BLENDING EDUCATION AND ARTIFICIAL INTELLIGENCE

Research Paper

Dr. Anu Khanchandani, Swiss School of Business Management, Geneva, Switzerland,
anu3@ssbm.ch

Abstract

This article explores the transformative impact of AI in education, focusing on the shift towards data-driven assessments and personalized learning. AI's analytical power facilitates a deeper understanding of student performance, refining the accuracy and efficiency of evaluations. It also predicts challenges to proactively tailor support, ensuring a more adaptive learning experience. Moreover, AI-driven chatbots using NLP enhance student support, available 24/7, reflecting a democratized access to information. The article further discusses personalized learning, where AI tailors educational pathways and goals to individual student needs, and the role of AI in matching student skillsets with internships, providing bespoke career guidance. Additionally, it delves into the use of AR and VR in creating interactive teaching experiences and AI's capability in content generation, highlighting the shift towards a more engaging, accessible, and customized learning experience. Overall, AI promises to make education more adaptable, inclusive, and aligned with the aspirations and needs of students.

Keywords: Artificial Intelligence (AI), Data-Driven, Personalised Learning, Augmented and Virtual Reality (AR/VR).

1   Introduction

The amalgamation of Artificial Intelligence (AI) within the educational sector will usher in a major shift towards a more data-driven and personalized avatar of education. This article examines the multifaceted impacts of AI, from enhancing data-driven assessments to revolutionizing personalized learning and pioneering innovative teaching methods with augmented and virtual reality.

2   Data-Driven Assessments

Data-driven assessment, facilitated by artificial intelligence (AI), marks a significant evolution from the traditional manual methods of evaluation that educators have relied on for decades. This approach uses the vast capabilities of AI to analyze large datasets. The power exhibited by AI thus enables a deeper understanding of student performance, learning habits, and potential areas for improvement. Manual assessments have a tendency to be time-consuming and subject to human error or bias.

Data-driven assessments, on the other hand, comprehensive and systematic analysis of student achievements. By automatically grading assignments, quizzes, and exams, AI systems can promptly deliver detailed feedback to both students and educators. This improved process and precision in assessment help educators identify gaps in knowledge and tailor their instructional strategies to meet

the individual needs of each student. Overall, this results in enhancing the overall efficiency and effectiveness of the educational process.

Kashif Ahmad et al. as part of their research have listed several automatic grading tools which are developed to analyze, assess, and score students' assignments and tests. A summary of some of the existing AI-based grading and evaluation tools and platforms has been provided in Figure 1

Tool/platform	Provider	Domain	Key Features
WriteToLearn [29]	Pearson	Generic (text only)	— Automated assessments, scoring system, and reporting to teachers — An immediate feedback to students to better practice — Focuses on summary and essay writing — Teacher as well as student reporting capabilities
Quantum Adaptive Learning and Assessment [30]	Quantum	Generic	— Provides a question answer facilities where students can put their inquiry — Acts as a cognitive coach observing the thinking and questioning expertise of the students
Azure Cloud AI Tools for Education [31]	Microsoft	Computer Science	— Facilitates all stakeholders in the education sector including students, teachers and administration — Provide deep analytical insights into student performances and then be visually displayed using Microsoft PowerBI dashboards — Coding courses and tutorials — Helps students to pursue careers in technology or other fields
Hubert.ai [32]	Hubert	Generic	— Makes use of chat-bot technology and AI to engage and extract actionable insights from students' personalized conversations — Provides an attractive user interface — Able to extract qualitative insights from its personalized conversations with students — Posses the ability of intelligent follow-up questions
Lightside [33]	Turnitin and Carnegie Mellon	Text only	— Evaluates of students' writing — Provides feedback on the use of language, focus of the document, organization and evidence — Specially customized for students in grades six through 12
Proctorio [34]	Proctorio	Generic	— Fully automated exam proctoring without scheduling 24 hours a day, 7 days a week — Supports automatic ID verification — Provides admin dashboard and aggregates exam data — Ensures content protection with copy/print/download restrictions
Gradescope [35]	Turnitin	Multiple subjects	— Supports grading of paper-based, digital, and code assignments — Also provides insights on students' performances — Covers multiple subjects
Respondus [36]	Respondus	Generic	— Supports both K-12 and higher education — Uses LockDown Browser to prevent cheating — Creates exams questions

Figure 1.   *Summary of tools/platforms for students' grading and evaluation*

3   NLP (Natural Language Processing) Based Chatbot for Enquiries and Doubt Solving

Students need a lot of constant support. This support could arise in the form of a sudden query or a request for a comprehensive source of information from the library. At such times availability of the support staff is a must. The deployment of NLP (Natural Language Processing) based chatbots for

course enquiries and doubt solving could be the answer to such situations. Not just in terms of enhancing student support but also giving a breather to the support staff.

These AI-driven chatbots leverage the sophisticated capabilities of Natural Language Processing to understand, interpret, and respond to student queries in real-time. This opens up a completely new support channel, offering a seamless and interactive communication experience. NLP chatbots provide instant responses, enabling students to receive the information they need without delay. The cognitive ability of these chatbots to process and understand natural language facilitates a more natural interaction. They can communicate their needs and questions as if they were speaking with a human counselor.

A study by Harshita Mangotra et al. (2023) proposes a deep learning (DL) chatbot for addressing common doubts of university students, providing efficient and accurate responses to college-specific questions. A self-curated dataset is used for the purpose of building the chatbot, and natural language processing techniques are utilized for the pre-processing of raw data gathered. The study compares two deep learning models–a bidirectional long- and short-term memory network and a simple feed-forward neural network model

Some sample responses which are an outcome of their research are illustrated in Figure 2 below :

Table 2
Responses by chatbot built on model 1

S. NO.	QUESTION	ANSWER BY BOT
1.	Hey	Hey there
2.	How to connect with seniors?	Through societies! Societies are an excellent way to build connections and interact with your peers as well as your seniors. You can also use LinkedIn and interact with the alumni network and your seniors of IGDTUW.
3.	How to manage time?	Making proper schedules and timetable is the key. Devote 2–4 hours to coding daily as per your capacity and the rest to college studies and society-related work.

Table 3
Responses by chatbot built on model 2

S. NO.	QUESTION	ANSWER BY BOT
1.	Hi!	Hello
2.	Where is the library?	The college library is open on all working days till 5PM, and books can be issued from there using your ID card
3.	How to connect with seniors?	75% attendance is mandatory.
4.	How to manage time with studies?	Attend the classes regularly, make notes, and revise them. Join a couple of interesting societies and try not to waste your time in unproductive things like overusing social media websites, etc.

Figure 2.   Responses by Deep Learning based chatbot to answer queries.

4   Personalised Learning

Every student has their own challenges w.r.t their learning. Personalized learning, if augmented by artificial intelligence, can help address this critical pain point. This would force moving away from the one-size-fits-all approach towards a more tailored educational experience. The action item related to this would be AI-driven platforms selecting the learning path for the student by matching each student's strengths, weaknesses, interests, and learning pace.

This level of customization ensures that students can grasp complex concepts by using a learning format that suits their style. This would increase the levels of engagement by leaps and bounds. The ability to choose their learning path empowers students by giving them an independent and confident mindset. This approach acknowledges the diverse backgrounds and capabilities of each student, ensuring that the educational experience is as effective and fulfilling as possible.

Olga Tapalova et al. (2022) in their research have coined a term AIEd which represents technologies which facilitate personalised approaches to learning. the following figure represents their research points :
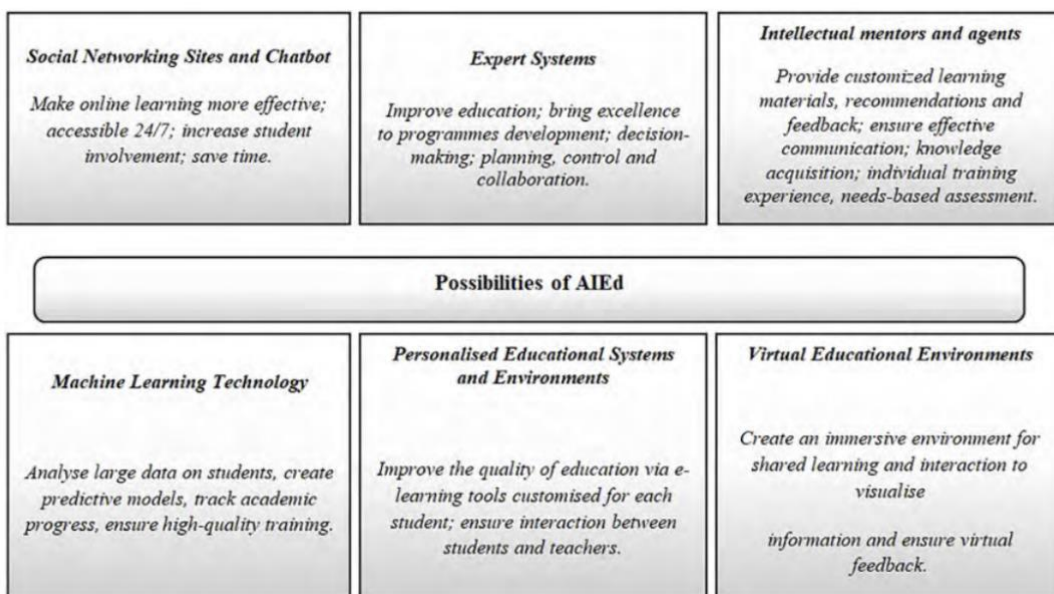

Social Networking Sites and Chatbot	Expert Systems	Intellectual mentors and agents
Make online learning more effective; accessible 24/7; increase student involvement; save time.	Improve education; bring excellence to programmes development; decision-making; planning, control and collaboration.	Provide customized learning materials, recommendations and feedback; ensure effective communication; knowledge acquisition; individual training experience, needs-based assessment.

Possibilities of AIEd

Machine Learning Technology	Personalised Educational Systems and Environments	Virtual Educational Environments
Analyse large data on students, create predictive models, track academic progress, ensure high-quality training.	Improve the quality of education via e-learning tools customised for each student; ensure interaction between students and teachers.	Create an immersive environment for shared learning and interaction to visualise information and ensure virtual feedback.

Figure 3.   AIEd technologies in personalised approaches to learning

5   Specially Abled Student Learning Tools

Inclusivity and equity in education was not-prevalent in the past. But development of specially abled student learning tools through advancements in technology, particularly artificial intelligence (AI), has bridged this gap effectively. These tools are designed to cater to the diverse needs of students with disabilities, ensuring that education is accessible to everyone, regardless of their physical or cognitive challenges.

Some examples - a) AI-powered applications can transform text into speech for visually impaired students, b) interpret speech into text for those who are deaf or hard of hearing c) interpret sign language d) prosthetics and mobility aids can significantly improve the physical accessibility of education for students with mobility impairments and a lot more. Adaptive learning platforms can customize the pace and style of content delivery according to the unique learning needs and preferences of each student, making education more accommodating and effective for those with learning disabilities. At the end of the day, it is about empowering the specially abled students to tackle their educational activities independently and with confidence.

A complete book - AI-Assisted Special Education for Students With Exceptional Needs - has been written by A. Kumar et al (2023) which delves into the profound impact of recent technological advancements in AI like Augmented Reality (AR) and Virtual Reality (VR) which have opened up a wealth of creative and innovative resources to enhance the learning experience of students facing challenges, be it physical, mental, emotional, behavioral or intellectual.

6   AI Based Content Generation

AI Based content generation is about using natural language processing (NLP) and machine learning algorithms to produce educational content on-the-fly. This generated content is tailored to the specific learning levels of students. For instance, AI can automatically generate quiz questions, reading materials, and interactive assignments that align with the curriculum. Not only that, they adjust in complexity according to the student's progress. Duolingo is a great example of this kind of content generation. It tailors the level of complexity based on the performance of a student.

This dynamic method of content creation enhances the variety and quality of educational materials available to a great extent. In addition it gives the added advantage of supporting teachers by reducing the time and effort required to develop course content. This is a boon for teachers since it allows them to focus more on teaching

Narrative-centric learning experience has been found to improve learner engagement by several researchers. Towards this end, Chaitali Diwan et al (2023) have proposed an AI-based approach in their research that generates auxiliary learning content called narrative fragments which are interspersed into the learning pathways to create interactive learning narratives.

7   Decision-Driven Marketing/Sales Analytics for the Educational Institution

The application of decision-driven sales/marketing analytics within educational institutions signifies a transformative approach to how schools and universities understand and engage their target audiences. By applying intelligent ML algorithms and big data, these institutions can now analyze complex datasets to extract meaningful insights about prospective and current students' behaviors, preferences, and trends.

This purpose-oriented use of analytics enables educational entities to tailor their marketing efforts and academic offerings to meet the specific needs and interests of their student population. For instance, by identifying patterns in course popularity or application rates, institutions can optimize their curriculum and marketing strategies to attract a broader, more diverse student body. Furthermore, predictive analytics can forecast future trends in student enrollment and course demand. This would facilitate more informed decision-making regarding resource allocation, program development, and strategic planning.

The research by Emma Winter (2022) contributes to education practice through providing a clear set of recommendations to university marketing decision makers to enable the university to better manage its relationship with the place in which it is located. A complete research paper on just one aspect of student acquisition for a university stresses the need for AI to evaluate all other parameters like

courses offered, student skill sets and many other such aspects to provide a clear marketing plan which will give perfect results.

8   Predictive Analytics in Intern Recruitment to assess Job Suitability

The integration of predictive analytics in recruitment processes uses the power of data very effectively to forecast the future success of a candidate in a given role. The process involves analyzing the following in great detail : a) historical data, b) resumes, c) performance evaluations, d) professional roadmaps, e) current job requirements. Using all these parameters and more, predictive analytics algorithms can identify patterns and correlations that are beyond the reach of human recruiters who work manually to sift through the huge amount of data.

The holistic nature of predictive analytics is clear in the fact that it uses past and present achievements and qualifications.Using that it predicts a candidate's potential for growth, adaptability, and long-term contribution to the organization. The predictive model considers various factors, such as a candidate's career progression, educational background, skill development, and even softer aspects like cultural fit and leadership potential. This overall perspective enables recruiters to make more informed decisions, selecting those student candidates who are not just capable of performing the job today but who are also likely to thrive in the evolving landscape of their chosen industry.

In his research on, Dr. Thiyagarajan R (2021) has worked out the model depicted in the figure below to stress the importance of the role of recruitment analytics and metrics in targeted recruitment post pandemic.
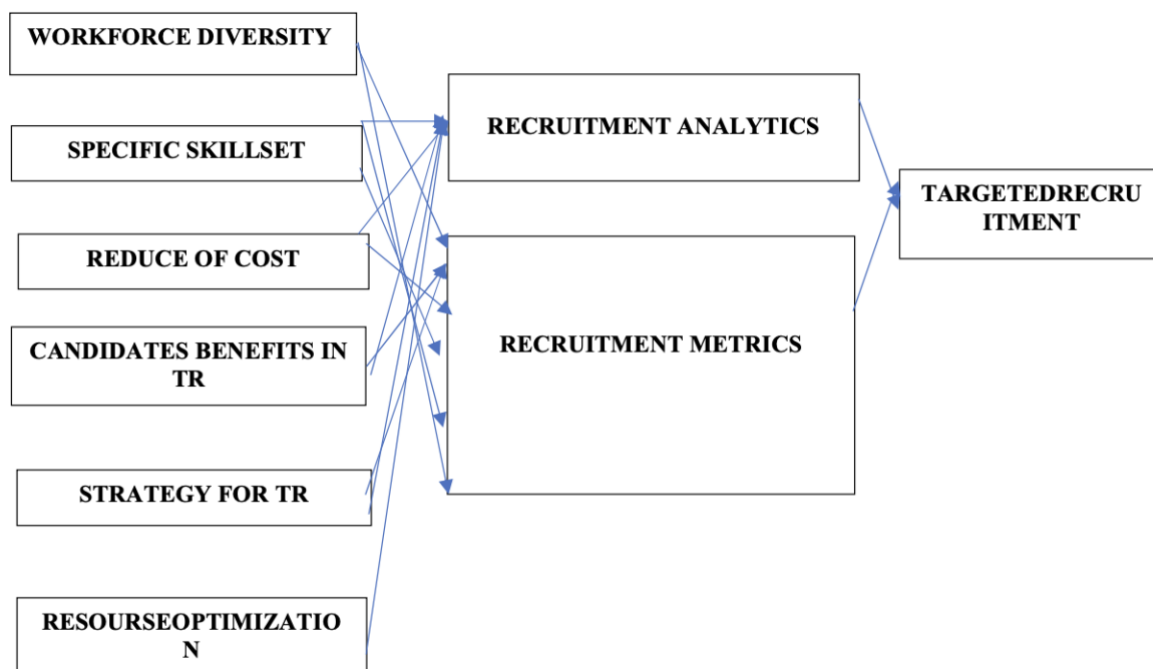
Figure 4.   Research model depicting how recruitment analytics and metrics can result in better targeted recruitment

9   EQ Tests to match a student with an internship opportunity

The adoption of Emotional Quotient (EQ) tests to assess job suitability is a revolutionary approach to arrive at a final decision on a candidate. These tests, powered by advancements in artificial intelligence and psychology, evaluate an individual's ability to perceive, control, and express emotions. Not only that, a recruiter can arrive at an assessment of the candidate's capacity to handle interpersonal relationships judiciously and empathetically. In the context of job suitability, EQ tests offer a comprehensive assessment beyond traditional metrics such as technical skills and experience.

This realization acknowledges the fact that emotional intelligence plays a crucial role in a person's ability to succeed in various roles and work environments. By integrating EQ assessments into the recruitment process, recruiters can get insights into a candidate's self-awareness, empathy, motivation, and social skills. These skills are critical for teamwork, leadership, and navigating the complexities of workplace dynamics. This approach ensures that the selection process is holistic and unbiased.

A research paper by Donald Kluemper (2006) has suggested a four factor ability-based measure of emotional intelligence, arguably, the most valid measure of emotional intelligence to date. The four factors consist of the ability to perceive, facilitate, understand, and manage emotions. An AI model which has these 4 factors as the base can prove to be a game changer in the way EQ can be used to assess job suitability of a student.

10   Skill Tests to match a student with an internship opportunity

The integration of AI in matching student skill sets with recruitment, specifically , internships presents a revolutionary shift towards more personalized and proactive career guidance. Here's how using sophisticated machine learning algorithms, AI systems can help in finding the right internships for students so that they can hone the knowledge gained in their educational journey : a) analyze students' academic performances b) give due credit to extracurricular activities, c) identify their strengths and weaknesses.

This data-driven approach allows for the creation of personalized recommendations for internships and job opportunities that closely align with each student's unique skillset and career aspirations. By leveraging this technology, educational institutions can provide a dashboard that displays tailored career opportunities to students. This would make things so much easier for them in terms of navigating their future career paths. Automation of communication with students by sending notifications about new and relevant opportunities via emails, SMS, or WhatsApp would add another layer of support both for the recruiter and the candidate. This not only ensures that students are promptly informed about potential internships and jobs but also encourages them to engage with these opportunities. All in all, such a powerful combination of activities will only help students in enhancing their career prospects by allocating the right internships to them.

Ayesha Javed et al. in their Literature Review explain how AI-powered systems are programmed to avoid unconscious biases like age, gender, race, or

names. Unconscious human bias in recruitment occurs when an individual or a group of individuals gets a favor based on age, race, color, education, or ethnicity.

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