, and achieve elevated levels of career satisfaction.	Fralick (1993); Hockett and Wallis (1998)	Focus on professional life
Academic performance is defined by high results in examinations.	Finn and Rock (1997)	Focus on achievements
People often think of academic performance as how well students do on tests, homework, and exams.	Cambridge University Reporter (2003)	Focus on achievements
The total points a student obtains in a course indicate academic performance.	Choi (2005)	Focus on achievements
Academic performance is the result of two variables: students' personal traits.	Dennis et al. (2005)	Focus on achievements
Academic performance refers to the results that students show after learning and training, which is usually shown by their grades.	Martinez (2007)	Focus on knowledge
Academic performance, a prevalent metric of success in educational institutions, is characterized by the degree to which a student fulfills their studies and associated responsibilities.	Sharm (2012)	Focus on knowledge
Student persistence can be used to define academic performance. This means that students are making progress toward getting their degrees, no matter what problems or issues they may be having at school.	York et al. (2015)	Focus on continuity
Academic performance is the knowledge that a student has gained, as measured by the grades given by the teacher or the learning goals set by the student and teacher to be met within a certain amount of time.	Yusuf, Onifade, and Bello (2016)	Focus on skills and abilities; focus on achievements

Source: (Singh, 2021, p. 3095).

From the above, we may conclude that the concept of academic performance has been approached from multiple perspectives due to the diversity of its definitions and the various factors influencing it. Accordingly, the following points can be identified as embedded within the preceding definitions:

- Academic performance exists as a dynamic concept which transforms based on the situation where it gets applied. The changing nature of the concept becomes evident through its development which occurs because psychological and social and economic elements

- determine its form. The selection process for researchers and academic institutions needs to find a definition which supports their research goals and practical needs.
- Classification of factors based on their impact: Putting these factors into groups like skills-focused, achievement, knowledge, career trajectory, and continuity shows how broad academic performance is. This classification shows that there are different ways to look at academic performance, such as grades, skills learned, or how education affects work life.
 - Significance of shared factors: Even though the definitions differ, there are some common factors that connect them, such as motivation, skills, the learning environment, and students' goals.
 - Definition of AI: The definitions of AI exist in two separate categories which focus on different aspects of the concept. The initial dimension examines mental operations and cognitive functions but the second dimension concentrates on observable conduct. The definitions of success for AI systems divide into two groups because some experts measure success through human performance equivalence while others define success through reaching an ideal rational standard that systems achieve when they perform correct actions based on their existing knowledge (Norving, 2010, p. 08). Dibbyo Saha defines it as a computational concept that enables a machine to think and solve complex problems in the same way humans do using their intelligence. People carry out activities while making errors and then gain knowledge from these mistakes although only the most intelligent individuals follow this learning process. AI systems follow a similar process because they start solving problems and make errors which they then use to learn through an automatic correction system that enhances their operation (Saha, 2018, p. 08). “Andreas Kaplan and Michael Heinlein describe artificial intelligence as a system which learns from data relationships to accomplish particular goals by adapting its behavior to changing situations.” (Haenlein, 2019, p. 17) AI systems receive their definition through two main perspectives which focus either on mental processes or on the observable actions that emerge from these processes. The definitions of artificial intelligence split into two groups because some experts emphasize the way systems think while others focus on their decision-making capabilities. AI success evaluation depends on two main methods which involve comparing AI results to human capabilities or assessing its ability to perform correct actions based on its knowledge. AI as a computational system according to Dibbyo Saha enables machines to perform human-like problem-solving through error generation and learning processes which lead to self-improvement. Artificial intelligence systems learn to understand external information and analyze it before using this knowledge to solve particular goals according to Andreas Kaplan and Michael Heinlein.

2. The Theoretical Framework of the Study

2.1 Factors Contributing to Academic Performance

A multitude of researchers have conducted extensive inquiries into the factors influencing student performance. Grits (1995) asserted that a student's academic performance is profoundly affected by the social status of their parents. Considine and Zappala (2002) discerned a comparable trend, demonstrating that parental income or social status positively impacts students' test scores. Minnesota (2007) posits that the effectiveness of higher education is dependent on the scholarly accomplishments of graduate students. Darden and Ellis, citing Stavroulani and Prati (2002), contended that evaluating students' previous educational outcomes is the foremost indicator of their future success, suggesting that exceptional past performance is associated with improved future academic achievement.

There are many factors that affect how well students do in college, and these factors have been found in many studies on student achievement. The analysis uncovers several essential factors that influence success in diverse contexts. The factors that affect how well students do in school include how hard they work, what kind of education they have had before, their family's educational history and financial

situation, their own drive, their age, their preferred learning styles, and their academic qualifications (Ali, 2013, p. 01).

The academic success of students correlates with their parents' socioeconomic position which encompasses their educational achievements and work experience and financial status and job roles. The academic performance of students shows a direct relationship with their parents' socioeconomic position according to numerous research studies. Students who come from privileged economic backgrounds achieve better academic success compared to their peers who come from disadvantaged financial backgrounds (Ali, 2013, p. 01).

Considine and Zappalà (2002) observed that children from low-income families tend to demonstrate poorer outcomes in later educational stages, including lower levels of literacy, reduced retention rates, behavioral problems at school, and greater difficulties in their studies. The students display negative attitudes when it comes to their learning process and their school attendance. The research of Eamon (2005) confirmed this perspective because he found that students from disadvantaged economic backgrounds and underperforming educational settings tend to achieve lower academic results than their peers.

Sentamo (2003) indicated that schools influence the educational process through factors such as content organization, teachers and teaching methods, and assessment practices. The researchers and educators (Ali, 2013, p. 02) have reached a consensus that the learning environment plays a crucial role in determining student academic achievement.

Students' daily interactions with their instructors lead to academic performance changes which faculty characteristics directly affect. The course content needs delivery from the assigned instructor who must use student interest-based methods because student attitudes and motivation levels depend on how course material gets presented (Hien Thu Thi Le, 2020, p. 48).

Academic research demonstrates through multiple studies that emotional abilities require assessment for their impact on personal life as well as academic development. Bar-On (2003) demonstrated that levels of emotional intelligence among university students predicted their academic performance at the end of the academic year” (Martín Sanz Noemy, 2017, p. 1106).

Tubsom (2009) discovered through his research that academic stress produces an adverse effect on students' study patterns. The research results demonstrated that girls experience more academic stress than boys which leads to reduced academic performance. Academic stress at lower levels seems to improve study habits but bad study habits result in higher academic stress levels. Academic stress together with study habits create a powerful influence which affects each other directly according to (Lone, 2021, p. 02). Multiple research studies and academic investigations have studied the elements that determine how well students perform academically. The following elements establish the framework:

- Impact of parents' socioeconomic status: According to the researchers who participated in this study families with better financial standing offer their children superior material support and motivational backing which results in higher academic success. The situation needs educational policies that create equal learning environments for students who come from different social and economic backgrounds.
- Role of educational institutions: The above highlights the importance of university quality and its resources in shaping students' learning outcomes. Students experience negative academic results when universities fail to provide essential facilities and qualified instructors which also leads to increasing achievement differences among students.
- Other factors: Students achieve academic success through the combination of their personal effort and natural drive along with their preferred learning methods and emotional intelligence abilities. The evaluation of these factors shows that academic success depends on more than

just individual effort because it requires the support of family and social relationships and personal circumstances.

2.2 Academic performance and the evaluation process:

Academic achievement of students results from the combination of their cognitive abilities and non-cognitive characteristics together with the learning environment which includes social and cultural elements according to researchers. The study examines how cognitive elements together with psychological aspects and environmental conditions affect student achievement across different social and cultural and demographic groups.

Gutiérrez and Thomas (2019) studied university students in the Dominican Republic to understand how autonomy support and self-efficacy and school connectedness affect academic and non-academic well-being. The modeling results showed that students who received autonomy support from teachers achieved better life satisfaction and school satisfaction and academic performance through the effects of self-efficacy and school connectedness.

Arias and Rodríguez conducted research on Spanish students to determine how optimism and coping methods affect their academic success. The research demonstrated that students who use positive coping methods will experience lower emotional exhaustion and higher academic efficacy which leads to better academic results.

Academic achievement benefits from mindfulness practice which led Alvinston et al. (2019) to conduct research on how mindfulness affects academic success through its influence on adaptability and emotional non-attachment. The study results showed that practicing mindfulness leads to better academic engagement and improved academic results (Gregory Arief, 2019, p. 04).

Academic achievement serves as a standard that teachers apply when they evaluate student performance in their academic work. According to the 2005 report of the Center for Academic Research and Development, it is a concept used to assess students' achievements, knowledge, and skills. The evaluation process takes place through a complete assessment method which considers student age and previous experience and their social and educational skill levels. Teachers assess student academic success through multiple assessment methods because assessment functions as an ongoing process which delivers crucial feedback about student learning progress.

Traditional educational systems require students to take midterm and final examinations as part of their standard academic evaluation process. Research critics point out that these assessment methods fail to help students remember information because they push students to focus on short-term memorization techniques. The existing body of research supports the use of alternative assessment methods to enhance student performance and information retention according to (Davison, p. 04).

Academic achievement used to depend on cognitive abilities alone but researchers now recognize that it depends on psychological and social elements and contextual factors. The new educational approach follows the principles of current educational psychology research and modern learning theory. The educational approach has moved away from its traditional memorization-based system because it now understands that psychological and social factors influence learning through its focus on autonomy support and psychological adjustment and mindfulness.

The research on international studies shows that assessment functions undergo transformation because they now serve as educational tools which help students develop personally while enhancing their academic performance through ongoing feedback and support systems. Effective assessment extends beyond normative judgment because it serves as a tool to support students through their learning

journey by connecting them to their surroundings while helping them achieve independence and self-actualization and internal competence development.

2.3 Teachers' Influence on Students' Academic Performance:

Another factor that explains students' low academic performance is the small number of teachers compared to the number of students. The number of teachers in public schools remains limited because many educators choose to work secondary jobs or handle personal projects for financial stability since government salaries fail to meet their needs. The poor working environment in schools results in more students skipping classes while their motivation to work decreases and their classroom performance suffers and their job satisfaction and morale at school declines. The opposite occurs when employees experience poor working conditions because their enthusiasm and motivation and commitment to their duties and teamwork decrease. The effects of teacher indifference towards students produce clear evidence of their negative impact on student learning outcomes.

Teachers serve as essential educational agents who interpret and present curricular content and learning standards to students during their instructional time. Teachers determine the methods and approaches which students will need to learn their subjects. It is therefore assumed that a teacher is considered productive when he or she achieves the desired outcomes while performing the instructional role.” (Evans Austin Brew, 2021, p. 08).

2.4 Core Ideas on Academic Learning in Educational Contexts

One of the main functions of university education is to introduce students to the modes of thinking required to become competent professionals in their chosen fields, a process commonly referred to as academic discourse. Students need to understand the academic definitions of multiple related concepts which form the basis of this discourse. The Gothenburg Research Group established a method to measure student understanding levels during academic task performance which represents their main achievement in this field of study (Noel Entwistle, 2011, p. 04).

To achieve this, Marton adapted the qualitative research methods previously used by his research group to develop a distinct research approach known as phenomenography (Marton, 1981). The method requires students to explain their learning process through multiple stages during interviews which the researcher uses subtle questions to uncover additional details about their experiences. Through analysis, distinguishable categories are separated, described using excerpts from the interviews, and examined in relation to one another (Marton & Booth, 1997) (Noel Entwistle, 2011, p. 04).

Research conducted on student academic concept understanding indicates that university faculty members need to understand student conceptions which exist within their classes. The development of academic concepts involves the establishment of agreed definitions through characteristic features which subsequently remove their original contextual associations. The process of developing new concepts in individuals requires both their existing knowledge base and the particular circumstances where these concepts emerge. This important finding builds on the work of Haldin (1999), who demonstrated how questioning can elicit alternative conceptions. Like Marton, he also drew attention to the different ways in which students perceived the tasks assigned to them in the classroom and described the significant implications of these differences for subsequent learning processes and, therefore, for learning outcomes (Noel Entwistle, 2011, p. 05).

The preceding text reflects a fundamental shift in educational thought, marking a transition from a traditional instructional model based on rote transmission of information to a constructivist cognitive model that prioritizes deep understanding and diverse modes of knowledge perception. Learning to join academic discussions in each subject area requires more than simple concept delivery because students must build understanding through psychological and social and cultural elements. Ference Marton and his phenomenographic research team demonstrated that learning methods differ between people by

studying how students understand the same concept which affects their academic results. The university instructor needs to move past their standard role of teacher or content deliverer because they must grasp student understanding to create instructional plans based on their learning perceptions.

2.5 Monitoring Academic Performance Based on Learning Analytics and Ontology

The growing need to study massive educational data sets has driven multiple research fields including big data and data mining and analytics to join forces for Learning Analytics implementation in educational settings. The educational system receives predictive information through Learning Analytics which enables teachers to create more effective teaching approaches based on their understanding of student needs (Elias 2011, p. 5) (Costa & Araujo, 2020, p. 05).

Khalil and Ebner (2015) proposed a method that describes the life cycle of learning analytics. The authors present the fundamental characteristics and research goals and methods of learning analytics through their proposed model which demonstrates the complete analytical process. The authors establish a reference model for learning analytics implementation through a four-stage circular process which starts with data creation by stakeholders in the learning environment and continues through big data processing and analytics techniques before reaching the action phase to achieve learning environment improvement goals. The authors state that learning analytics emerges as a cutting-edge research domain which creates research tools and platforms for studying educational technology.

Learning platform student monitoring tools exist but they present complicated operation and restricted functionality for continuous student performance tracking. The instructors attempt to use learning platform tools according to Yago et al. (2018) (Costa & Araujo, 2020, p. 06).

2.6 Applications of AI Systems in Knowledge Management Processes

The applications of AI in the field of knowledge management take shape through the following:

2.6.1 Expert Systems

Expert systems operate through the combination of human knowledge with computer programs which enable them to perform tasks that need specialized human expertise. These programs mimic expert human problem-solving abilities through their computer-based design. AI branches include expert systems which hold specialized knowledge from experts in particular fields to help solve problems without obvious answers. Expert systems depend on stored knowledge from accumulated experience which they retrieve and analyze to find related facts. Expert systems contain five essential elements which include knowledge acquisition and the knowledge base and the inference mechanism and the user interface and result interpretation capabilities and neural networks according to (Haddi, 2015, p. 22).

2.6.2 Neural Networks

These are smart computer systems that work like the brain does when it processes information. People use this technology for a lot of different things, like analyzing signatures, predicting stock movements, and analyzing investments. (Haddi, 2015, p. 22).

2.6.3 Fuzzy Logic Systems:

Fuzzy logic systems allow for the representation of vague or unclear information, which makes it easier to learn new things and deal with situations that aren't clear (Haddi, 2015, p. 23).

2.6.4 Genetic Algorithms:

These algorithms simulate the biological evolution of living organisms and are employed to devise solutions to managerial challenges, especially those affected by numerous variables (Haddi, 2015, p. 23).

2.7 Platforms and AI for Monitoring and Assessing Academic Performance:

These platforms lack the essential data to assess student academic performance. Villagra-Arrideo et al. (2018) indicate that modern educational theories advocate for a student-centered teaching process supported by genuine formative assessment. The academic performance assessment model needs to

deliver enough information about student learning for teachers to understand their progress and detect learning patterns and trends.

The educational objectives function as pedagogical resources which naturally exist within the teaching process according to Bloom et al. (1956), Anderson and Krathwohl (2001), Lima and Vialle (2001), and Freire (2000). They guide course planning and allow for the evaluation of students' academic performance, as well as monitoring students' adherence to the planned objectives. Haidt (2011) defines educational objectives as the desired and expected outcomes of educational work. The teacher reaches these outcomes through instructional methods that become their educational work. The initial step for creating an effective distance-learning course involves establishing educational objectives which represent the most crucial base for all teaching actions according to Pelissoni (2009) (Costa & Araujo, 2020, p. 06).

Fernández-Delgado et al. (2014) state that students' learning activities relate to one or more educational objectives, and that each educational objective is achieved through one or several learning activities. A student who finishes a particular learning activity successfully achieves the educational goals which show up in that activity's requirements. Students demonstrate their academic performance levels through their success in reaching educational objectives.

The hierarchical system of educational objectives with six levels came into existence through Benjamin Bloom's work during 1956. The taxonomy presents particular verbs which students should accomplish at each level to reach the specified objectives. Educators continue to rely on Bloom's taxonomy as a fundamental resource which helps them create their teaching strategies. Student progress evaluation becomes possible through educational data processing when educational objectives are organized into a taxonomy system. The three taxonomies that students often encounter include Bloom's original taxonomy (Bloom et al., 1956) and its revised version by Krathwohl & Anderson (2001) and the SOLO taxonomy developed by Biggs & Collis (1982). Bloom's taxonomy continues to be the leading educational framework which researchers have studied in the past.

The understanding of educational objectives by software agents requires the transformation of taxonomies into structured forms through ontology engineering. The educational sector has implemented ontologies for multiple purposes which include connecting learning materials to student progression (Lima et al., 2017), generating semantic descriptions of learning materials (Sánchez et al., 2017), and text-based information extraction (Chang & Chang, 2010). (Costa & Araujo, 2020, p. 06).

2.7.1 Intelligent Teaching Assistant (AI Teaching Assistant): Explanation of the Concept

Most educational AI systems focus on automating tasks that require repetitive work and time investment from teachers through their design. The systems which aim to help teachers actually end up performing major parts of classroom instruction because they sometimes execute personalized learning better than teachers do at specific moments and because they limit teachers to basic operational tasks like equipment setup and automated instruction following.

Research scientists have stated that they do not expect AI systems to replace human teachers in the educational environment at any time in the future. The teacher's role will undergo a complete transformation according to their prediction which will enable educators to work more productively while using their skills at an elevated level (Wayne Holmes, 2023, p. 12).

This assistant goes beyond traditional dashboards to become a useful tool for teachers by creating an intelligent teaching assistant (AI TA) that works with the teacher and adds to the role of the intelligent learning companion for students:

- Automatically forming collaborative student groups.
- Replacing traditional examinations with continuous AI-supported assessment.

- Managing peer assessment and performing some automated grading tasks.
- Giving teachers educational materials and opportunities to learn new skills, like texts, images, videos, links, or even augmented-reality content (Wayne Holmes, 2023, p. 12).

2.7.2 Analytical Techniques Derived from Big Data Research: Learning Analytics and Educational Data Mining

Learning Analytics is the process of measuring, collecting, analyzing, and reporting data about learners and their environments in order to better understand and improve the learning process. Educational Data Mining, by contrast, is concerned with collecting and analyzing data for the purpose of understanding, supporting, and improving student learning.

The Open University's tool, which collects data from all over the university (like students' access to digital learning materials, assessment submissions, and results), is one example that goes beyond this distinction and has worked well. It finds students who are likely to drop out of their studies. This lets teachers and support staff help when they need to and before they need to.

The Medical Research Council Cognition and Brain Sciences Unit at the University of Cambridge recently published a well-known example of how AI can be used as a research tool in the learning sciences (Wayne Holmes, 2023, p. 13).

For a long time, putting students with learning disabilities into big groups like Attention Deficit Hyperactivity Disorder (ADHD), Dyslexia, and Autism has not been enough for teachers who want to help each student learn better.

Because of this, researchers at Cambridge are currently looking into how machine learning can be used to more accurately and in-depth classify students who have trouble learning, using things like listening skills, spatial reasoning, problem-solving, vocabulary, and memory. Machine learning found four patterns of learning problems that had not been as clear before by looking at data from more than 500 kids:

- difficulties in working memory skills,
- difficulties in processing sounds within words,
- broad cognitive difficulties spanning multiple domains,
- cognitive test results that are typical for the child's age.

The researchers discovered that categorizing students into these four groups yielded greater accuracy and utility than conventional diagnostic classifications, thereby enabling teachers to more effectively address individual learning challenges (Wayne Holmes, 2023, p. 14).

2.7.3 The use of machine learning to enhance Learning Design:

Learning design is a group of methods that help teachers or designers make smart choices about how to plan learning activities and teaching interventions. These methods are meant to help teachers make better decisions about how to teach and make learning more enjoyable for students. They can also be used to get important information for learning analytics or mining educational data.

Most of the methods that colleges and universities use today depend on teachers' professional knowledge of how to teach and learn. The Open University is currently looking into a new way of doing things that uses machine learning to look at thousands of course learning activities in order to find groups of learning activities that are very accurate. This may help teachers and learning designers figure out which learning designs are really the best, based on the subject, length, and level of the class (Wayne Holmes, 2023, p. 15).

This viewpoint signifies a qualitative transformation in educational paradigms, as it amalgamates traditional pedagogical principles—such as Bloom's taxonomy and learning objectives—with the significant digital advancements propelled by AI technologies and data analytics. It is clear that the modern educational imperative is no longer just about passing on knowledge or testing understanding.

It has grown to include personalized learning, predicting academic success, and improving learning processes before they happen.

The text clearly shows how important effective formative assessment is as a teaching tool that helps teachers understand how their students are doing and what they need right away. This makes digital environments more interactive, which is the opposite of the negative stereotype that says distance learning is rigid and doesn't allow for much interaction.

This viewpoint also shows that using AI in education (AIED) is not just about automating grading or delivering content; it is a deeper change that changes the way we think about and understand education. The intelligent assistant (AI TA) does not get rid of the teacher's job; instead, it changes it so that the teacher works with the AI TA to come up with data-driven and guided teaching strategies.

Conclusion

This study has demonstrated that AI systems are not merely auxiliary technical instruments in the educational context; instead, they represent a transformative influence that is redefining the comprehension and enhancement of academic performance. The investigation into academic performance indicated that this concept encompasses various dimensions, originating from cognitive factors, psychological components, social influences, and institutional effects; furthermore, academic achievement transcends mere test scores and cumulative grade points. The literature indicates that AI transcends fundamental tasks and computations, as it can emulate human cognition, make rational decisions, and acquire knowledge autonomously.

The study also showed, by looking at relevant literature and models, that things that affect academic performance are spread out across the family and social dimension, the institutional dimension, and the learner's personal characteristics. To fully evaluate academic success, you need to look at every part of the process.

The study of learning analytics, ontology, and digital learning platforms shows that AI technology has made better assessment systems that don't depend on traditional exams to judge students. Instead, they look at how well students finish their tasks and reach their goals. The current educational assessment system does not meet the needs of students, so it needs a complete overhaul.

The study also showed that teachers are still very important to the learning process, even though AI is becoming more common. Instead of seeing AI tools as a threat to their teaching methods, a successful teacher uses them as educational tools to make better lesson plans and connect with students more effectively. Because digital technology has changed learning spaces at a fundamental level, teachers need to change the way they do their jobs.

Recent research utilizing machine learning techniques indicates that AI systems can identify intricate learning challenges and student behavioral patterns, thereby assisting educational institutions in formulating programs that cater to the needs of all learners.

Study Recommendations

- The government must establish clear national policies which support AI integration in education through ethical standards and human role preservation.
- The evaluation system needs to transform into an all-encompassing model which combines various assessment methods while learning analytics should be employed to generate better feedback mechanisms.
- Teachers must undergo training to learn how artificial intelligence tools help them boost student academic results while enhancing their teaching methods.

- The assessment requires both psychological and social elements to understand achievement because these elements work together with technical analytics to measure student success.
- The investigation of educational AI requires researchers to comprehend how learning design and technological interaction influence student academic achievement.

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