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Impact of Integration of Technology in Education

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ABSTRACT

Technology is the power that has changed many aspects of the lives. The impact of the ICT on each sector of the life across the past two-three decades has been enormous. The way these fields act today is different as compare to their pasts. Across the past twenty years the use of ICT has basically changed all forms of endeavour within business, governance and off-course education. ICT has begun to have a presence but unfortunately, we are lacking to achieve desired impact. The education is a socially oriented activity. It plays vital role in building the society. The quality education traditionally is associated with strong teachers having high degrees. Using ICTs in education it moved to more student – centred learning. As world is moving rapidly towards digital information, the role of ICTs in education becoming more and more important and this importance will continue to grow and develop in 21st century. This paper highlights various impacts of ICT and Artificial intelligence on education and explores the potential challenges and barriers in implementation of information and communication technology.

Introduction

The education has vital role in building the society. Education determines standard of society. The quality education helps to empowering the nation in all aspects by providing new thoughts, the ways of implementation of various technologies and so many such things. The quality education is basic need of

the society. There are number of effective teaching & learning methodologies in practice. Technology is the most effective way to increase the student's knowledge. Nowadays ICT (specially an internet) plays imminent role in the process of integrating technology into the educational activities.Information and Communication Technology (ICT) includes computers, the Internet, and electronic delivery systems such as radios, televisions, and projectors among others, and is widely used in today's education field. School is an important environment in which students participate in a wide range of computer activities, while the home serves as a complementary site for regular engagement in a narrower set of computer activities. Increasingly, ICT is being applied successfully in instruction, learning, and assessment.

Present Educational Situation

In the present educational scenario, Information and Communication Technology (ICT) and Artificial Intelligence (AI) play a vital role in reshaping how teaching and learning take place. The traditional classroom has evolved into a digital and interactive learning environment, where technology supports both teachers and students in achieving better learning outcomes.

ICT tools such as smart classrooms, online learning platforms, digital content, and virtual labs have become essential in today's education system. After the COVID-19 pandemic, the use of ICT increased rapidly, enabling online and blended learning through platforms like Google Classroom, Zoom, and Microsoft Teams. These technologies ensure that students can learn anytime and anywhere, breaking geographical and time barriers.

At the same time, AI is adding intelligence and personalization to education. It helps analyze students' performance, adapt lessons to their individual needs, and provide instant feedback. AI-based applications such as intelligent tutoring systems, chatbots, and adaptive learning platforms assist both teachers and learners. For example, AI can automatically grade assignments, suggest improvement areas, and even detect learning difficulties early.

In the current situation, AI and ICT also promote inclusive education by providing assistive tools like translation software, speech recognition, and text-to-speech technology that support students with diverse needs. They make learning more accessible and equitable for all. Furthermore, these technologies are preparing students with digital literacy and problem-solving skills needed in the 21st-century workforce.

Overall, in the present situation, ICT and AI are not just supplementary tools but have become core components of modern education, making learning more flexible, personalized, inclusive, and future-oriented.The integration of ICT in early childhood and primary education represents a highly innovative and significant area of research, with the potential to transform teaching and learning in these crucial developmental stages (Akyar et al., 2024; Ihmeideh and Al-Maadadi, 2018).The present era is of technology, and the most important among technology is information communication technology (ICT). It is a force, and it plays a crucial and vital role in all aspects of human life. It has integrated the world and altered the entire global scenario of economic, social, political, and education. Global overall growth and development depend primarily on a skilled workforce which can be achieved through quality education. The potentials of ICTs in increasing access and improving relevance and quality of education in developing countries..

Educational Applications

The integration of Information and Communication Technology (ICT) and Artificial Intelligence (AI) has created powerful tools and methods that enhance teaching and learning in schools, colleges, and universities. Their applications span across all areas of education — from classroom instruction to administration and student support.ICT provides the technological foundation through tools such as smart classrooms, e-learning platforms, interactive whiteboards, multimedia presentations, and online assessments. These applications make learning more engaging and accessible to students by using videos, animations, and simulations to explain complex topics. AI enhances these ICT tools by making them more intelligent, adaptive, and personalized. For example, AI-powered platforms like adaptive learning systems adjust lesson content based on a student's performance and learning pace.

In teaching, AI and ICT enable virtual classrooms, online collaboration tools, and learning management systems (LMS) that allow teachers to share materials, conduct live sessions, and track student progress efficiently. AI chatbots and virtual tutors provide students with 24/7 learning support, answering questions and giving instant feedback.

In assessment, ICT supports online testing, while AI helps with automated grading, identifying learning gaps, and providing personalized recommendations for improvement. Administrative applications include digital attendance systems, data analytics for performance tracking, and AI-based predictive systems that help educators identify students at risk of falling behind.

Moreover, AI and ICT promote inclusive education through assistive technologies such as speech-to-text, screen readers, and translation tools, ensuring equal learning opportunities for all. They also encourage self-directed and lifelong learning, allowing students to learn at their own pace using digital resources.

REVIEW OF RELATED LITERATURE

Guma et al. (2013) aimed at finding out the factors influencing use of ICT to make teaching learning effective in higher institutions of learning in Uganda and identifying the innovations that ICT has brought into teaching-learning process, particularly in higher institutions of learning in Uganda. A survey was employed and in order to empirically investigate the study. The findings of this study revealed that teaching staff and administrators had a strong desire to integrate ICT into teaching-learning processes. Therefore, the training of teaching staff in the pedagogical issues and administrators in administration should be increased if teachers and administrators are to be convinced of the value of using ICT in their teaching-learning process and administration

Cavanaugh et al. (2013) examined that the first six months of a national college level iPad implementation project involving 14,000 new students based on faculty shift from substituting their teaching methods with mobile technology to augmentation of teaching methods with new affordances of mobile technology. Thus the findings may generalize in very specific ways at different campuses. The campus context may support or impede professional growth by influencing a faculty member's access to professional development opportunities, by offering incentives to participation, by creating a culture that values experimentation and by providing supports for applying learning in the classroom. Its intent is to guide education organizations in planning faculty development for mobile education programs.

Saxena and Kumar (2014) aimed to better understand and measure Pupil-Teachers attitudes and Psychological Readiness regarding the use of mobile learning in Teaching-Learning process due to the increasing global demands towards the integration of mobile technology. This paper reports on the results of a study of two hundred students of G.G.S.I.P. University about their attitude and psychological readiness regarding the use of mobile technology in education. Results of this study clearly indicate that offering mobile learning could be our method for improving retention of pupil-teachers by enhancing their teaching/learning. The main aim of this research study is to better understand and measure Pupil-teachers attitudes and Psychological Readiness regarding the use of mobile learning in Teaching-Learning process.

Ali et al. (2015) study mainly deals with the use of ICT to make teaching learning process effective and the factors influencing use of ICT in teaching learning process in secondary schools in Punjab Province of Pakistan. A descriptive survey for data collection from 200 secondary teachers were collected and analyzed through statistical tools of frequency and simple percentage. The study points out that the secondary teachers have a keen desire for the use of ICT and its integration within classroom environment. The work concluded stakeholder in education should facilitate the secondary teachers in the use of ICT and must have to support the secondary school teachers through the conduction of trainings in ICT.

Ghavifekr and Athirah (2015) study aims to examine teachers‘ perceptions on effectiveness of ICT integration to support teaching and learning process in classroom. A survey questionnaire was distributed randomly to the total of 101 teachers from 10 public secondary schools in Kuala Lumpur, Malaysia. The data for this quantitative research were analyzed for both descriptive and inferential statistic using SPSS (version 21) software. The results indicate that ICT integration has a great effectiveness for both teachers and the students and teachers‘ well-equipped preparation with ICT tools and facilities is one the main factors in success of technology-based teaching and learning.

Ghavifekr and Rosdy(2015) This study aims to analyze teachers’ perceptions on effectiveness of ICT integration to support teaching and learning process in classroom. A survey questionnaire was distributed randomly to the total of 101 teachers from 10 public secondary schools in Kuala Lumpur, Malaysia. The data for this quantitative research were analyzed for both descriptive and inferential statistic using SPSS (version 21) software. The results indicate that ICT integration has a great effectiveness for both teachers and the students. Findings indicate that teachers’ well-equipped preparation with ICT tools and facilities is one the main factors in success of technology-based teaching and learning.

Ubulom et al. (2016) examined the impact of ICT on Business studies students‟ academic performance in Upper Basic Education in Tai Local Government Area of Rivers State. The population of the study comprised of all Junior Secondary School in Tai Local Government Area with sample size of 300. Analysis of the data revealed that ICT has tremendous impact on Business Studies Students‟ academic performance. It was recommended that the use of ICT as instructional media bridged the gap between teachers. It was also recommended that ICT has changed teachers and students‟ perception about visualizing real world application of course concepts, documenting memories and recording of information

Thakkar, Tejas, A.(2020) The main objectives of study was, to compare the effectiveness of traditional lecture method and concept attainment model method on academic achievement of the students with reference to area, gender, level of achievement and level of intelligence. Total 172 students were selected as sample by random sampling method among these 89 students (45students in experimental group and 44 students in controlled group) were from urban area and 83 students (40 students in experimental group and 43 students in controlled group) were from semi-urban area. A standardized IQ test developed by Dr. J. H. Shah And self-maid Concept Attainment Model and achievement test were used for data collection. Collected data were analysed by using Mean standard deviation and t-value. From the study it was found that Concept Attainment Model (CAM) teaching method more effective than Traditional Teaching Method.

Vijayakumar et al. (2023) This study investigates how online students taking a course called Essentials of Spoken and Presentation Skills can develop high order thinking skills through computerised tests that are in line with Bloom's Taxonomy. The study uses both qualitative and quantitative data to demonstrate how students who participated in more advanced activities significantly improved their critical thinking, analysis, evaluation, and creative skills. According to structured interviews, students thought at activities and course material helped in developing their HOTS. The results offer educators and instructional designers' evidence-based suggestions fordeveloping successful and captivating virtual learning environments

Kumari and Singh (2023) This study investigates how blended learning affects secondary students' development of higher-order thinking skills (HOTS). The study used the Test for Higher Mental Ability in Science (THMAS) and self-designed blended lesson plans with 262 students from two Siwan schools. The findings show that students in the experimental group significantly outperformed those in the control group in terms of HOTS. The effectiveness of blended learning in promoting HOTS in science education was highlighted by the gender-based differences and variations between classes 9 and 10.

Li et al. (2024) developed a scale to assess HOTS in interior design students within a blended learning environment. Using qualitative interviews to guide the development of a 66-item assessment scale, the study used a mixed-methods design. The scale identified four factors: practical innovation skills, problem-solving abilities, teamwork, and critical thinking. High validity and reliability were demonstrated, making it an invaluable instrument for evaluating and fostering HOTS in interior design education. Subsequent studies could investigate the elements that impact skill development and help guide teaching methods.

The reviewed literature underscores the pivotal role of Information and Communication Technology (ICT) and innovative pedagogical practices in enhancing the quality of teaching and learning. Guma et al. (2013) and Ali et al. (2015) emphasized that teachers and administrators exhibit a strong inclination toward ICT integration, provided adequate training and institutional support are available. Studies by Ghavifekr and Athirah (2015) and Ghavifekr and Rosdy (2015) similarly revealed that effective ICT integration, coupled with teachers' preparedness and access to necessary resources, substantially improves classroom engagement and learning outcomes.Cavanaugh et al. (2013) and Saxena and Kumar (2014) explored the role of mobile learning, highlighting that institutional encouragement, faculty readiness, and positive attitudes are critical to successful technology adoption in higher education. Ubulom et al. (2016) found that ICT utilization positively impacts students' academic performance and promotes interactive learning environments. Thakkar (2020) demonstrated that the Concept Attainment Model surpasses traditional teaching in enhancing student achievement.More recent studies by Vijayakumar et al. (2023), Kumari and Singh (2023), and Li et al. (2024) emphasized that blended and technology-based learning approaches effectively cultivate Higher Order Thinking Skills (HOTS). Overall, the literature affirms that ICT integration and innovative teaching methods significantly contribute to improved teaching effectiveness and learner outcomes.

Impact of Artificial intelligence and ICT on School Students

The integration of Information and Communication Technology (ICT) and Artificial Intelligence (AI) has significantly transformed school learning. ICT provides the foundation for digital education through tools such as smart classrooms, online platforms, and multimedia resources, making learning more engaging and accessible. When combined with AI, these technologies become even more powerful. AI enables personalized learning by analyzing each student's progress and adapting lessons according to their needs and pace. It supports teachers through intelligent tutoring systems that offer instant feedback, explanations, and guidance similar to human tutors. Moreover, AI enhances assessment by identifying learning gaps and suggesting targeted improvements, while ICT facilitates the collection and management of data. Together, ICT and AI make education more inclusive through features like speech-to-text, translation, and adaptive interfaces that support students with diverse needs. They also automate administrative tasks, freeing teachers' time for creative and interactive teaching. Overall, the correlation between ICT and AI has revolutionized education by making it more efficient, personalized, and student-centered, while preparing learners with the digital and analytical skills essential for the future.Lin and Lin (2018) explored ICT use in primary schools and found that it significantly improved students' reading

and mathematics performance while enhancing their learning motivation and classroom engagement.Scherer et al. (2019), through quasiexperimental studies, demonstrated that educational software and online resources can effectively enhance cognitive development, especially in areas such as problem-solving and critical thinking, while also supporting social interaction skills.Verhoeven et al. (2020) highlighted the positive impact of ICT on preschool and early primary children's language acquisition and literacy. Kolić-Vehovec et al. (2020), reported that well-integrated ICT practices in classrooms fostered both academic performance and student engagement..

Challenges and Barriers in Integration of ICT and AI in Education

Despite the numerous benefits, the integration of ICT and AI in education faces several challenges and barriers. One major issue is the digital divide, where unequal access to technology and the internet limits opportunities for students from rural or economically weaker backgrounds. Lack of infrastructure, such as reliable electricity, updated hardware, and stable internet connectivity, also hinders effective implementation. Additionally, many teachers face insufficient training and lack the digital skills or confidence to use ICT and AI tools effectively in the classroom. There are also financial constraints in schools and institutions that make it difficult to adopt and maintain advanced technologies. Moreover, concerns about data privacy, cybersecurity, and the ethical use of AI create hesitation in fully embracing these innovations. Resistance to change and traditional teaching mindsets further slow down progress. Therefore, addressing these barriers through proper planning, training, and policy support is crucial for the successful and equitable integration of ICT and AI in education.

Conclusion

The integration of Information and Communication Technology (ICT) and Artificial Intelligence (AI) has revolutionized the education system by transforming traditional teaching and learning methods into more interactive, personalized, and efficient processes. ICT enables easy access to information, promotes digital literacy, and supports collaborative and self-paced learning. Meanwhile, AI adds an intelligent dimension to education through adaptive learning platforms, automated assessments, and data-driven insights that help teachers understand students' needs better. Together, ICT and AI enhance the quality, accessibility, and inclusiveness of education, preparing learners for a technology-driven world. Therefore, the effective integration of these technologies is essential for developing innovative, equitable, and future-ready education systems.

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