

AI-Powered Education

Bridging Gaps and
Transforming Education in
Pakistan through AI Innovation

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Introduction:

In the 21st century, the world is witnessing an unprecedented transformation driven by the power of artificial intelligence. Across the globe, different sectors and industries are reaping the benefits of AI-driven innovations, from healthcare to agriculture, education to economic growth. The integration of AI in education is an emerging trend, progressively transforming conventional approaches to teaching and learning. Global Market Insights Inc. has recently included a new report on the AI in education market, projecting that the market value for AI in education is anticipated to surpass \$20 billion by the year 2027. However, Pakistan is on a unique trajectory, marked by distinctive challenges and opportunities. **Pakistan's current AI readiness, according to a State of AI Report, ranks 117 out of 172 countries with an index score of 34.03.**¹

In recent years, Artificial Intelligence (AI) has been playing a pivotal role in reshaping learning experiences. According to UNESCO's Director-General Audrey Azoulay, "Education will be profoundly transformed by AI- Teaching tools, ways of learning, access to knowledge, and teacher training will be revolutionized."



In Pakistan, as in many other countries, Artificial Intelligence (AI) is emerging as a transformative force in the education sector. This article explores the impact of AI on education in Pakistan and the potential it holds for revolutionizing the way students learn and teachers educate. It will unravel the current educational landscape, probing the vast scope of possibilities, identifying opportunities for growth, addressing the formidable challenges that lie on the horizon and will delve into strategies that can pave the way for a harmonious integration of AI, ensuring an inclusive and forward-looking educational future for Pakistan.

Pakistan's Unique AI Landscape:

Pakistan's AI landscape is distinctive, marked by both opportunities and challenges that set it apart from the global AI narrative. Before delving into the role of AI, it's essential to

¹ "Government AI Readiness Index 2022," Oxford Insights (2022).

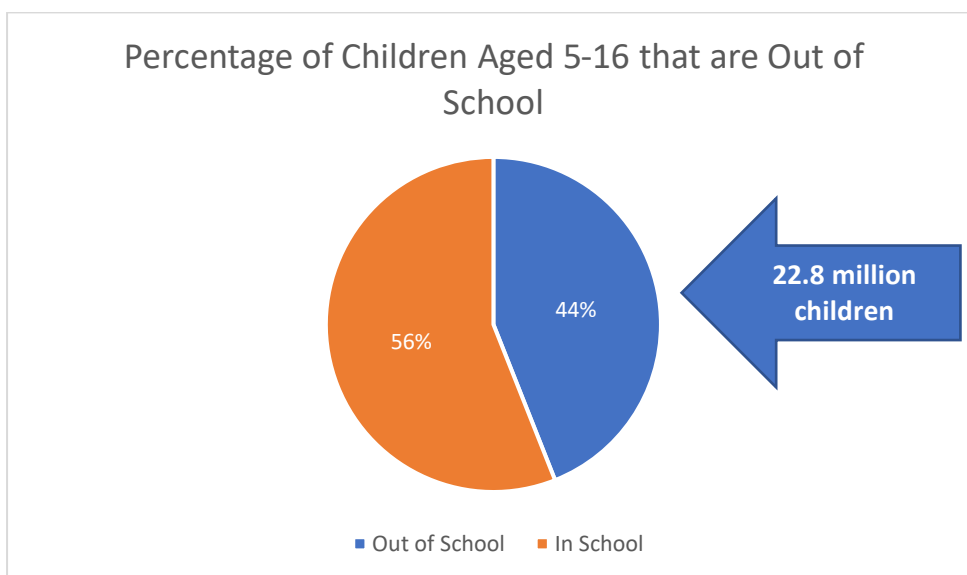


understand the existing challenges in the Pakistani education system. **According to the World Bank, Pakistan's literacy rate stands at around 60%, significantly lower than that of our neighboring countries.**²The country faces issues such as a high student-to-teacher ratio, a lack of quality educational resources, and disparities in access to education across different regions. **According to a report by the Pakistan Education Statistics 2018-19, the overall teacher-student ratio in the country is 1:41, which is significantly higher than the recommended ratio of 1:30.**

In recent years, there has been a noticeable surge in the adoption of AI tools and technologies in Pakistani classrooms. For example, The City School has entered a partnership with London-based technology firm **CENTURY Tech** to deploy its world-leading AI learning tools to all students across its national network of schools.

But this initiative remains limited to one brand of private school franchises. There are also several issues such as limited access to technology, especially in remote areas. Additionally, resistance to change rooted in traditional teaching methods and a shortage of AI expertise in the education sector hinder effective implementation.

Currently, Pakistan has the world's second-highest number of out-of-school children (OOSC) with an estimated 22.8 million children aged 5-16 not attending school, representing 44 per cent of the total population in this age group. (UNICEF)



The education landscape in Pakistan faces multifaceted challenges that impede the holistic development of students. According to the ASER survey data, one pressing issue is the prevalence of learning deficiencies among students. Additionally, teacher training and attendance in public schools are persistent challenges, especially in the context of incorporating AI into education. The challenges extend beyond the visible issues. A critical concern lies in the scarcity of comprehensive data detailing the extent to which students lag behind their designated grade levels. The lack of such information hampers targeted

²Tahir Andrabi et al., "Learning and Educational Achievements in Punjab Schools – LEAPS" (2008).



interventions, making it challenging to address specific learning gaps and tailor educational strategies to individual needs.

Moreover, complexity of the education system in Pakistan is aggravated by the existence of multiple schooling systems. The diversity between public and private institutions, along with the contradiction of different schooling systems such as metric, A-levels, IB, and the Cambridge system, poses a considerable challenge to formulating a unified education policy. The ongoing debate over the single national curriculum underscores the difficulty in reconciling diverse educational approaches. Balancing standardization with the need for flexibility to accommodate different learning styles and backgrounds is crucial for fostering an inclusive and effective educational environment.

These challenges provide the canvas upon which we can paint a brighter future using AI in education. Amidst these challenges, there exists a chance to comprehensively reassess and revamp the education system in Pakistan.

Scope and Opportunities:

Artificial Intelligence offers a range of solutions to address these challenges and enhance the overall education experience.

One significant application is **Personalized Learning**. AI algorithms can analyze individual student performance, identify strengths and weaknesses, and tailor educational content to meet each student's needs. This adaptive learning approach has the potential to significantly improve learning outcomes and bridge educational gaps. One-size-fits-all teaching methods often struggle to accommodate the diverse needs of students, particularly in areas with varying socio-economic backgrounds.

Hence using AI, tailored educational content can be delivered to address specific learning needs, helping bridge the gap between urban and rural educational standards in Pakistan. However, for this tool to be effectively used in the Pakistani context, we would need trained teachers and educationists who know how to apply and utilize the recommendations and AI-generated personalized outcomes to the benefit of students. This requires a steady and stable transition and adoption of new technologies within the schooling systems of the country.

Another use of AI is **Virtual Learning** to reach remote areas. In a country like Pakistan, where limited schools and infrastructure pose challenges to accessing quality education, the integration of Artificial Intelligence offers a transformative solution. AI-powered virtual learning platforms enable students in remote areas to access high-quality education from the comfort of their homes, overcoming the barriers of distance and lack of nearby schools.



This approach not only reduces the financial burden on families by eliminating the need for travel but also provides flexibility in learning schedules.



Another facet of AI in education in Pakistan is the utilization of **AI-driven administration automation for education** which optimizes teaching resources and addresses teacher shortages for improved literacy outcomes.

In Pakistan, where a shortage of teachers poses a significant obstacle to educational progress, AI-powered tools emerge as a transformative solution. By automating administrative tasks such as grading, attendance tracking, and data analysis, these technologies alleviate the burden on educators, enabling them to concentrate on addressing the individual needs of students. For example, technologies like Turnitin and Gradescope for grading, RFID systems for attendance tracking, and learning management systems such as Moodle streamlines workflow. Additionally, AI-powered platforms like Knewton analyze student performance for personalized learning. Chatbots like ChatGPT handle administrative queries, while timetabling software optimizes schedules. By integrating these technologies, educators can focus on teaching, and institutions can improve overall education quality.

The efficiency gains from AI assistance contribute to the optimization of limited teaching resources, potentially mitigating the impact of teacher shortages. This streamlined approach not only enhances the quality of education but also has the potential to increase the literacy rate by ensuring that the available teaching workforce can allocate their time more effectively, reaching a larger number of students and fostering a more impactful learning environment.

Virtual Reality (VR) and Augmented Reality (AR) are additional AI-driven technologies that can create immersive learning experiences. For example, students in remote areas of Pakistan can have virtual field trips to historical sites or explore complex scientific concepts through interactive simulations. These technologies can bring the curriculum to life and make learning more engaging.



Initiatives like **Google Expeditions** and projects like the **Classroom 3.0** program, have successfully implemented VR and AR in schools, showcasing the potential of these technologies to enhance learning outcomes and bridge educational gaps. China, the USA, the U.A.E, and France are among the top countries investing in VR in education at the moment. China has strategically allocated a significant portion of its budget to the integration of virtual reality (VR) exclusively within educational settings, emphasizing a commitment to serious advancements in the field. Unveiling its comprehensive masterplan for VR development in 2019, China has set its sights on global leadership in this burgeoning industry. The application of VR technology is already evident in Chinese schools, where students engage in immersive learning experiences facilitated by virtual tutors while seated in designated pods. With a forward-looking approach, China aims to extend the use of VR headsets to every classroom nationwide.



Moreover, use of AI in education can also lead to **Language Inclusivity Enhancement**. AI's ability to translate educational materials into various languages holds the potential to alleviate language barriers, making content more accessible to a diverse student population. This feature can play a crucial role in Pakistan, where linguistic diversity is prevalent, by fostering inclusivity and improving comprehension among students who speak different languages, ultimately contributing to a more effective and equitable education system.

Way Forward:

While the integration of AI in education holds tremendous promise, there are certain factors that need careful consideration and some strategic initiatives that should be taken.



The Role of Government: Government initiatives, including funding for technology infrastructure and policies promoting digital inclusivity, play a pivotal role. The Government of Pakistan has taken several initiatives to promote AI.

Vision 2025 plan includes a long-term focus on developing infrastructure and digital capabilities to position Pakistan as a knowledge economy. By targeting ICT growth, it supports the adoption of AI, data sciences, and cloud computing across sectors to transform education, businesses, and public services. The government envisions increased ICT penetration and a shift toward digital business models as essential components for economic growth.

Another significant initiative is the **e-Taleem** project, developed by Classera Inc. in collaboration with PTCL, HP, and the Ministry of Federal Education & Professional Training. This platform aims to serve 200,000 users over the next three years, focusing on equipping students with digital skills and enhancing access to high-quality learning. It's designed to foster critical 21st-century skills such as creativity, collaboration, and digital literacy, especially in underserved regions.

Sino-Pak Center for Artificial Intelligence (SPCAI) is another important initiative. As part of Pakistan's collaboration with China, SPCAI supports advanced AI research and technology-driven solutions across various sectors, including education. By housing labs dedicated to specific AI applications, this center provides resources for AI-based products and workforce training, aligning with national goals to integrate AI into the educational system and build technical expertise within Pakistan.

However, more initiatives and efforts are required such as:

Teacher Training and Professional Development: For AI to be effectively integrated into the education system, teachers must be equipped with the necessary skills. Professional development programs should be implemented to train educators on how to leverage AI tools, interpret data insights, and integrate technology seamlessly into their teaching methods.

Bridging the Digital Divide: Bridging the digital divide is crucial for the success of AI-driven education in Pakistan. Efforts should focus on providing better digital infrastructure, expanding internet access, and promoting the use of low-bandwidth AI applications.

According to the 2022 Inclusive Internet Index, commissioned by Meta and conducted by Economist Impact, the report emphasized that Pakistan holds the lowest ranking among 22 Asian countries and stands at 79th globally.³ This assessment was based on crucial indicators, including availability, affordability, relevance, and readiness.

Investment in AI Research and Development: Encourage public and private sector collaboration, collaborate with industry experts, and establish AI research centers and provide incentives for AI innovation, and establish research grants and funding programs.

³ Michael Paterra et al., "The Inclusive Internet Index 2022," Economist Impact (2022).



Entrepreneurship and Innovation Ecosystem: Establish incubators and accelerators focused on AI, provide funding and mentorship programs, and create a conducive environment for entrepreneurship.

LCE has played a pivotal role in incubating various EdTech startups, each contributing to the transformation of education. Among these, includes KEL that focuses on revolutionizing conventional learning by crafting personalized branded learning experiences designed to engage learners and enhance knowledge retention.

Another notable venture is Qari that is dedicated to developing an interactive platform and marketplace connecting students with online Quran teachers, facilitating accessible and effective Quranic education.

SchoolBlocks is another pioneering startup. This venture offers an AI-powered Learning Management System (LMS) tailored for traditional non-digital classrooms, aiming to revolutionize education with advanced technology and enhance the learning experience.

Further contributing to the EdTech revolution are startups like Zarya. Zarya offers comprehensive career counseling and admissions assistance to aspiring students across Pakistan through a well-integrated psychometric process, guiding them toward suitable universities and academic paths.

The STEM Educators is a notable versatile learning platform offering online and offline courses focused on STEM (Science, Technology, Engineering, and Math) subjects. Their mission is to make learning engaging and future-focused, catering especially to younger audiences. Courses cover essential areas like programming, robotics, and game development, aiming to build computational thinking skills from an early age.

Other initiatives such as Go Up Lift Me, Pengrow, Chotay Ustaad, Skill2Success, and Roshini, each addresses unique aspects of education and skill development.

These startups, ranging from scholarship and job platforms to personalized learning solutions and digital tools for early years education, collectively exemplify the diverse and innovative approaches facilitated by NICL in reshaping the educational landscape in Pakistan.

Public-Private Partnerships: Facilitate collaboration between the government, private sector, and academia to jointly address challenges and drive AI initiatives.

International Collaboration: Foster collaboration with international organizations, research institutions, and industry leaders to leverage global expertise and best practices in AI.

Several leading EdTech companies globally are pioneering AI integration in education, enhancing personalized learning, real-time feedback, and data-driven insights for students and educators alike. Here's a look at some key players:

Coursera – This globally accessible platform uses AI to tailor course recommendations based on users' learning history and engagement, providing tailored experiences for millions of learners. The AI capabilities help streamline content suggestions, catering to learners' unique goals and preferences.



Carnegie Learning – Known for its AI-driven math solutions, Carnegie Learning combines cognitive science with machine learning to create personalized math instruction. Its MATHia platform gives students immediate feedback, helping them develop core mathematical skills at their own pace.

Squirrel AI – A prominent EdTech company in China, Squirrel AI specializes in adaptive learning technologies, using AI to pinpoint students' strengths and weaknesses. This platform adjusts learning paths dynamically, offering custom-tailored curricula for each learner.

Century Tech – Based in the UK, Century Tech merges AI with neuroscience to deliver personalized learning experiences. The platform continuously assesses students' learning progress and provides actionable insights for teachers to support personalized education.

Quizlet – Popular for its adaptive “Learn” mode, Quizlet uses AI to analyze student performance and customize study materials. By prioritizing areas where learners need the most practice, Quizlet improves study efficiency and retention.

Conclusion:

To harness the full potential of AI in education, Pakistan must focus on strategic planning, investment, and steadfast commitment. Collaborative efforts involving government bodies, educational institutions, and the private sector are highly essential to ensure sustained progress. In conclusion, embracing artificial intelligence (AI) presents a transformative opportunity for Pakistan to overcome challenges and unlock numerous benefits in the realm of education. By strategically addressing issues and implementing the right initiatives and strategies Pakistan can position itself as a leader in the AI landscape.

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