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ST. XAVIER'S INSTITUTE OF EDUCATION
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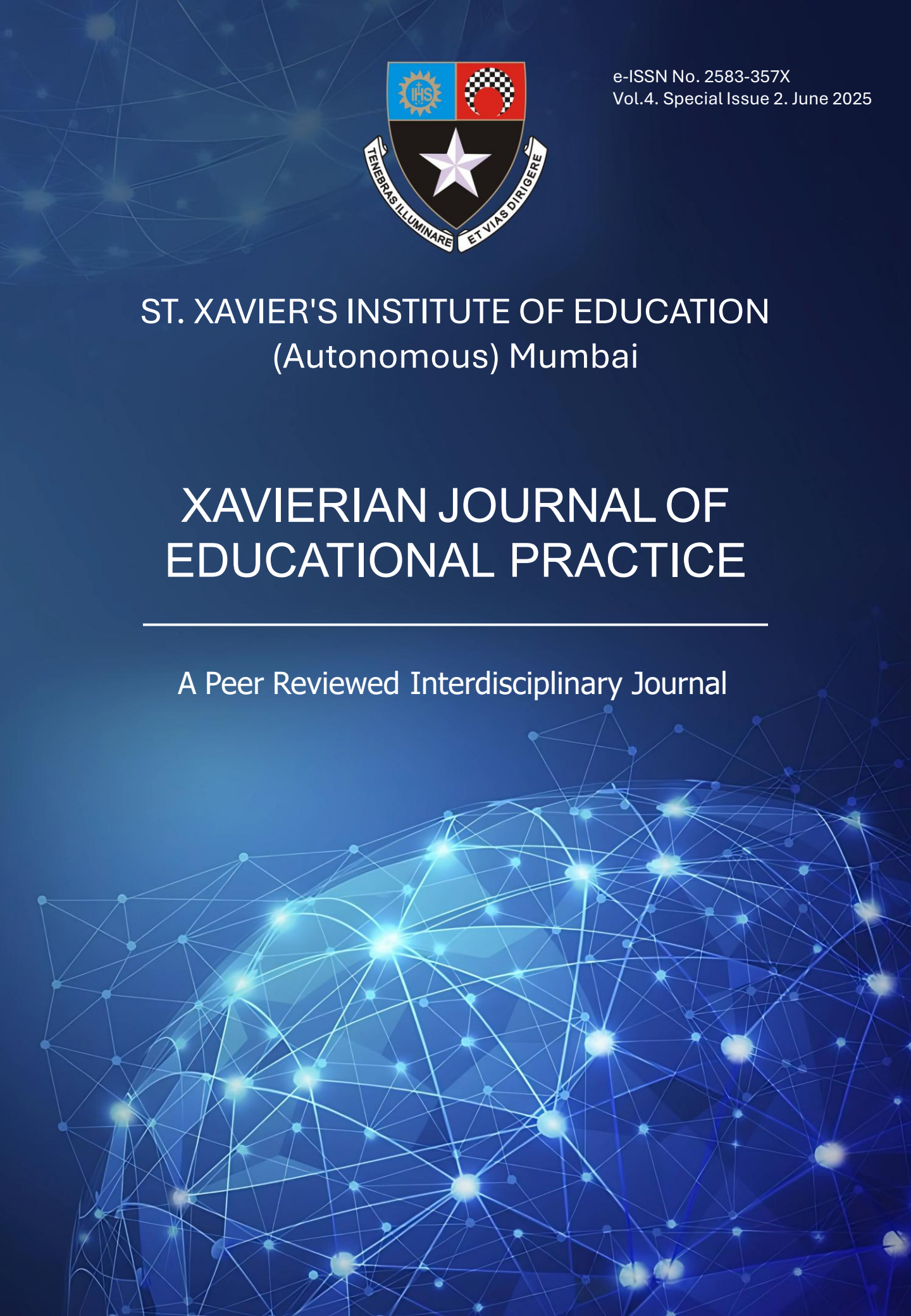
XAVIERIAN JOURNAL OF EDUCATIONAL PRACTICE

A Peer Reviewed Interdisciplinary Journal



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About the Journal

The e-journal "XAVIERIAN JOURNAL OF EDUCATIONAL PRACTICE", is published by St. Xavier's Institute of Education (Autonomous) is Peer reviewed Open access journal. The name of the journal exuberates the institution's commitment to encouraging innovations in educational practice which can bring transformation and enhance progressive thinking.

The journal aims to corroborate multiple perspectives and innovations in different contexts, leading to collaborative learning and networking. The understanding of how educational practice can be understood for maximising the outcomes of learning is the main thrust of the journal.

The e-Journal is a bi-annual journal and encourages authors to publish their conceptual as well as research articles in the journal. The e-journal will review and publish conceptual papers, research papers, case studies, analytical papers, book reviews, critical views on policies and any other of educational interest.

The e-journal provides a platform for teachers in Higher Education, student teachers, researchers and all those interested in novel educational practices and making them more student-centric in nature. The e-journal provides updates on the current research trends in different disciplines as well as conceptual articles with innovative ideas. The quality of the articles will be assessed by a (double-blind) peer review. The peer reviewers as well as the members of the Editorial Board constitute a group of eminent persons in Education and the institute will have the right to decide the members in these teams. The publication will be a resource for all those striving to carry out innovations in the field of Education.

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EDITORIAL

St. Xavier Institute of Education, Autonomous takes pride in its Peer-reviewed Interdisciplinary Journal, the Xavierian Journal of Educational Practice (XJEP) to be a vehicle of dissemination of knowledge and skills for enhancing academia-industry connect and encouraging innovative educational practices.

St. Xavier's Institute of Education (Autonomous) on behalf of the Xavier Journal of Educational Practice (XJEP), Editorial Board is glad to present, XJEP, Volume 4, Special Issue 2. The National Policy of Education 2020 on 'Holistic Development of Learners', states that "The main aim of education will not only be cognitive development but also building character and creating a holistic and well-rounded individuals equipped with the key 21st century skills".

Higher Education is transforming rapidly, driven by globalisation, technology, sustainability, and evolving workforce demands. To stay relevant, universities are embracing digital learning, interdisciplinary education, industry partnerships, and internationalisation. Additionally, inclusivity, mental well-being, and sustainability are becoming core institutional priorities. This webinar will explore key trends shaping the future of higher education, the challenges institutions face, and strategies for adapting to this dynamic landscape. Digital Innovation, Leveraging Technology in Higher Education, the accelerated development of digital technologies have revolutionized higher education, opening up new learning and teaching strategies. Sustainable Practices in Higher Education, a global context. Institutions of higher learning have an important role to play in advancing sustainability through innovation, research, and leadership. Institutions are incorporating green campus programs, green curricula, and responsible governance. Internationalization of Higher Education, As the pace of globalization quickens, the higher education sector is transforming through internationalization, such as mobility, global collaboration, and cross-border curricula. The Industry-Academia Collaboration Bridging the Gap, and the changing job market necessitates greater collaboration between industry and academia have resulted in preparing students and faculty with the necessary skills. Stronger partnerships boost research, innovation, and employability and make graduates work ready.

Higher education is rapidly evolving due to technology, globalization, and shifting societal needs. Digital learning, AI, and interdisciplinary education are transforming teaching and research, while sustainability, international collaboration, and industry partnerships shape future-ready graduates. This publication will help educators, policymakers, and industry leaders develop strategies to enhance learning, promote inclusivity, and adapt to a changing world.

The Editorial Team

The Use of Artificial Intelligence (AI) in Research: Benefits, Innovations, Tools, Ethical Concerns, and Future Prospects

Dr. Lata Pandey
Assistant Professor,
The Maharaja Sayajirao University of Baroda, Vadodara
lata.pandey-edu@msubaroda.ac.in

Abstract

Zeitgeist is a German word which loosely translates to 'spirit of the times'. Like a Daemon - a computer program which runs in the background, and performs tasks by itself without direct user interaction, the Zeitgeist is that which imbues into characteristics of a generation, for a given time. Artificial Intelligence (Al), and the way it is exponentially influencing everything around us, could be said to be the zeitgeist of modern times. Moving closer to the field of research, both academic and scientific, Al is being utilized to analyse vast amounts of data and information, boost research effectiveness and efficiency, and construct innovative processes through invisible, highly complex algorithms. This paper inquires the impact of Al at different stages of research. Specific Al based tools have been considered for different research aspects, like, Research Rabbit for literature mapping, Consensus for evidence-based question answering, Chat PDF for interactive reading of academic texts, Gemini for content generation and summarization, Grammarly for advanced language editing, and few others too. The paper examines how research workflow is remodelled through these Al tools. Al rendered benefits like in-depth accessibility, better accuracy, speedy filtering, automation, etc are highlighted with practical discerning inter-tool comparisons. The study also expounds limitations and the cons associated with Al like ethical concerns, including overdependence, data bias, and IPR issues. The paper concludes that AI, if used correctly, responsibly, and ethically, is a revolutionary tool in the hands of researchers and has the transformational ability to complement human research endeavour, in a world where intelligence, both human and artificial, coexist and develop solutions for the betterment of all.

Keywords : *IPR, Artificial Intelligence, ethical concerns , innovations*

Introduction

A rapid influx of Artificial Intelligence (AI) in almost every walk of life has become a norm in recent times. Given the unequivocal attention being paid to AI by developers and amateurs alike, these is seldom any field which is left untouched by it. Academic and industrial research too has seen researchers scourging the realms of AI to improve, simplify, and speed up their research process. Researchers today have access to vast repository of data and information, courtesy AI, along with its superhuman analytical abilities. With these abilities, however, AI brings with itself the question of ethical concerns, and the risk of breeding an entire generation of armchair researchers, who never visited a real, physical, library, and completed their entire

research sitting in front of a computer. On these lines, this paper provides a comprehensive overview of the use of AI in research, highlighting key benefits, innovations, ethical considerations, and limitations, with special emphasis on select AI tools that are making a significant impact in today's times.

NEP 2020: A Step Towards Tech-Driven Research and Learning: When looking into NEP 2020, there is a strong emphasis on the integration of technology, including Artificial Intelligence (AI), into education. Elaborating further, key points from NEP 2020:

- NEP 2020 stresses the importance of equipping teachers with the necessary skills to effectively use technology in their teaching practices. This includes training in the use of Artificial Intelligence (AI)-powered tools and platforms.
- The NEP 2020 recommends the integration of coding and Artificial Intelligence (AI) into the school curriculum from early stages. This necessitates that teacher training programs prepare future educators to teach these subjects.
- The NEP 2020 recognizes the transformative potential of technology in enhancing the quality and accessibility of education and research. This includes the use of Artificial Intelligence (AI) for personalized learning, adaptive assessments, and improved educational administration and research

Benefits of AI in Research

A variety of AI based tools have been developed to aid researchers, and they offer several benefits over manual method involved in research. Some of these benefits are as under:

- **Speed**: Unimaginable speed in sifting through data is a hallmark of AI research tools. Large volumes of data could be scanned in the blink of an eye and diverse data sources tapped with surprising levels of relevance. There are Natural Language Processing (NLP) based tools that can behave like human brain in reading & interpreting text like full length research papers, and offer comprehensive insight on the same, basis quality, sentiment, relevance, etc.
- **Error-proofing:** Human effort in tasks like data classification and analysis is rendered completely redundant where AI tools are used, which negates any possibility of human error. Accurate results are obtained by use of pattern recognition and predictive analytics, which are imperative in disciplines like genomics and social sciences, where complex data processing is needed.
- **Automation**: AI keeps learning usage patterns increasingly, and over time it can hence conveniently automate filtering through irrelevant information, helping researchers focus on the most pertinent data. Productivity enhancing features like automatic content generation, summarization, citation tracking, etc. reduce research effort to a great extent. The ability of AI to learn usage patterns also helps researchers in deciphering the effect of customized learning programmes on different learners.

- **Common platform:** AI acts like an online aggregator for researchers where they could come together and collaborate through real-time analysis of large-scale data.
- **Predictive Analytics:** AI algorithms can be used by researchers to design programs and develop methods for at-risk learners, who have an AI-based prognosis of parameters like dropout risk, irregular attendance, uneven performance, through its predictive analytics feature.
- **Elimination of Bias:** AI being completely devoid of bias, eliminates this element at all stages of research, and thereby promotes rational research outcomes.

AI Tools Transforming Research

A variety of AI tools have been developed in recent times to enable research. This paper will now discuss some popular AI based research tools with emphasis on their functionality, relevance, and features.

- **Chat PDF** helps researchers to browse through and understand PDF documents. It has a chatbot interface which allows researchers to perform various tasks with a given PDF document uploaded by them, like:
  - asking direct questions about the content of a document and receiving instant replies
  - generating gist of complex passages, or entire document
  - highlighting important passages
  - simplifying and organizing literature review process

Impact on Research: Chat PDF speeds up PDF document review process by reducing visual overload of researcher. It makes lengthy documents coherent by making them more interactive with the user.

- **Research Rabbit** is an AI-powered tool which provides a graphical network of linked research literature for a given research query or string. Each link could then be used to access successive linked research literature. In this manner, Research Rabbit provides a chain of relevant research literature from its database to researchers. It aids in:
  - looking out for relevant research papers and linking multiple such papers together.
  - chronological linking of research literature.
  - bookmarking of required articles.
  - citation management.

Impact on Research: It significantly reduces time required to search through research literature and provides handy linkages to further a given research query. This allows researchers to explore available research literature in a very efficient manner.

Consensus: Evidence based research requires detailed analysis of peer-reviewed papers; Consensus tool is used to browse through such papers and provide replies to researcher queries based on inbuilt algorithms.

Features and Applications:

- Researchers can present multiple studies to Consensus and get replies to their queries that are an aggregated result of such multiple studies.
- Evidence based research in fields of medicine, psychology, etc. are ideally suited for use of Consensus.
- Provides internet links for validation of aggregated queries and further analysis/research.

Impact on Research: It negates bias and complements evidence-based decision-making. It is especially useful in such fields that require evidence based decisions, like policy making, healthcare, etc.

- **Gamma:** Gamma is used to convert given text or into specified formats like PPTs, reports, etc.

Features and Applications:

- Transforms text/data into presentable formats
- Is compatible with images, charts, tables, etc.
- User-friendly UI

Impact on Research: Gamma significantly reduces time required to convert data into visually appealing formats. It has an extremely simple user interface which facilitates even technically challenged researchers to adapt to it very quickly.

- **Perplexity AI:** Perplexity is the Google of researchers. Its is a query handling platform that provides cited responses to research queries from data available on the internet.

Features and Applications:

- Researchers do not need to phrase questions in a complex form to elicit replies from Perplexity
- Replies are backed by internet links to their respective resources
- Valuable in gathering any information at any stage of research

Impact on Research: It provides a more focussed search engine, since it deals only with research databases. It also saves time by providing credible links to queries posted by researchers.

- **Nepkin.ai:** Nepkin.ai is a holistic AI platform that offers tools for research visuals and research assistance through review of related literature, paper summarization, analysis of text, etc.

Features and Applications:

- Supports multiple users simultaneously
- Provides suggestions, generates summary, and uses keyword strings to present results
- Customised support for different research needs

Impact on Research: It streamlines infographics, charts, reports, presentations, etc. and assists researchers by virtue of its multi-functionality. Multiple researchers can collaborate together on it and analyse research data in real-time, thereby saving time and effort.

Inter-tool Comparison and Practical Applications

Tool	Primary Use	Strengths	Limitations
ChatPDF	PDF summarization and Q&A	Quick, interactive, document-focused	Limited to uploaded content
Research Rabbit	Literature exploration	Visual discovery, citation mapping	Requires manual validation
Consensus	Evidence synthesis	Research-backed answers, scientific rigor	Limited to available databases
Gamma	Presentation generation	Time-saving, visual, communicative	May need manual editing
Perplexity	Research Q&A with citations	Real-time info, source-backed	Needs cross-checking for accuracy
Nepkin.ai	All-round research assistant	Versatile, integrated toolkit	Can be complex for beginners

(Generated with the assistance of ChatGPT, OpenAI, 2025)

These tools, when collectively utilized, synergize the entire research effort to yield faster, more accurate results to queries, better accuracy in filtering data, freedom from repetitive tasks, and better comprehension and presentation of research results.

Ethical Use and Limitations of AI in Research

Use of AI in research presents some ethical and concerns which are as under:

- **Lack of initiative:** Overdependence on AI may lead to lack of initiative on part of researchers, which could lead to degeneration of their logical and analytical skills.
- **Bias:** AI systems are known to inherit and amplify biases present in data which is fed to them. This could lead to skewness in interpretation and analysis.
- **Intellectual Property Rights (IPR):** AI generated content has potential authorship and copyright / trademark issues. It is difficult to pin-point origin of AI generated results which could lead to IPR violations.
- **Data Integrity:** AI tools could easily be used to manipulate, amend, or fabricate data, which could jeopardize research results.
- **AI algorithms** are considered 'Black Boxes', meaning that it is not possible to completely decipher the reasoning behind how they work. This makes it difficult to understand how they make decisions, and consequently, researchers may not be sure as to how a particular conclusion is arrived at by an AI tool.

Researchers must maintain control over their research process and use AI responsibly, with a firm understanding of the tool's limitations.

Conclusions: Artificial Intelligence is poised to become an indispensable tool in all aspects of life. AI models are being developed at exponential speeds to suit various needs across the world. The speed, and precision provided by AI tools has no parallel as on date. AI tools in research improves researchers' efficiency, saves time, and provides innovative solutions. AI tools like ChatPDF, Research Rabbit, Consensus, Gamma, Perplexity, and Nepkin.ai each offer customised solutions that make work of researchers faster, easier, and more productive.

While the above benefits have potential to reap great results for researchers, at the same time one must not forget that this technology should complement, not replace the creative, ethical, critical, and analytical human intelligence. This can happen only when researchers use AI responsibly for what its worth, and not a s a quick fix that does what they'd rather avoid doing, because of the sheer amount of effort involved. With new usages and lacunae being discovered in AI on a routine basis, it may be said that, like money, AI in research could be a good servant but a bad master. Leveraging its strengths, avoiding its weaknesses and drawing clear lines of its use case, should guide researchers in their pursuit of knowledge.

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Emerging Digital Innovations in Higher Education: Case Study Evidence from India

Pooja Chaudhary
Assistant Professor of Commerce, S.U.S. Govt College, Karnal.
poojadabra75@gmail.com
Nisha Khanna
Assistant Professor of Commerce, Govt College for Women, Karnal.

Abstract

The rapid change of new technologies in the world is revolutionizing higher education everywhere, and institutions are now looking for ways to meet the 21st-century knowledge economy's requirements. The study identifies the use of high-tech instruments and how that affects, updates, and switches traditional educational models into more agile, flexible, and open ones. The paper has shown tech inclusion such as AI, VR/AR, Big Data and Learning Analytics, Blockchain, and Cloud Computing through a very far-reaching literature review and real-life illustrating studies. This paper also highlights the benefits of digital innovation in higher education as well as challenges in the adoption of digital technologies.

The outcomes of the case study show that if the digital technologies are implemented in a very well-thought-out manner, they can be a great benefit for the educational results, because they will then encourage creativity, enable differentiated instruction, and help students to acquire essential competencies for their performance in the future labour market.

Keywords: *Higher Education, Digital Technology, Digital Innovation, Artificial Intelligence*

1. Introduction

Higher education is tremendously affected by the digital revolution, characterized by the rapid extension of reach and capabilities through digital technologies. The digital technologies i.e. AI, virtual and augmented reality, blockchain, and cloud-based platforms among others, are fundamentally changing the creation, sharing, and application of knowledge, and thus, forcing academic institutions to modernize teaching methods, upgrade technological infrastructure, and rethink student engagement so that they can meet the needs of today's learners and an evolving global workforce. These modifications have not only secured academic continuity and extended access to education but also have become the cornerstone of the importance of the digital tool in maintaining institutional relevance.

1.1. Definition of Digital Innovation in Education: Digital innovation in education is the deliberate coordination and use of high-tech digital tools to create new and improve traditional educational and training systems. It is not just about converting the content or methods into a digital format. Still, it is the revolutionary reconfiguration of the ways educational delivery, evaluation, management, and interaction happen with the help of technologies like AI, machine learning, VR, cloud computing, mobile learning, and data analytics.

2.1 Literature Review:

Author(s) / Year	Purpose / Objective	Methodology / Type	Key Findings / Insights
Garrison and Vaughan (2008)	To talk about the role of LMS in the implementation of blended learning	Literature review	LMS enables blended learning by providing both synchronous and asynchronous learning experiences.
Ally (2009)	To investigate the influence of digital platforms on lifelong learning	Conceptual Review of MOOCs, micro-credentials	Mobile and online platforms enable continuous skill updates.
Means et al. (2010)	To find out the key benefits of adaptable learning models	Meta-analysis of online and blended learning	Hybrid and flexible schedules improve job satisfaction outcomes, for adults and learners.
Siemens and Long (2011)	To examine the authority of AI in fulfilling educational functions	Conceptual/ Analytical	AI frees teachers from time-consuming tasks, enabling greater student engagement.
Laurillard (2012)	To discuss resistance to the use of digital technology in schools	Conceptual / Change management theory	Change management with stakeholders drives innovation adoption.
Johnson et al. (2014)	To explore how technology supports collaboration, flexible, experiential learning	Conceptual / Analytical	Digital revolution fosters radically new forms of learning, beyond replicating traditional classrooms.
Kirkwood and Price (2014)	To examine the i3xe33mpact of the digital divide on education	Empirical studies on access & inequality	Lack of universal internet access exacerbates educational inequality.
Selwyn and Facer (2014)	To investigate ethical private issues in educational data use	Theoretical / Policy-focused	Organizations must ensure data governance, participant consent, and transparency.
Dede (2016)	To explore how VR/AR improves experiential learning	Case studies/ Literature review	VR/AR enhances spatial understanding and hands-on learning through practical experiments.
Redecker (2017)	To examine blockchain's potential role in secure credentialing	Conceptual / Emerging technology review	Blockchain can improve transparency and reduce fraud in credential verification.
Tondeur et al. (2017)	To assess faculty readiness for digital innovation	Survey-based / Empirical study	Faculty require digital literacy and continuous professional development.
Bates (2019)	To conceptualize digital innovation beyond content digitization	Conceptual analysis / Literature-based	Digital innovation transforms pedagogy, assessment, and management through online learning, automation, and data analytics.
Selwyn (2020)	To emphasize the socio-cultural alignment of digital innovation with institutional learner needs	Conceptual / Theoretical	Innovation should align with institutional and learner needs, not just technology-driven.
Ifenthaler and Yau (2020)	To analyze the impact of learning analytics on student retention and decision-making	Empirical studies / Data-driven	Learning analytics supports success and institutional decision-making.
Chen and Yao (2021)	To study how AI influences personalized learning	Empirical exam of adaptive learning systems	AI assists in gap detection, learning personalization, and outcome improvement.
UNESCO (2022)	To promote digital education as a tool for expanding access	Policy reports / Global case studies	Digital platforms provide educational access for marginalized groups.
EDUCAUSE (2023)	To examine how digitalization improves admin efficiency	Survey-based institutional reports	Automation of administrative tasks enhances efficiency and scalability.

2.2 Research Objectives: The primary objectives of this study are:

1. To identify new emerging digital technologies in higher education
2. To examine real-world case studies of Indian higher education institutions that have successfully implemented digital innovations.
3. To find out the major benefits of adopting digital innovation in higher education,
4. To analyze the main challenges and barriers to the adoption of digital technologies in higher education
5. To provide a set of strategic recommendations as well as the policy implications for a fruitful, inclusive, and environmentally sound digital transformation in the higher education field.

2.3 Research Methodology: This research uses barely a little bit qualitative, exploratory method grounded on the wide literature review and case study analysis of two Indian institutions (SXIE, Mumbai, and Amity University). It borrows secondary data from scholarly articles, institutional reports, and public sources. Thematic analysis has been employed to combine findings on the opportunities, barriers, and policy directions for digital transformation in higher education.

3.1 Technological Innovation in Higher Education: The digital transformation of higher education is being propelled by various advanced technologies that revolutionize the way teaching, learning, and institutional operations are conducted:

- **Learning Management Systems (LMS):** Platforms like Moodle, Canvas, Blackboard, and Google Classroom deliver a total digital environment for content delivery, assessment, and student engagement.
- **Artificial Intelligence (AI):** AI makes personalized and adaptive learning via systems like Squirrel AI and Carnegie Learning. It also automates administrative work, simplifies grading, provides performance insights, and if the students need it, chatbots and virtual assistants help them.
- **Virtual and Augmented Reality (VR/AR):** The VR/AR empowers immersive, hands-on learning in medical, engineering, and architectural fields. Tools like Labster and zSpace can be used for learning through simulations and interactive environments.
- **Big Data and Learning Analytics:** Such tools are utilized to comb through the mountains of data that are educational to improve decision-making and student support.
- **Blockchain:** The technology of the blockchain provides security of academic records and credentials as it makes record keeping and sharing foolproof and quick to verify.
- **Cloud Computing:** Cloud platforms such as Google Workspace, Microsoft Azure, and AWS offer scalable infrastructure that is capable of handling collaboration, data storage, and online learning, which in turn allows for no geographical barriers to accessing educational resources and also helps in the creation of modern digital campuses.

3.2 Case Studies

The following case studies highlight how universities/colleges in India are leveraging digital tools to enhance access, engagement, and outcomes.

3.2.1 Case Study 1: St. Xavier's Institute of Education (SXIE), Mumbai

Background: St. Xavier's Institute of Education (SXIE), Mumbai, is a teacher training institution with a futuristic vision that has implemented digital innovations in its curriculum, teaching, and institutional practices to meet the 21st-century education needs. Key initiatives include:

- **Blended and Online Learning:** A LMS (Learning Management System) allows for blended learning that combines both face-to-face instruction and online parts, providing flexibility for different learners.
- **Digital Pedagogy Training:** Faculty and student-teachers are undertaking a continuous professional development program that enables them to improve their digital literacy by employing various toolkits such as interactive whiteboards, digital content creation, and virtual collaboration.
- **Technology-Enhanced Teacher Training:** SXIE makes use of video lessons along with virtual practicums, other than the actual classroom environments, to enable young teachers to develop and refine their instructional strategies.
- **Inclusive and Accessible Education:** The institute is implementing assistive technologies as well as inclusive digital content for the betterment of their professional training of educators so that they can become able to support diverse learners, including students with disabilities.
- **Collaborations and Partnerships:** SXIE is collaborating with EdTech firms, as well as academic institutions, to realize pilot projects of emerging technologies such as AI-driven tools and digital assessment systems.

- **Xavierian Journal of Educational Practice (XJEP):** Through the Xavierian Journal of Educational Practice (XJEP), SXIE is empowering the educational community to research the impact of educational technologies on educational development and learning. In summary, SXIE is a teacher training-focused institution using digital innovation to modernize teacher education, promote inclusive practices, and develop future school educators.

3.2.2 Case Study 2: Amity University (India)

Amity University, India, has become a shining example of digital innovation. The institution is providing education to a huge and diverse student population through digital tools to nurture skill-based, flexible, and globally connected education. Key strategies include:

- **Digital Learning Platforms:** Amity harnesses an exclusive learning management system (Amity LMS), which involves video lectures, e-books, interactive assessments, and discussion forums.

- **Cloud Labs and Virtual Simulations:** Talking about STEM and technical subjects, Amity is here with the decision to offer virtual laboratories that run on cloud computing as the power source.
- **AI and Machine Learning Integration:** Amity is testing AI gadgets in different sectors, such as customizing the learning corridors, grading task automation, and real-time feedback facilitation.
- **Global Engagement:** Virtual exchange programs, international webinars, and collaborative research platforms are all options Amity has for students and faculty to connect with peers across the globe.

In short, Amity University is a multi-disciplinary private university with a global vision, using cutting-edge technologies (AI, cloud labs, LMS) to scale flexible, skill-based education and engage in global academic ecosystems. Its focus is broader, across many disciplines, not just education.

3.3 Benefits of Digital Innovation in Higher Education

Digital innovation is profoundly changing the educational experience and institutional management in higher education, enabling more inclusive, efficient, and adaptive systems.

- **Accessible:** Digital technology is the enabler of tools that go beyond the barriers set by the traditional educational system; the students of remote areas are allowed to have high-quality education.
- **Flexibility:** Digital technology allows several different ways to be utilized according to the student and teacher's needs, be it synchronous, asynchronous, blended, or competency based. Moreover, students have the advantage of learning whenever and wherever they want, as well as at the pace they consider suitable.
- **Student Engagement**: Interactive and multimedia-dominant materials, game-based education, virtual laboratories, and real-time feedback make active learning possible. In addition, simulations, quizzes, and teamwork positively influence motivation, participation, and knowledge retention in the various learning styles.
- **Administrative Efficiency:** The use of LMS, cloud platforms, and data analytics makes academic and administrative processes easier. Get rid of the technostress: grading, admission, enrolment, performance monitoring – technology makes all of these tasks easier, thus decision-making in institutions can be improved due to the availability of real-time data on students.
- **Lifelong Learning:** Digital platforms provide a way to continue learning that is available via online courses such as MOOCs, micro-credentials, and certifications.

3.4 Challenges & Barriers : Though digital innovation presents a great potential to change higher education radically, the digital innovation in the learning institutions still must clear a couple of hurdles if the idea is to be fully integrated.

- **Digital Divide:** The Digital divide is a big issue. There are still great disparities in the access to high-speed internet, modern devices, and technical support everywhere. It is especially so in the low-income, rural, and marginalized communities.
- **Faculty readiness:** The implication here is that most educators are not at all prepared for using digital. The areas of digital literacy and technology-enhanced pedagogy are the ones in which educators lack training. The main cause of the resistance is, however, unfamiliarity with LMS platforms, online instructional design, and advanced tools like AI and VR.
- **Data privacy and ethics:** Student data ownership, consent, usage, and storage are hot issues in the use of technology that is highly digital.
- **Resistance to change:** It is always very difficult to change the culture of a particular institution and its traditional ways of doing things. Faculty scepticism, administrative hesitance, and innovation fatigue can slow progress down a lot.

3.5 Policy Implications and Strategic Recommendations

A remarkable digital transformation in university education can be achieved only by continuous collaboration of various actors that cover together the institutional, national, and global levels of operation and that are engaged at different levels. The key policy priorities are:

- Investing in digital infrastructure (broadband access, affordable devices, upgraded campuses).
- Increasing educator capacity by professional development and incentives.
- Improving data governance and digital ethics to respect privacy, security, and ethical use of educational technologies.
- Supporting public-private partnerships for co-developing digital tools as well as for research.
- Giving priority to equity and inclusion by using multilingual, mobile-friendly, accessible content, targeted digital literacy programs, and financial support for marginalized learners.
- Strengthening human digital competence, digital research infrastructure, technology-driven pedagogies, and community-wide digital skills.

Universities can become a great force for a significant, inclusive and sustainable digital transition by focusing on these areas.

4. Conclusion: The digital revolution in the higher education sector is influencing educational thoughts, teaching methods, and the way courses are delivered to learners. Those courses are now more personalized, flexible, and learner-centered. Findings highlight that the use of AI, VR, and data analytics results in a rise in quality, involvement, and skills that increase the chances of getting a job. Problems with poor infrastructure, faculty's lack of preparation, privacy concerns, and institutional resistance hurt the worst place and need to be solved through strategic investment, training, partnership, and trustworthy data governance. Digital innovations will signify education as being more accessible, attractive, and future-ready, along with students having the opportunity to succeed in the fast-changing global market, will be the one that is going to lead.

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The Role of Higher Education in Fostering Women Entrepreneurship: A Comparative Analysis of Digital Innovation and Sustainable Practices.

Prof. (Dr.) Khan Ashfaq Ahmad
Principal, Rizvi College of Arts, Science & Commerce.

Mubeen Yousuf Shaikh
Assistant Professor, Tolani College of Commerce (Autonomous)
mubeens@tcc.tolani.edu

Abstract

Women-led entrepreneurship serves as a crucial catalyst for economic progress, technological advancement, and societal improvement. Institutions of higher education play an essential role in nurturing female entrepreneurship by equipping women with critical competencies, insights, and resources. This research presents a comparative evaluation of how higher education supports the growth of women entrepreneurs through digital transformation and environmentally responsible strategies.

The study investigates the influence of digital proficiency initiatives, entrepreneurial instruction, and eco-conscious business models on the performance and development of women entrepreneurs. Utilizing a mixed-methods framework, it integrates quantitative results derived from structured surveys with qualitative perspectives gathered from detailed case analyses. It compares the experiences of women entrepreneurs across various academic institutions, identifying effective methodologies as well as persistent obstacles.

The outcomes indicate that higher education institutions can make a substantial impact on women's entrepreneurial success by facilitating access to digital tools, offering entrepreneurial skill development, and encouraging sustainable operational practices. The analysis further reveals that women engaged in digital innovation and sustainable enterprise models demonstrate increased self-assurance, creativity, and business expansion. The insights presented carry meaningful implications for decision-makers, academic professionals, and industry leaders aiming to enhance female entrepreneurship and promote inclusive sustainable development.

In conclusion, the study affirms that higher education institutions hold transformative potential in empowering women entrepreneurs, driving eco-friendly economic growth, and fostering innovation. By harnessing the power of digital technologies and sustainable methodologies, academic institutions can help close the gender gap in entrepreneurship and support the realization of the United Nations' Sustainable Development Goals.

Keywords: Women Empowerment, Digital Literacy, Inclusive sustainable development, Sustainable strategies, Digital Transformation, Eco friendly business model, Entrepreneurial Education.

Introduction: This investigation forms an integral empirical component of the thesis "An Empirical Study of Self-Help Groups for Promotion of Women Entrepreneurship in Mumbai among Minority Communities." While the primary proposition examines grassroots collective empowerment through SHGs, this sub-research addresses a critical complementary dimension: the catalytic function of tertiary institutions in advancing minority women's entrepreneurial ventures. Specifically, it probes how Mumbai-based higher education ecosystems equip women entrepreneurs from minority backgrounds with capabilities for digital-age and ecologically conscious enterprise development. Moving beyond SHG frameworks, the study comparatively analyses institutional mechanisms—digital skill initiatives, entrepreneurship pedagogy, and sustainability-integrated curricula—deployed across diverse academic settings.

The research tests core propositions regarding HEIs' role in strengthening venture resilience, innovation capacity, and market competitiveness for this demographic. Findings aim to bridge institutional support systems with community-driven SHG models, offering actionable insights for scalable, policy-relevant interventions that advance both gender-inclusive entrepreneurship and sustainable development imperatives within urban minority contexts.

Objectives:

1. Compare how different universities support women entrepreneurs through digital skills, entrepreneurial training, and sustainable business practices.
2. Understand how these supports impact women entrepreneurs' success, innovation, and confidence.
3. Identify the key factors that help or hinder women entrepreneurs in leveraging university resources.
4. Develop insights into how universities can contribute to women's entrepreneurship through digital and sustainable initiatives.
5. Provide actionable recommendations for policymakers, educators, and industry partners to promote women's entrepreneurship and inclusive economic growth.

Research Gaps:

1. **Digital Skills:** Women entrepreneurs need advanced digital skills to optimize business, access markets, and innovate.
2. **Entrepreneurial Training:** Comprehensive training is needed in areas like business modelling, financial management, and strategic planning for digital and sustainable ventures.
3. **Sustainable Business Models:** Women entrepreneurs lack knowledge on designing and implementing eco-friendly business models.
4. **Practical Application:** There's a need to bridge the gap between theoretical knowledge and practical implementation of digital and sustainable strategies.

5. **Overcoming Gender Barriers:** Women entrepreneurs need skills to overcome gender-specific challenges, build resilience, and access supportive networks.
6. **Innovation & Creativity:** Fostering skills to generate innovative solutions at the intersection of digital technology and sustainability is crucial.
7. **Networking & Resource Utilization:** Women entrepreneurs need skills to effectively utilize resources, network, and pitch to investors.
8. **Measuring Sustainability Impact:** Women entrepreneurs lack skills to measure and communicate their business's environmental and social impact.

Hypotheses

1. H_o: HEI support programs show no performance difference for women entrepreneurs.
H_a: HEI support programs enhance women entrepreneurs' performance.

2. H_o: Digital skills do not mediate entrepreneurial training's effect on success.
H_a: Digital skills mediate entrepreneurial training's positive effect on success.

3. H_o: Sustainability-integrated curricula show no effect on venture sustainability.
H_a: Sustainability-integrated curricula increase venture sustainability.

4. H_o: Combined digital/sustainability training shows no synergistic business boost.
H_a: Combined digital/sustainability training yields synergistic business outcomes.

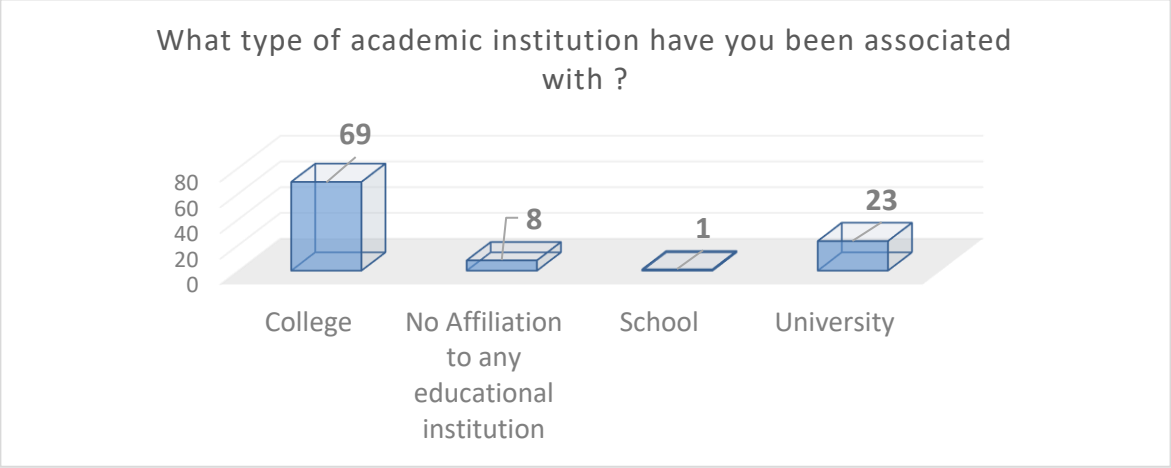
Research Methodology: This study used two types of data:

1. **Primary Data:** A digital survey was conducted with around 101 female respondents, mainly in Mumbai, to gather opinions on women entrepreneurship.
2. **Secondary Data:** The study reviewed over 15 existing sources, including journals, reports, and articles, and gathered insights from experts in government, international organizations, and private companies.

Analysis of Data:

Question No. 1.: What type of academic institution have you been associated with?

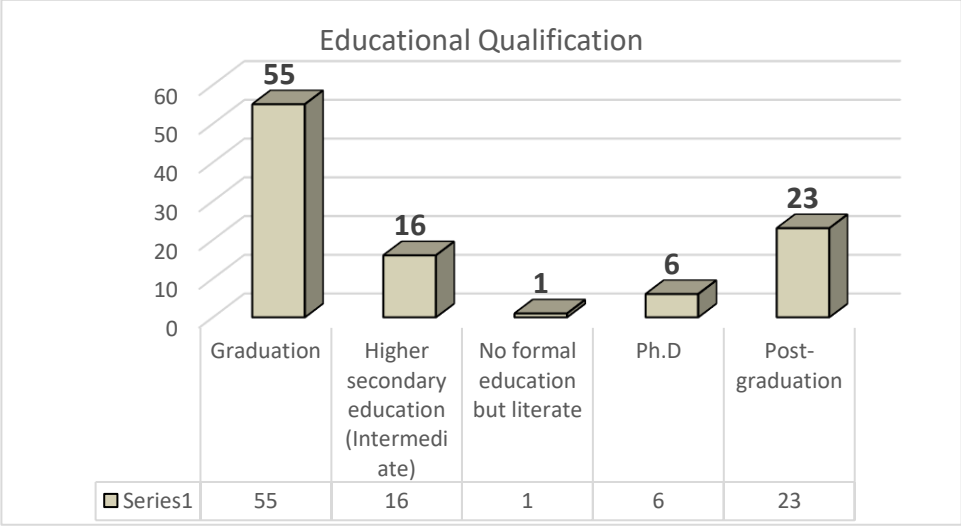
What type of academic institution have you been associated with?	
College	69
No Affiliation to any educational institution	8
School	1
University	23
Grand Total	**101**



Conclusion: The data indicates that a significant majority of respondents (approximately 68%) have been associated with colleges, followed by universities (about 23%). A small percentage (around 8%) reported having no affiliation with any educational institution, and only 1% were related with schools. This suggests that the academic engagement of the respondents is primarily centered on higher education institutions, particularly colleges.

Question No. 2.: Educational Qualifications

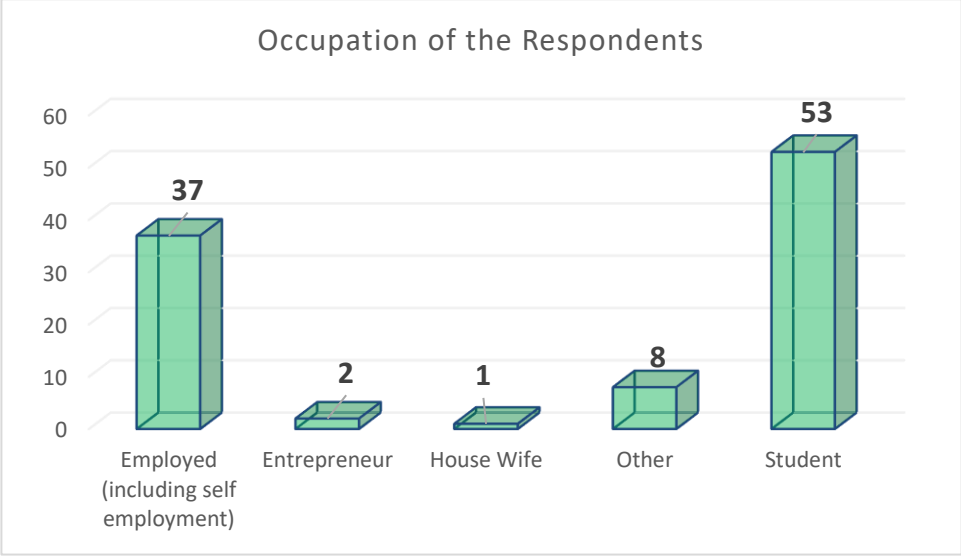
Educational Qualifications	
Graduation	55
Higher secondary education (Intermediate)	16
No formal education but literate	1
Ph.D.	6
Post-graduation	23
Grand Total	101



Conclusion: The data shows that the majority of respondents (approximately 54%) hold a graduation degree, followed by post-graduation qualifications (around 23%). A smaller portion (about 16%) have completed higher secondary education, while only a few respondents hold a Ph.D. (6%). Just one respondent reported being literate without formal education. This indicates that the respondent group is generally well-educated, with most having attained at least an undergraduate degree.

Question No. 3.: What is your current occupation?

What is your current occupation?	
Employed (including self-employment)	37
Entrepreneur	2
House Wife	1
Other	8
Student	53
Grand Total	101



Conclusion: The data reveals that the largest segment of respondents (approximately 52%) are **students**, followed by those who are **employed or self-employed** (about 37%). A smaller portion identified as **other** (8%), while only **2%** are **entrepreneurs** and **1%** are **housewives**. This indicates that the respondent group is predominantly composed of students, suggesting that the data reflects perspectives largely from an academic or early-career stage of life.

Question No. 4.: Residential Area

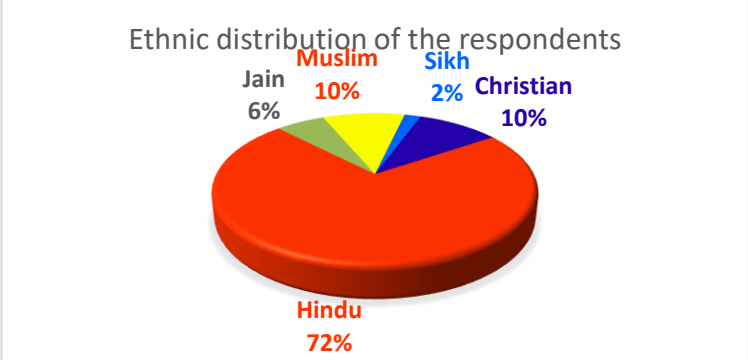
You are residing in	
Rural Area	4
Urban Area	97
Grand Total	101

Conclusion:

The data clearly indicates that an overwhelming majority of respondents (approximately 96%) reside in **urban areas**, while only a small fraction (around 4%) are from **rural areas**. This suggests that the insights or responses gathered are primarily reflective of an **urban population**, potentially influencing preferences, accessibility, and exposure to resources and opportunities.

Question No. 5.: Community

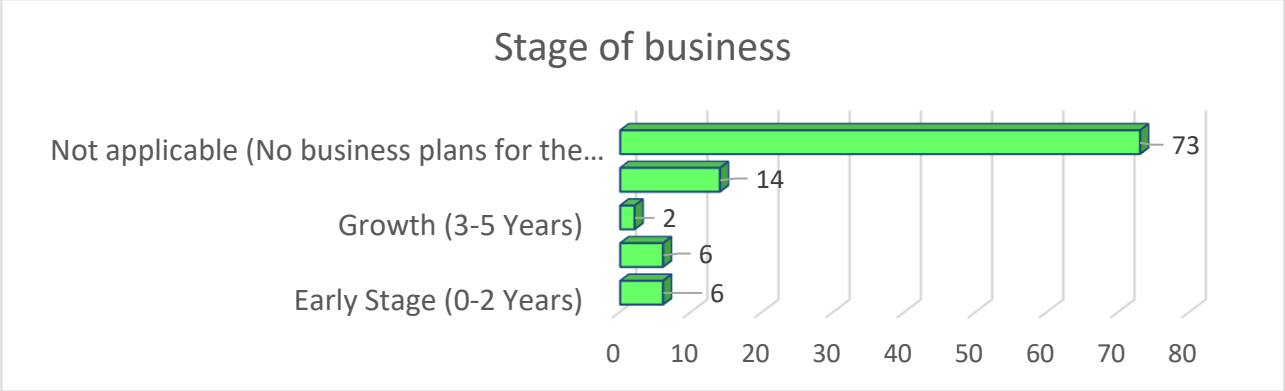
You belong to which community?	
Christian	10
Hindu	73
Jain	6
Muslim	10
Sikh	2
Grand Total	101



Conclusion: The data shows that the majority of respondents (approximately 72%) belong to the Hindu community. Christian and Muslim respondents each constitute about 10%, while Jain respondents make up 6%, and Sikh respondents account for 2%. This indicates that the sample is predominantly Hindu, with a moderate representation from other religious communities, reflecting a diverse yet Hindu-majority demographic.

Question No. 6.: Business

Which stage is your business in?	
Early Stage (0-2 Years)	6
Established (Since 6 Years or more)	6
Growth (3-5 Years)	2
Ideation (Planning a startup)	14
Not applicable (No business plans for the near future)	73
Grand Total	101



Conclusion: The data indicates that a significant majority of respondents (approximately 72%) have no business plans for the near future, suggesting limited immediate entrepreneurial intent. However, around 14% are in the ideation stage, showing some interest in starting a business. Only a small percentage are currently running businesses, with 6% in the early stage, another 6% having established businesses, and 2% in the growth phase. This suggests that while entrepreneurship is not the primary focus for most respondents, there is a small but notable segment showing emerging or existing entrepreneurial activity.

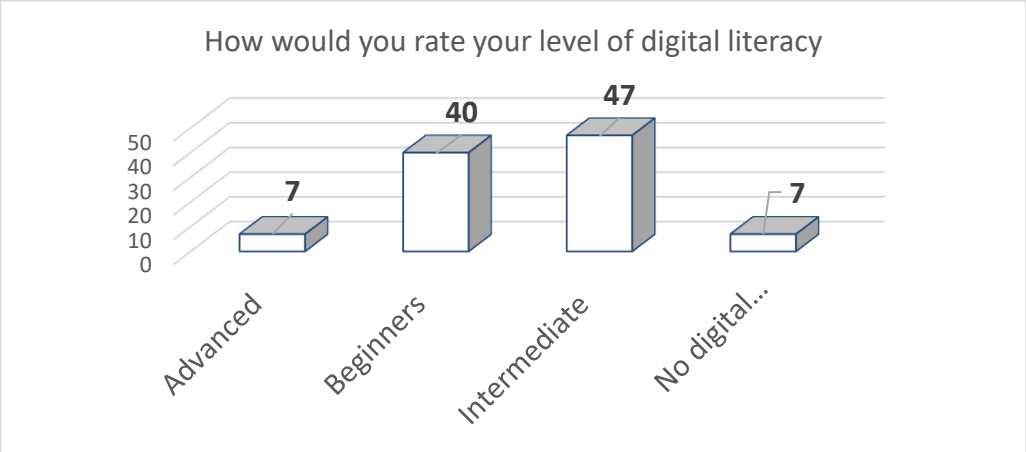
Question No. 7.: Have you received any training in digital tools and technologies?

Have you received any training in digital tools and technologies?	
No	56
Yes	45
Grand Total	101

Conclusion: The data reveals that a majority of respondents (approximately 55%) have not received any training in digital tools and technologies, while 45% have undergone such training. This indicates a digital skills gap among the respondents, highlighting the need for increased access to digital literacy and training programs to better equip individuals for modern, technology-driven environments.

Question No. 8.: How would you rate your level of digital literacy?

How would you rate your level of digital literacy?	
Advanced	7
Beginners	40
Intermediate	47
No digital literacy	7
Grand Total	101



Conclusion: The data shows that the majority of respondents consider themselves to have beginner (40%) or intermediate (47%) levels of digital literacy, indicating a generally basic to moderate familiarity with digital tools. Only 7% rate themselves as having advanced digital literacy, while another 7% report having no digital literacy at all. This suggests that while most respondents possess some level of digital competency, there is significant scope for enhancing digital skills, especially to move more individuals from basic to advanced proficiency.

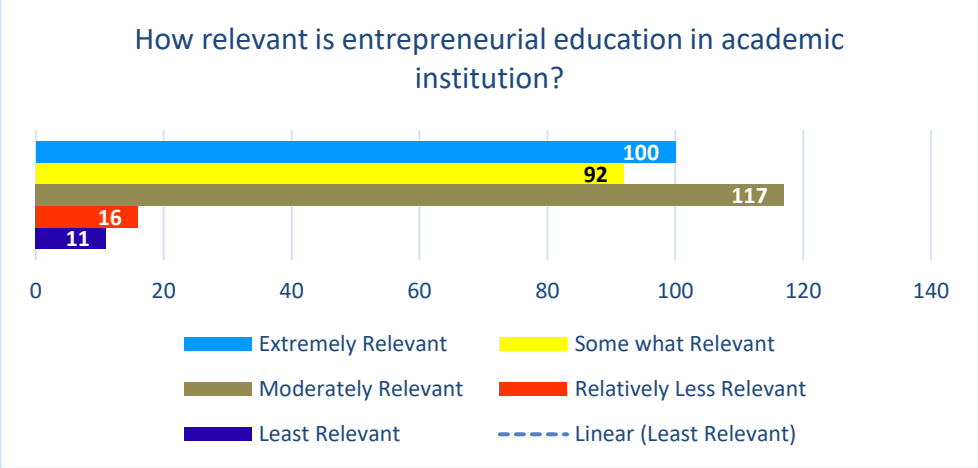
Question No. 9.: Are you familiar with sustainable business practices?

Are you familiar with sustainable business practices?	
No	34
Yes	66
Grand Total	101

Conclusion: The data indicates that a majority of respondents (approximately 66%) are familiar with sustainable business practices,

Question No. 10.: How relevant is entrepreneurial education in academic institution?

How relevant is entrepreneurial education in academic institution?	
Least Relevant	11
Relatively Less Relevant	16
Moderately Relevant	117
Somewhat Relevant	92
Extremely Relevant	100
Grand Total	336



Conclusion: The data reflects a strong overall belief in the importance of entrepreneurial education within academic institutions. A significant portion of respondents consider it extremely relevant (100), followed closely by those who find it somewhat relevant (92) and moderately relevant (117). Together, these three categories account for over 90% of the responses, indicating a broad consensus on its value. Only a small number view it as relatively less relevant (16) or least relevant (11). This suggests a clear recognition of the role entrepreneurial education plays in shaping future opportunities and skills among learners.

Question No. 11.: Do you think implementing eco-friendly business models in business is important?

Do you think implementing eco-friendly business models in business is important?	
No	6
Yes	95
Grand Total	101

Conclusion: The data clearly shows that an overwhelming majority of respondents (94%) believe that implementing eco-friendly business models is important, with only a small fraction (6%) disagreeing. This indicates a strong awareness and support for sustainable and environmentally responsible business practices among the respondents.

Question No. 12.: Is it necessary to collaborate with any Self-Help Groups with reference to Higher Education in Fostering Women Entrepreneurship?

Is it necessary to collaborate with any Self-Help Groups with reference to Higher Education in Fostering Women Entrepreneurship?	
No	16
Yes	85
Grand Total	101

Conclusion: The data indicates that a significant majority of respondents (84%) believe that collaboration with Self Help Groups (SHGs) is necessary in the context of higher education to foster women entrepreneurship. Only 16% responded negatively. This suggests a strong consensus on the importance of linking academic initiatives with grassroots organizations like SHGs to empower women and promote entrepreneurial development.

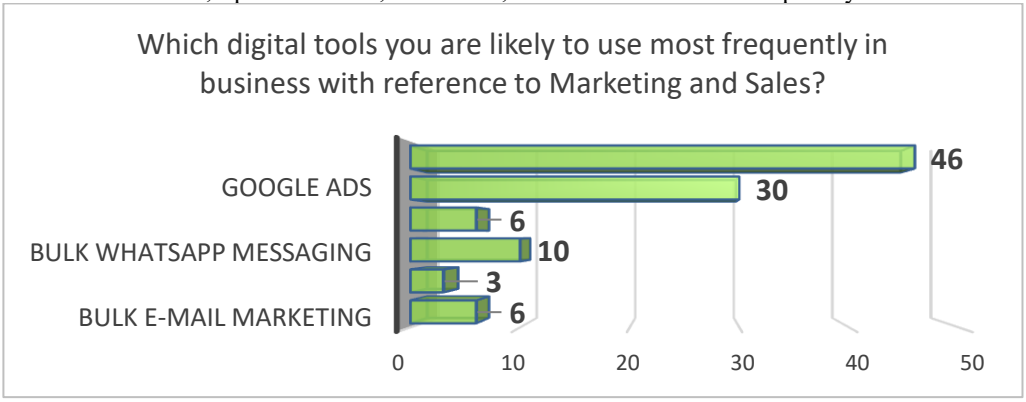
Question No. 13.: Are woman entrepreneur empowered in your present or past academic institution?

Are woman entrepreneur empowered in your present or past academic institution?	
No	18
Yes	83
Grand Total	101

Conclusion: The data shows that a large majority of respondents (82%) feel that women entrepreneurs are empowered in their present or past academic institutions, while 18% do not share this view. This suggests that most institutions are perceived to be making positive efforts toward supporting and empowering women entrepreneurship, though there is still room for improvement to ensure inclusive empowerment across all academic settings.

Question No. 14.: Which digital tools would you use most frequently in business in Marketing and Sales?

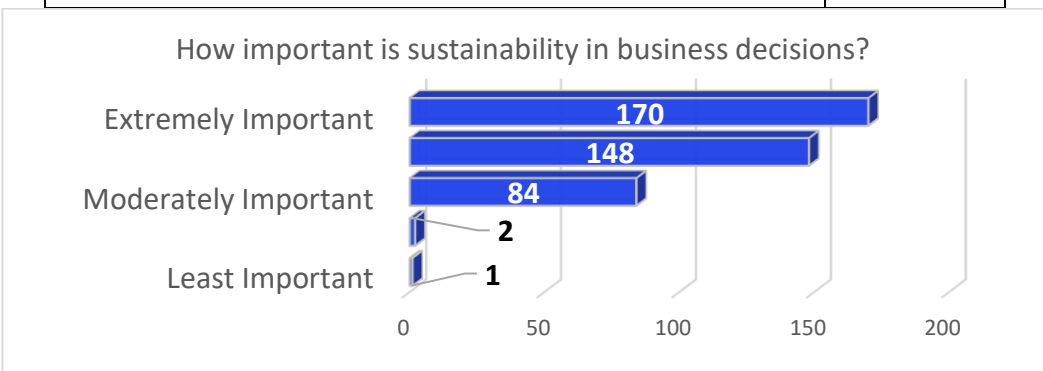
Which digital tools would you use most frequently in business in Marketing and Sales?	
Bulk E-mail Marketing	6
Bulk SMS	3
Bulk WhatsApp messaging	10
Facebook Ads	6
Google Ads	30
Instagram	46
Grand Total	101



Conclusion: The data indicates that Instagram (46%) is the most frequently preferred digital tool for marketing and sales among respondents, followed by Google Ads (30%). Other tools like Bulk WhatsApp messaging (10%), Facebook Ads (6%), Bulk Email Marketing (6%), and Bulk SMS (3%) are less commonly used. This suggests a strong inclination toward social media and digital advertising platforms, particularly Instagram, highlighting the growing relevance of visual and interactive platforms in modern business marketing strategies.

Question No. 15. : How important is sustainability in business decisions?

How important is sustainability in business decisions?	
Least Important	1
Relatively Less Important	2
Moderately Important	84
Some what Important	148
Extremely Important	170
Grand Total	405



Conclusion: The data clearly demonstrates that a vast majority of respondents consider sustainability to be a key factor in business decisions. With 170 rating it as extremely important, 148 as somewhat important, and 84 as moderately important, over 98% of the responses reflect a strong emphasis on sustainability. Only a negligible number (3 responses) view it as less or least important. This indicates a broad and growing recognition of the critical role sustainability plays in responsible and future-oriented business practices.

India's position in global Gender Gap

Year	Global Index	Economic Participation and Opportunity	Educational Attainment	Health and Survival	Political Empowerment
2020	112 (0.668)	149 (0.354)	112 (0.962)	150 (0.944)	18 (0.411)
2018	108 (0.665)	142 (.385)	114 (0.953)	147(0.940)	19 (0.382)
2016	87 (0.683)	136 (0.408)	113 (0.950)	142 (0.942)	9 (0.433)
2014	114 (0.6455)	134 (0.4096)	126 (0.8503)	141 (0.9366)	15 (0.3855)
2012	105 (0.6442)	123 (0.4588)	121 (0.8525)	134 (0.9312)	17 (0.3343)
2010	112 (0.6155)	128 (0.4025)	120 (0.8369)	132 (0.9312)	23 (0.2913)
2006	98 (0.601)	110 (0.397)	102 (0.819)	103 (0.962)	20 (0.227)

(Source: Global Gender Gap Report 2006, 2010, 2012, 2014, 2016, 2018 and 2020 by World 20 (0.227) Economic Forum**)**

Recommendations on the basis of the above analysis.

1. **Teach Practical Digital Skills:** Include hands-on training in digital tools, e-commerce, and data analysis in entrepreneurial courses.
2. **Support Women Entrepreneurs:** Create incubators and mentorship programs for women-led start-ups, especially those using digital solutions for sustainability.
3. **Focus on Sustainable Business:** Teach students how to design and implement sustainable business models, including circular economy and environmental impact measurement.
4. **Create Innovation Labs:** Set up spaces for students to prototype digital-green solutions, encouraging interdisciplinary collaboration**.**
5. **Provide Long-Term Mentorship:** Pair students with mentors for sustained guidance, focusing on business skills and overcoming obstacles.
6. **Foster Industry-Academia Partnerships:** Collaborate with businesses on projects that solve real-world challenges using digital tools and sustainable practices.
7. **Train Educators:** Ensure faculty are equipped to deliver experiential, digitally-enabled, and sustainability-focused entrepreneurship education.
8. **Track Impact:** Establish clear metrics to measure the progress and impact of women-led ventures, focusing on digital adoption, environmental/social impact, and job creation.

Limitation and Scope for further research

1. **Unclear Scope:** The study doesn't specify which institutions or regions are being compared, making it hard to apply the findings broadly.
2. **Lack of Sample Details:** There's no information on the number or characteristics of women entrepreneurs studied, making it difficult to assess the findings' reliability.
3. **No Long-Term Perspective:** The study seems to capture a single moment, without tracking progress or long-term impact.
4. **Methodological Details Missing:** The study lacks crucial information on survey validation, case selection, and data integration, making it hard to evaluate validity.
5. **Intersectional Factors Overlooked:** The study doesn't consider how factors like race, ethnicity, or socioeconomic background might affect the support mechanisms' effectiveness.
6. **External Factors Ignored:** The study focuses on institutional support but doesn't account for external factors like market conditions or access to finance.
7. **Potential Bias:** The study might be skewed due to self-selection of institutions or entrepreneurs with positive or negative experiences.
8. **Unclear Outcome Measures:** The study doesn't define what "performance and development" means, making it hard to interpret the findings.

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Investigating the Conceptual Gaps and Industry Implications of Institutional Autonomy in Higher Education

Dr. Sarika Chhabria Talreja
Associate Professor,
Department of Chemistry, Smt. C.H.M College, Ulhasnagar
sarikachhabriatalreja2023.24@gmail.com
Dr. Varsha Vaswani
Lecturer, Department of Commerce, Smt. C.H.M College, Ulhasnagar
dr.varshvaswani@gmail.com

ABSTRACT

The present research investigates the conceptual gaps and industrial implications of the institutional autonomy in higher education. The study examines the impact of autonomy in higher education on the graduate employability in India with focus on the discrepancies between academic curricula and industry demands. The investigation uses a descriptive methodology to examine the case studies from top IT firms viz. Wipro, Infosys and Tata Consultancy Services (TCS) along with the banking industry insights and real-world feedback from a suitable population expressed in the thematic qualitative source. Results indicated that the graduates from the autonomous colleges frequently have high rejection rates because of the inadequate foundational knowledge and lack of conceptual clarity in the key subjects like algorithms and data structures, however they excel in the practical skills. The skill gap is worsened by automation, changes in hiring practices across industries and macroeconomic difficulties that result in the major headcount reductions in such contemporary firms. To improve graduate employability, the study emphasizes the necessity of integrating theoretical and practical components into curricula and bringing higher education in line with the industry standards. The investigative study also emphasizes how skill development initiatives can help close these gaps and guarantee that the workers are prepared for cutting-edge technologies like artificial intelligence and machine learning. Policymakers, educators and business executives are recommended to develop a comprehensive framework that considers both professional and academic competencies.

Keywords: Autonomy, conceptual clarity, education, employability, skill development

1. Introduction: Institutional autonomy in higher education is a significant issue in the Indian context, particularly under the NEP 2020. It refers to the degree of self-governance a higher education institution (HEI) enjoys in areas such as academic autonomy, administrative autonomy, and financial autonomy. However, there are several real-world issues and conceptual gaps that need to be addressed. The National Assessment and Accreditation Council (NAAC) reports that less than 30% of autonomous colleges in India meet uniform standards in research quality, infrastructure, access to updated laboratories and faculty qualifications, leading

to the graduates lacking employable skills. Additionally, marginalized groups face reduced access. Market-driven autonomy may lead to disproportionate focus on finance and marketing, neglecting ethical and societal aspects of business. Indian institutions like IITs and IIMs incorporate autonomy elements but this shift has negatively impacted the students' employability as per available source of data and media and students, industrial feedback and employability.

Real-world Issues & Conceptual Gaps Study represented figure no. 1 followed by using thematic infographic source to get insights on the **practical challenges and causes in real world:**

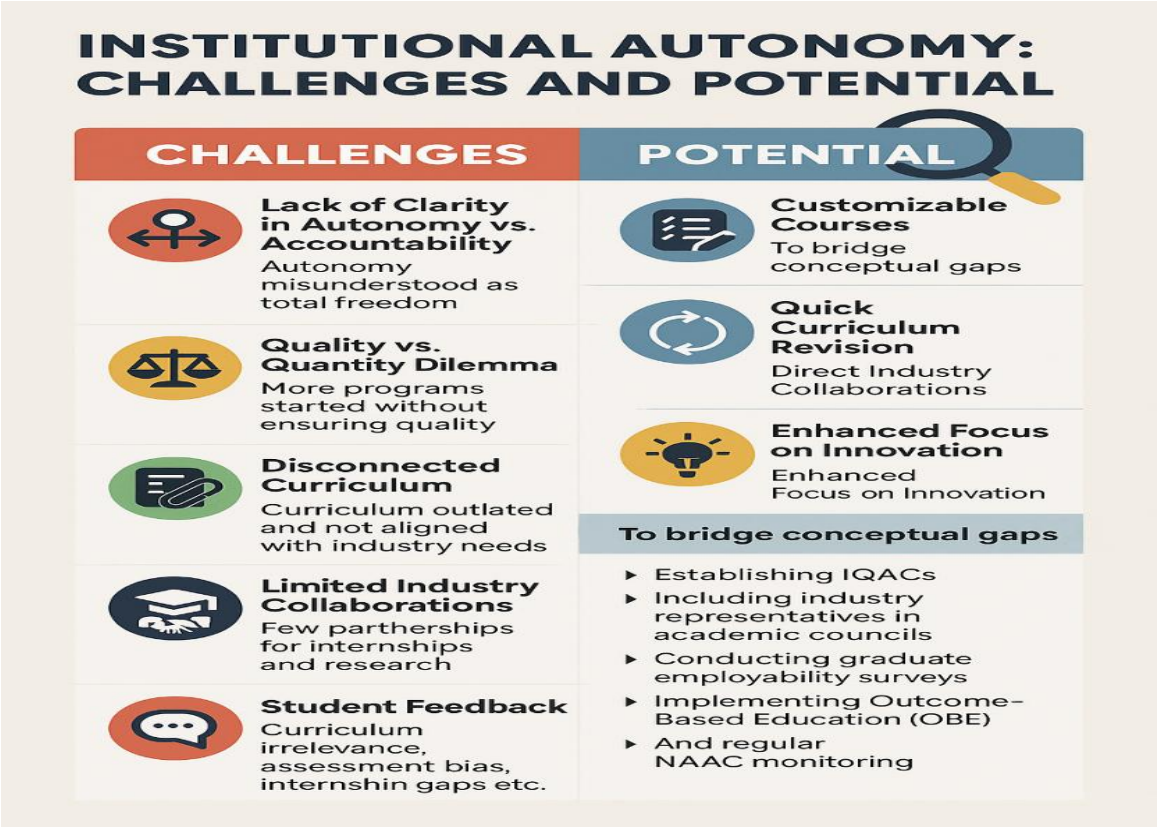


Figure 01: Infographic: Practical challenges and causes in real world

1.2 **Statement of problem:** According to the employers, autonomous college graduates frequently report lacking the conceptual clarity necessary to function properly in professional settings, this disparity calls for the question whether independent learning effectively equips students to meet the demands of the contemporary workforce.

1.3 Objectives of the Study:

1. To examine the impact of autonomy in higher education on student employability.
2. To identify gaps in conceptual clarity resulting from autonomous curricula.
3. To provide recommendations for aligning autonomous education with industry requirements.

1.4 Significance of the Study:

This research highlights the challenges faced by employers and institutions in preparing the students for the job market, providing valuable insights for policymakers, educators and industry leaders.

2. Research Methodology:

Design of the study and Data collection:

The study uses a Thematic Analysis under Qualitative Research, analyzing the impact of autonomy on employment outcomes of graduates from autonomous colleges in Kerala State higher education. It uses literature review, industry reports, educational policies, and recruitment practices from leading companies.

3. Analysis and Examination of Data:

3.1 Literature Review:

A) Understanding Autonomy in Higher Education:

Dickinson's (1995) theory stated Self-determination Theory and Attribution Theory highlighting the importance of autonomy in motivating students to take responsibility for their learning. Murray (1999) reported that the autonomous language learning facilitated by technology allows the students to control their academic journey, enhance motivation and navigate the complexities of second language acquisition thereby bridging the gap between classroom and real-world application. Darling - Hammond (2000) and Cullen's research highlights the importance of student autonomy in higher education and the potential benefits of standardized testing in addressing educational inequalities.

B) Standardized Education Systems:

Hong and Youngs (2016) A study on South Korea's new national curriculum shows that despite its aim to empower educators, teachers are not satisfied with the increased autonomy. The curriculum's focus on standardized expectations and a credential-oriented culture further diminishes the benefits of curricular autonomy. The findings suggest the need for supportive structures for meaningful educational outcomes. An Associate Professor at GM University named Harihar Sarangi (2018) studied how college autonomy affected the quality of higher education. In this study, sixty instructors from nine autonomous and nine non-autonomous colleges participated. Teachers in autonomous colleges preferred better teachers and expressed less satisfaction with the principal as a leader, according to the findings. They were also dissatisfied with relationships, material resources, exams, teaching, office administration, students, extracurricular activities, links and interface, and job satisfaction. Study investigated that autonomous college exam systems perform better than those of non-autonomous ones, more research is necessary to figure out how college autonomy affects the quality of higher education.

C) Perspectives on Employability:

Higson (2008) outlines the importance of problem-solving abilities and conceptual clarity in employability. Employers prioritize the graduates who exhibit flexibility and strong foundational knowledge. Iftene C. (2014) examines the evolution of educational autonomy in European countries focusing on the reforms to improve democratic participation, manage public funds efficiently and enhance education quality. Their study emphasizes the balance between decentralization and national policy in fostering autonomous education systems. Sancheti et al.'s (2020) essay emphasizes the importance of institutional autonomy in Indian higher education stating that it is crucial for universities to achieve teaching and research objectives effectively. They support governance reforms that strengthen the institutions by citing international standards and establishing an Indian Index of Institutional Autonomy (i3A) to gauge and enhance autonomy within the frameworks like NAAC. These measures align academic programs with industry demands thereby improving the graduate employability in Indian companies. The World Economic Forum Report (2023) emphasizes the growing demand for skills like creativity, emotional intelligence and analytical thinking to adapt to emerging technologies such as AI and automation.

3.2 Corporate Case Studies (India):

1. **Tata Consultancy Services (TCS) reported a high rejection rate of candidates from autonomous colleges due to poor computer science foundational knowledge despite strong performance in practical tests.**

Category	**Details/Facts of TCS rejection rate of candidates impacting employability**
Company	**Tata Consultancy Services** (TCS)
Issue Identified by TCS	High rejection rates of candidates from autonomous colleges despite strong performance in practical tests due to poor foundational knowledge in core computer science concepts.
Recruitment Focus	TCS evaluates candidates based on: ● Practical Skills (e.g. coding, technical problem-solving) ● Theoretical Knowledge (e.g. algorithms, data structures)
Key Findings	Candidates from autonomous colleges excelled in practical tests but demonstrated weak theoretical knowledge in areas such as data structures, algorithms and operating systems.
Areas of Concern	1. Poor Fundamental Knowledge: Many candidates lack the understanding of core concepts (e.g. time complexity, recursion). 2. Lack of Conceptual Clarity: Difficulty in explaining the basic principles of computer science
Examples of Deficiency	Candidates struggle with designing algorithms and comprehending the complexity of space and time and using data structures to solve problems efficiently.
Educational Trends	Autonomous colleges focus more on industry tools (e.g. programming languages, software development frameworks) and less on fundamental computer science education.
Feedback from TCS	Practical skills are necessary but candidates must also have strong conceptual knowledge in fundamental areas to solve real-world problems effectively.
TCS Hiring Data (2024)	Despite strong performance on coding tests, there is a 15% drop in the number of new hires from autonomous colleges and high rejection rates.
Industry Impact	Other IT companies (e.g. Infosys, Wipro) reported similar rejection trends for candidates with weak theoretical understanding leading to the reduced employment opportunities.
TCS Hiring Criteria	Candidates are assessed on both practical coding tasks and theoretical knowledge (e.g. algorithms, problem-solving techniques). Strong conceptual understanding is crucial.
Impact of Conceptual Gaps	Weak foundational knowledge limits the candidate's ability to solve the complex problems and innovate by posing difficulty in adapting to the evolving technologies like AI and machine learning.
Employment Consequences	Reduced employment from autonomous colleges due to inability to meet the conceptual expectations resulting in fewer job opportunities for graduates from these institutions
Industry Trends	Increased need for deep conceptual knowledge as the companies invest in automation, AI and machine learning.

This summarizes the case of conceptual gaps contributing to the reduced employment rate for candidates from autonomous colleges at Tata Consultancy Services (TCS) with key facts, figures, and findings from the 2024 recruitment cycle.

2. **India's top IT firms, Tata Consultancy Services (TCS), Infosys and Wipro reported combined headcount decline of 63,759 employees in FY2024, marking the first decline in atleast 20 years.**

This trend is attributed to the significant shifts in hiring strategies and operational priorities amid economic uncertainties and industry-specific challenges. Infosys reduced campus hiring with less than 50% of freshers hired from campuses while Wipro is yet to onboard freshers from its post-COVID hiring spree indicating a lag between hiring and deployment.

Company Head Count	Reduction in FY 2024
TCS	13,249
Infosys	25,994
Wipro	24,516

Wipro and Infosys are focusing on improving the utilization rates and reducing operational costs leading to slower hiring and reduced workforce expansion. AI and automation are replacing repetitive tasks reducing the entry-level roles and reskilling internal talent.

3. **Independent Indian Banks like HDFC Bank are addressing the skill shortages in the Indian banking sector. Through initiatives such as Parivartan's Skill Development Programs, HDFC Bank has provided training to over 3.25 lakh young people.** Through its CSR (Corporate Social Responsibility) initiatives such as the Common Service Centre Academy for Digital Villages, the bank also promotes financial services and rural issues. The 'Skill Financing in India' and 'Future of Jobs in India: 3.0' reports are among the studies conducted by the Federation of Indian Chambers of Commerce & Industry (FICCI) on skill shortages in the Indian workforce. However, problems with the Indian skill development ecosystem also come into play. For example, the current system of vocational training does not target the informal or casual sectors which results in a talent shortage.

4. **Thematic infographic:**
   Figure 02: Challenges due to Conceptual Gap was employed to identify patterns in employer feedback and graduate performance, focusing on conceptual clarity and job readiness.

5. **The Autonomy Appraisal in Kerala State Higher Education Council KSHEC report (2018 - 2019)** Report offers a comprehensive evaluation of the implementation of autonomy in Kerala's higher education institutions. The report identifies several key findings and areas for improvement that can serve as valuable secondary sources for research papers.

4. Findings & Analysis:

1.Impact of Autonomy on Employability:

A high score in the practical tests is a result of the frequent emphasis of autonomous institutions on practical abilities. But the lack of emphasis on theoretical ideas like algorithms, data structures and time complexity has left graduates ill-equipped to handle the intricate practical problems that the firms face. Despite excellent practical test scores, TCS and other IT companies claim a 15% drop in hiring from autonomous colleges because of inadequate basic knowledge.

2. Conceptual Clarity Gaps:

Graduates, particularly those from independent universities, consistently exhibit a lack of profound theoretical knowledge. Employers stress the value of having a solid conceptual basis for problem-solving especially when considering cutting-edge technology like automation, AI and machine learning. According to case studies from TCS, Infosys and Wipro, the capacity of graduates to adjust to cutting-edge technologies is hampered by conceptual gaps in fundamental topics.

3. Recommendations for Alignment with Industry Requirements:

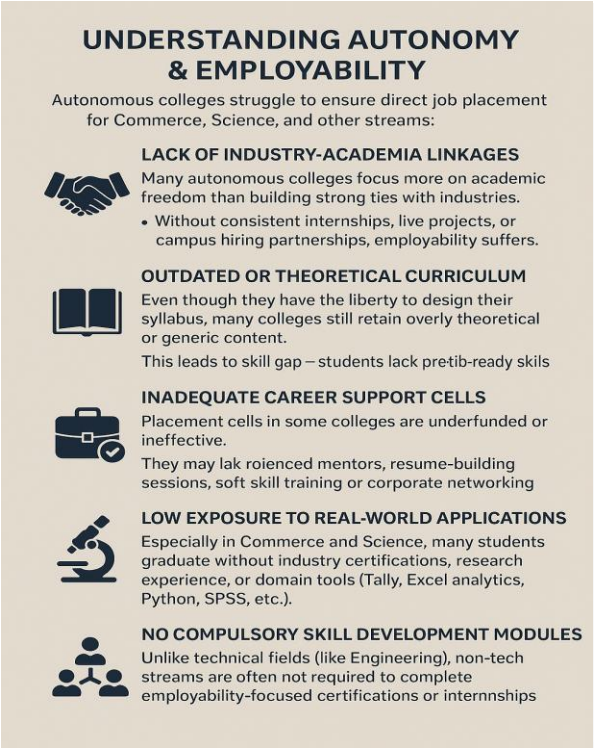
To improve the academic performance and industry expectations, courses should balance theoretical knowledge with practical skills, institutional reforms and tailored vocational training programs addressing the skill shortages.

4. Key Findings from the KSHEC Autonomy Appraisal Report:

The KSHEC report highlights the following points: Ambiguity in the concept of autonomy among stakeholders, including administrators, faculty and students. This lack of consensus has led to inconsistent implementation across institutions resulting in the limited scope of autonomy. While academic autonomy is granted, financial and administrative freedoms remain constrained, hindering the college's ability to innovate and respond effectively to local and global educational demands.

a. Challenges in curriculum development persist as many autonomous colleges rely on parent universities for curriculum development undermining the purpose of granting autonomy. Inadequate quality assurance mechanisms are also noted with the establishment and functioning of Internal Quality Assurance Cells (IQACs) being inconsistent. Stakeholder disengagement is also noted with key stakeholders including faculty and students not participating in decision-making processes. Research by Kulavelil (2018), Mathew (2016), and Nair (2019) further supports these findings highlighting the issues such as high fees, socio-economic discrimination and lack of transparency in admissions.
b. To enhance autonomy, recommendations include clarifying the definition and scope of autonomy, strengthening financial autonomy, encouraging stakeholder engagement, developing robust quality assurance mechanisms and promoting capacity building. These recommendations aim to ensure uniform understanding and implementation across institutions enabling autonomous colleges to innovate and respond effectively to changing educational needs.

5. **Thematic Analysis to investigate key factors:** Through infographic study depicted as follows:



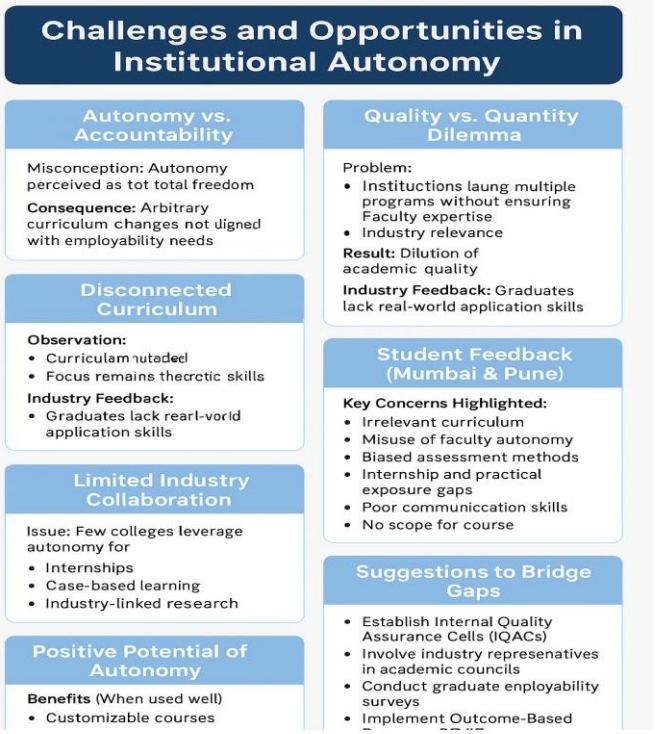
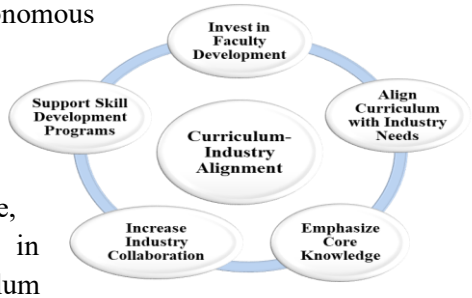


Fig.3: Understanding Autonomy & Employability

Fig.4: Challenges & O opportunities in institutional Autonomy

Conclusion of Study: The study reveals a significant gap between the skills offered by autonomous education systems and the expectations of employers. It suggests that by addressing conceptual clarity gaps and aligning curriculum with industry needs, educational institutions can improve graduate employability and prepare students for the modern job market. Independent colleges excel in developing practical skills but prioritize industry tools over theoretical knowledge leaving the graduates unprepared for high-level problem-solving. To increase the employability, educational changes should focus on a well-rounded curriculum that incorporates both conceptual and practical learning, keeps up with business developments like automation and artificial intelligence, and fills skills gaps in vital industries.

Recommendations of Study: The effectiveness of standard education versus autonomous college syllabi depends on several recommendations. These include aligning curriculum with industry requirements, emphasizing core conceptual clarity. These recommendations enhance the autonomous colleges and improve student employability. Instead of opening of many courses and lack of expert faculty, the strategy involves investing in faculty development, enhancing core knowledge, fostering industry collaboration and supporting skill development programs in emerging sectors to enhance education quality. Figure05 depicted the curriculum industry alignment highlights suggestions to focus on study related issues and seeding better employability.



Declaration of Conflict of Interest: The authors declare that they have no known competing financial/ academic interests or personal issues that could have appeared to influence the work reported in this paper.

CREDIT Authorship Contribution Statement:

- **Dr. Varsha Vaswani:** Conceptualization, Investigation, Methodology, Data Collection, Validation of Resources & Original Draft preparation
- **Dr. Sarika Chhabria Talreja:** Data Curation, Reviewing, Editing, Plagiarism Check, Final Draft Preparation & Overall Project Supervision

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A STUDY ON THE EVOLVING ROLE OF EDUCATORS IN THE USE OF TECHNOLOGY

Daris Lobo

Teacher, Aditya Birla World Academy

lobo.daris98@gmail.com

Abstract:
In a world, where educators are trying to keep up with the pace or even struggling while at it to keep students from plagiarising research work, use AI tools to their fullest and complete a sizable number of tasks. It is arguably one of the most efficient forms of innovation reaching the education field at the right time. Digital innovation is vital to progress and fulfil the requirements set by institutions and achieve greater learning outcomes and therefore I specifically construct my views on the implications of digital innovation in education to the benefit of all the stakeholders who make teaching-learning possible. In my paper, I will not just discuss the what and how of the possibilities of making full use of technology but also share some teaching strategies and digital tools specific to helping administrators, educators and even students prepare for a more effective method forgoing conventional methods but also looking at a blend of techniques especially in places which are undergoing substantial transitioning and are not yet well paced with digitalisation.
One of the fundamental components of the United Nations' sustainable development 2030 agenda is quality education. It aims to ensure inclusive and equitable quality education for all. Digital technologies have emerged as an essential tool to achieve this goal. These technologies are simple to detect emissions sources, prevent additional damage through improved energy efficiency and lower-carbon alternatives to fossil fuels, and even remove surplus greenhouse gases from the environment. Digital technologies strive to decrease or eliminate pollution and waste while increasing production and efficiency. These technologies have shown a powerful impact on the education system. The recent COVID-19 Pandemic has further institutionalised the applications of digital technologies in education. These digital technologies have made a paradigm shift in the entire education system. These views can help many alike thinkers share their best practices and collaboratively work towards providing better experiences overall.
Keywords: digital innovation, education technology, teaching strategies, artificial intelligence, academic integrity, blended learning, stakeholder engagement, learning outcomes, educational transition, institutional requirements, pedagogical transformation, plagiarism prevention, collaborative practices

Introduction: In a 21st century classroom of today, a teacher enters with a lot more than mere subject knowledge. An educator needs to be equipped with the latest trends in technology, the current affairs, the relevance and purpose of teaching and the resilience to the unending pressure of work. Students, on the other hand have adapted quickly to the rapid changes and emerging trends that has not just made them more socially connected but overall, academically challenging! In its true sense, they can now refer to and verify the sources being used to convey the knowledge. Traditional classroom instructions fall short of providing an immediate learning environment, faster evaluations, and more engagement. In contrast, digital learning tools and technology fill this void. Some of the efficiencies such technologies provide are simply unrivalled by traditional learning methodologies. With smartphones and other wireless technology devices becoming popular among the general public, it only makes sense that schools and educational institutions make efficient use of them by putting technology in the classroom.

Indeed, today's technology's adaptability and non-intrusive character make learning more appealing to the next generation. However, it may be a formidable technique to manage initially since traditional instructors are hesitant to include contemporary technology and gadgets in school, viewing them as a distraction rather than an intelligent learning aid. This is both essential and can be overwhelming but the bigger challenge lies in making the most of the emerging technological advancements to the use of education and effective teaching-learning. With the emergence of AI tools, gamification and simulations that could create a lasting impact on students in terms of learning a new concept, are we as educators fully prepared to take charge of it? This research explores the rapid emergence of new technologies, particularly AI tools and how educators and institutions can effectively and responsibly use the same. It addresses the concerns highlighted by educators regarding academic integrity (plagiarism) in work.

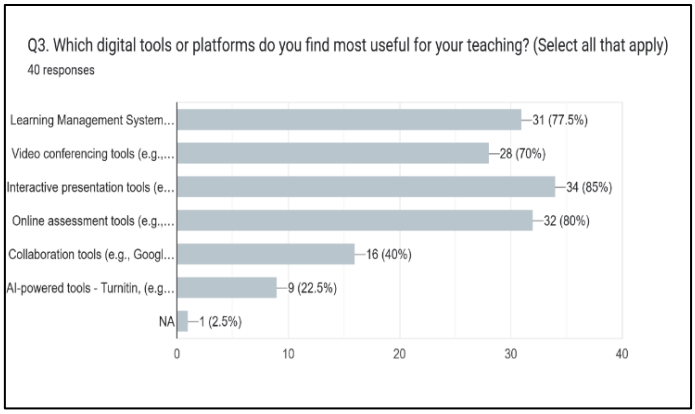
Rationale of the Study: The education sector is witnessing a paradigm shift with the rapid infusion of digital technologies, artificial intelligence (AI), and innovative teaching tools. While these advancements promise enriched learning experiences and greater institutional efficiency, they also pose significant challenges for educators. Teachers are now expected to not only possess subject knowledge but also adapt swiftly to new technologies, uphold academic integrity, and facilitate digital literacy among students. This evolving role requires a reassessment of traditional teaching practices and a deeper understanding of how technology can be effectively integrated into pedagogy. Given the fast-paced nature of digital innovation and varying levels of institutional readiness, it is imperative to examine how educators can transition into these new roles and what support systems are essential to enable that transformation. The rationale behind this study lies in understanding the implications of digital innovation on the roles of educators and identifying strategic pathways to enhance teaching effectiveness, maintain academic standards, and promote stakeholder collaboration in a technology-driven learning environment.

Aim of the Study: This study aims to examine the evolving roles of educators in the context of digital innovation and technology integration in education. Specifically, it seeks to:

- Explore the challenges and opportunities presented by emerging digital tools, especially AI, in the teaching-learning process;
- Investigate how educators can maintain academic integrity while leveraging technology;
- Identify effective teaching strategies and digital practices that support institutional goals and student learning outcomes;
- Provide recommendations for blended teaching models in transitioning or under-digitized educational environments;

Objectives:

1. To identify the gap between the knowledge and usage of AI and new technologies in education.
2. To explore educators' readiness and adaptability to integrate emerging digital tools into teaching practices.
3. To evaluate the effectiveness of blended and technology-assisted teaching strategies in enhancing student engagement and learning outcomes.



Methodology: For the study, I prepared a survey questionnaire to collect responses from educators from different schools. The data collected comprises of educators from primary school, secondary school and higher education. There are 40 responses. The survey was conducted in Mumbai and therefore the responses are from teachers of private and public schools in Mumbai.

Data Analysis and Interpretation:

Question 1: The frequency of digital tool usage

Findings: 50% of the respondents indicated that they make use digital tools very often while another 35% of respondents have indicated that they often use digital tools in teaching which overall presents a positive result in terms of the current trends of usage of digital tools and technologies.

Inference: As per my observation and the data I can say that educators are shifting towards digital tools or technologies based on the current need in a tech-driven society.

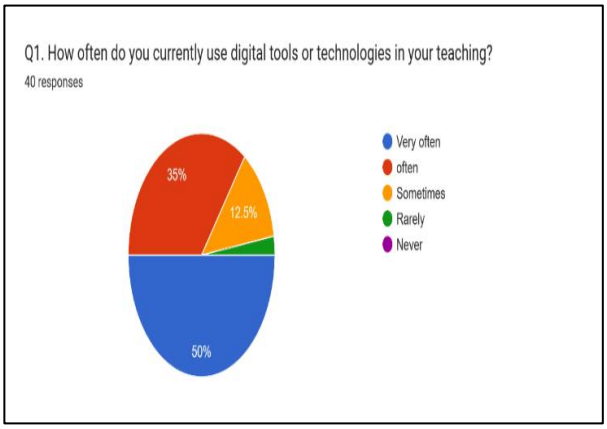


Figure 1.1 indicates the frequency of digital tool usage

Question 2: The comfort level in using digital technologies

Findings: Based on the scale of comfort, a lot of educators have responded positively indicating their comfort level and confidence in using digital technologies for teaching.

Inference: With the current trends in the level of omfort in using digital technologies, we can infer that the shift towards digital tool and AI will continue to grow and educators will play a big role in the impact of technology in education.

Question 3: The digital tools and platforms educators find most useful

Findings: Nearly 80% of the responses indicated the use of digital tools for online assessment and another 85% indicating the use of interactive presentation tools but only 22.5% respondents have indicated the use of AI-powered tools for teaching.

Inference: The reason for the above findings could be in reference to the school policies and the prescribed LMS (Learning Management System) that is already in place in the school setting or most recommended by the administration. Other than that, the system or approach for the use of AI tools is not in place at the moment in many schools and with lesser training/workshops on use of AI tools, its usefulness in higher education is partially impacted resulting the said findings.

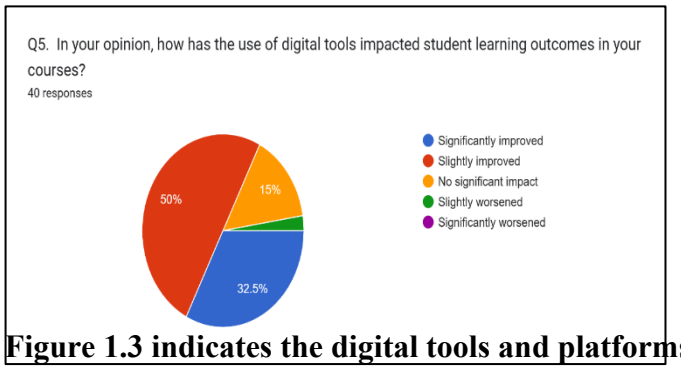
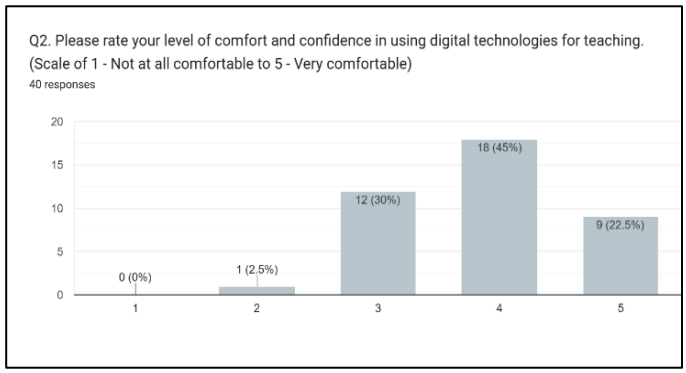


Figure 1.3 indicates the digital tools and platforms educators find most useful

Question 4: Opinions on Digital tools have enhanced engagement in classes

Findings – About 70% respondents have indicated an agreement to the statement that "Digital tools have enhanced engagement in classes"

Inference – This finding shows that digital tools have paved the way for an enhanced teaching learning experience in the field of education and it can be inferred that educators are positive about the impact of digital tools in their classes.



Question 5: Highlights the impact of digital tools on learning outcomes.

Findings – 50% of the respondents have indicated that use of digital tools has slightly improved the student learning outcomes.

Inference – Based on the findings we can infer that digital tools in class have impacted the student learning outcomes. This is mostly observed through the in-class virtual assessments such as quiz, gamification and research projects.

Question 6: Efficiency rate of digital innovation

Findings – 82.5% respondents believe that digital innovation has made teaching more efficient for them.

Inference – Through this finding we can infer that digital innovation is one of the major reasons teaching – learning is becoming more efficient and effective.

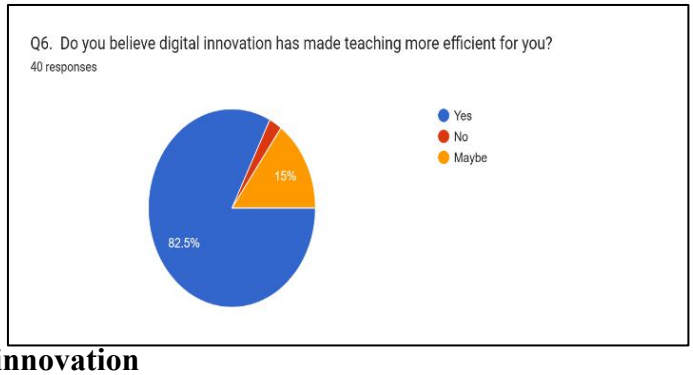


Figure 1.6 indicates the efficiency rate of digital innovation

Question 7: Challenges teachers face while integrating digital technologies

Findings: 72.5% respondents have highlighted "concerns about academic integrity and dishonesty as the main challenge they face when trying to integrate digital technologies into teaching. 62.5% educators have also indicated technical difficulties being another major challenge.

Inference – When it comes to making use of technology for research, assignments and during assessments, one of the biggest drawbacks is the integrity with which the work is completed. Through this finding, we can infer that along with technical difficulties and time constraints in the preparation and execution, educators also face the challenge of honest work submission by students.

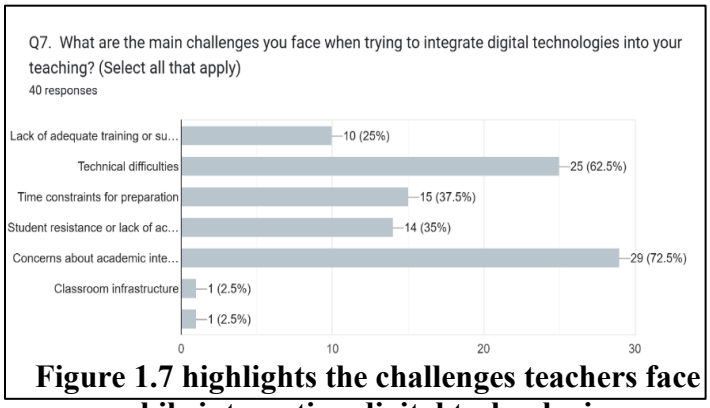


Figure 1.7 highlights the challenges teachers face while integrating digital technologies

Question 8: Most effective way forward for higher education

Findings – 70% respondents have indicated and believe in a blended approach being the most effective way forward for higher education.

Inference – Based on the findings we can infer that a majority of the educators who responded highlighted that a blended approach is the most effective way forward for higher education.

Conclusions: While educators have accepted and demonstrated their confidence in using digital tools in teaching, there are few factors that need to be addressed and raises concerns.

1. Even though a lot of digital tools are being used for teaching, AI-powered tools are still not being tested or implemented enough as it may still be a vast field with a need for training and understanding.
2. Based on the responses, we can also note that digital tools and technologies has not significantly improved the overall teaching learning experience.
3. While teachers and educators all over do face technical challenges which is prevalent in urban areas too due to various circumstances, we can also notice time constraints being another challenge for the integration of digital tools and technologies.
4. One of the most challenging parts is the concerns regarding academic integrity and plagiarism while using digital tools.

The overall study indicates how the evolving role of educators necessitates moving out of the traditional or conventional methods of teaching and embracing technology but it also poses a challenge in terms of the integrity of the published work of the students and how effective it can be in assessing the students correctly.

Suggestions:

1. One of the major adaptations could be the use of blended learning (both traditional and digital) to ensure a more efficient teaching learning process.
2. Another suggestion is the use of credible sources and tools that have been tried and tested in this matter. For example – Quiz is a digital tool that is now AI-powered and can help in creating online assessments completely using AI. This feature not only blends well as it saves time and efforts with the right prompt but also enhances the effectiveness and learning in class.
3. Another example is Canva – Being a digital tool for creating posters and other designs, educators can make use of the AI powered tool to create lesson presentations and can also assign similar tasks to students to assess their tech skills.

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Digital Scaffolding in STEM: Revolutionizing Higher Education through AI, Immersive Technologies and Gamification for Experiential Learning

Nevelle Coutinho
Teacher, nevelle.coutinho@gmail.com

Abstract:
This paper conducts a detailed investigation into the transformative role of Artificial Intelligence (AI) and immersive technologies in making education more engaging and experiential. This includes Augmented Reality (AR), Virtual Reality (VR), emerging Metaverse and the aspects of gamification in technology which can be considered as "Digital Scaffolding" in contemporary higher education to enhance STEM learning. The research seeks to understand the impact of these technologies on teaching methodologies and student learning outcomes. Some of the important aspects of investigation include the shift from traditional educational methods towards a more dynamic, student-centered, and interactive approach facilitated and enhanced by these technologies. It also explores how AR, VR, and the Metaverse can create a more engaging, experiential learning environment which includes virtual laboratories, visually appealing science and mathematics simulations, and interactive social experiences. It can also make learning more fun and engaging through rewards and challenges by introducing various levels of assessments based on the individual learner. The research highlights the importance of these technologies to enhance academic performance.
Keywords: Artificial Intelligence, Immersive Technologies, Augmented Reality, Virtual Reality, Metaverse, Higher Education, Pedagogical Innovation, Ethical Considerations, Digital Scaffolding, Experiential Learning.

1. Introduction: Transforming STEM Higher Education with Digital Scaffolding

1.1. The Imperative for Engaging STEM Education

STEM education is an approach to apply the knowledge gained through learning subjects like Science, Technology, Engineering, and Mathematics and ensure that students develop important skills like critical thinking and logical reasoning to solve real world problems. Policy (NEP) 2020, for instance, emphasizes the need for an education system that cultivates critical thinking, problem-solving capabilities, creativity, and multidisciplinary abilities, especially considering rapid scientific and technological advancements like Artificial Intelligence. Therefore, it is essential that an effort is made to ensure that students develop these necessary skills through this learning approach. STEM education which is a cornerstone for societal progress should be made engaging to ensure effective translation of theoretical knowledge into practical application.

1.2. The Rise of "Digital Scaffolding"

The metaphor of "scaffolding" in education traditionally refers to temporary support structures that aid learning. In the digital landscape emerging technologies Artificial Intelligence (AI), Immersive Technologies (Augmented Reality - AR, Virtual Reality - VR, and the Metaverse), and Gamification particularly in STEM aptly termed "Digital Scaffolding". These technologies are creating new forms of support. They have brought a change in various aspects of how the society functions and therefore impacts the way we deal with problems associated with this new change. Education is a way of thinking that helps a person to adapt to its surroundings. These emerging technologies act as a digital scaffold to support STEM education.

1.3. Research Aim and Scope

This paper aims to conduct a detailed investigation into the transformative role of AI, immersive technologies (AR, VR, Metaverse), and gamification as "Digital Scaffolding" in making contemporary higher STEM education more engaging and experiential. The primary focus is to explore the impact of these technologies on the student learning outcomes, teaching methodologies, the evolving curriculum, and ethical consideration involved in integrating these technologies.

1.4. Thesis Statement

The scope of this research focuses on the application and impact of AI, AR, VR, the Metaverse, and gamification within STEM disciplines in higher education settings. It is an approach to understand how these digital scaffolds could be harnessed to address the challenges involved in the teaching and learning process. It offers insights on how to create effective, equitable and engaging STEM learning experiences.

2. Literature Review: Foundations

2.1. Experiential Learning: The theoretical basis for understanding the concept of digital scaffolding in creating engaging STEM experiences can be found in the theoretical framework presented by Kolb on experiential learning. According to Kolb's model, learning is a continuous cycle that begins with hands-on experience. This is followed by a period of thoughtful observation and reflection, which in turn allows the learner to form new ideas or conclusions. Finally, these new insights are actively tested in future situations, starting the cycle anew, and emphasize doing and learning. Digital tools like simulations explored by Jonathan & Laik (2024) facilitates this theory by providing students with environments to apply theoretical knowledge.

2.2. AI in Education: Personalization in STEM: Artificial Intelligence (AI) is rapidly progressing as a revolutionary force in education, particularly in STEM fields. Particularly Generative AI which refers to generating content with prompts that are text based and sometimes associated with an image input. The use of Generative AI with an education perspective can be considered as creating structured lesson plans, generating visuals for the powerpoint presentation, creating assessments and tailoring teaching methods in order to make concepts more engaging.

2.3. Immersive Technologies (AR/VR) in STEM:

Augmented Reality (AR) and Virtual Reality (VR) displays increasing potential to revolutionize STEM education by offering immersive and interactive visualisation experiences. It can facilitate hands-on laboratory work and can enhance student motivation. VR can create virtual laboratories where the experiments can be performed by the students in a safe and cost-effective manner. AR can overlay digital information onto the real world for example viewing the structures of DNA molecules in 3D. The integration of VR/AR integrated with haptic wearables can further achieve multi-sensory learning

2.4. The Metaverse for Collaborative STEM Learning

Metaverse is an evolution of digital spaces into more experiential and engaging platforms. It idealises the concept of co presence where an individual using these immersive technologies feels being one with the experience. This "embodied presence" can be achieved through various technologies, from using avatars on phones to AR glasses that blend physical and virtual environments. This will enable students from diverse locations to avail the benefits of high quality education.

2.5. Gamification in STEM

Gamification is one of the best strategies that can help in the use of game design elements in academic contexts to improve student performance in STEM disciplines. Game elements are often classified into dynamics (e.g., emotions, narrative), mechanics (e.g., competition, feedback), and components (points, leaderboards, badges)

3. The Evolving Pedagogical Landscape in STEM Higher Education

3.1. Limitations of Traditional STEM Pedagogy

Traditional STEM pedagogy often includes lecture - based instruction which promotes rote memorization and therefore poses several limitations in preparing students to face real world problems. It does very little contribution in cultivating essential traits like creativity, critical thinking, and complex problem-solving. These approaches present knowledge in the context of idealised conditions which do not reflect real world challenges. This can lead to superficial learning of concepts which in return hinders the effectiveness of understanding the concepts and the application of theoretical knowledge.

3.2. Shift Towards Student-Centered Models

There is observable shift in higher education towards learning models which are student centred and emphasize experiential learning, active participation and development of critical thinking and problem solving. Experiential Learning Theory (ELT), as discussed by Jonathan and Laik (2024, citing Kolb), advocates for learning through doing, reflecting, conceptualizing, and experimenting. This model helps students become active participants, discoverers and experimenters of knowledge rather than being mere passive recipients of instruction given. This makes learning more relevant and meaningful by creating a connection between theory and practice fostering self-directed learning.

3.3. Digital Scaffolding Facilitating the Shift

AI, immersive technologies, and gamification as digital scaffold plays a crucial role in facilitating the transition towards more experiential learning and student-centered models in STEM higher education. AI offers learning pathways that are personalized, intelligent tutoring, and assessments that can be adapted to individual learners, thereby catering to individual student needs and enhancing engagement. Immersive technologies like AR and VR create simulated environments where students can gain deeper understanding on complex concepts via hands-on experience and conducting virtual experiments, and visualization thereby bridging the gap between theory and practice.

4. Impact of Digital Scaffolding on STEM Learning and Teaching

4.1. Enhancing Engagement and Experiential Learning

Digital scaffolding significantly promotes student engagement and enhances experiential learning in STEM. AI-powered tools, through personalized feedback and adaptive learning paths, keep students actively involved and motivated in the learning process . Immersive technologies like VR and AR allow students to "learn by doing" in virtual environments thus making abstract concepts easy to understand.

4.2. The Metaverse for Collaborative STEM Learning

The Metaverse in its entirety can be considered as an advanced form of digital scaffolding which holds immense potential for fostering collaborative and enhanced STEM learning. It has the capacity to create a sense of "co-presence" which allows students and educators to interact and communicate within shared virtual environments, regardless of their actual physical locations. Virtual classrooms and laboratories within the Metaverse can be useful in promoting interactive simulations of scientific phenomena or engineering designs, allowing students to explore collectively, experiment, and solve problems intuitively.

Conclusion:

The integration of Artificial Intelligence, immersive technologies (AR, VR, Metaverse), and gamification in STEM higher education as forms of "Digital Scaffolding" can be considered a strategic approach to enhance teaching learning process. These technologies collectively ensure a paradigm shift from traditional learning methods which are often passive towards a more dynamic, student-centered, and experiential educational model that can revolutionise STEM education.

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From Classroom to Career: Collaborative Teaching with Vygotsky's Constructivism Theory and the One Teach, One Assist Model in Higher Education.

Christine Mendonsa
B.Ed. Student Teacher, St. Xavier's Institute of Education (Autonomous), Mumbai
2024christine@sxie.in

Abstract

With the rapidly changing job market of the present times, the industry-academia gap continues to be a significant issue. This research paper delves into the potential of collaborative teaching models—namely Lev Vygotsky's Social Constructivism and the One Teach, One Assist (OTOA) co-teaching approach—to successfully bridge this divide in higher education. Vygotsky's theory, grounded on the principle that learning is socially constructed, places great focus on the Zone of Proximal Development (ZPD), interaction, and scaffolding as aspects of knowledge construction. By fostering inclusive instruction and individualized support through shared teaching duties, the OTOA model complements this flexible approach to teaching.

The research examines the application of these models to various Higher Education disciplines by providing practical examples of aligning academic material with employability relevance. The study highlights how collaborative teaching deepens experiential learning, differentiates instruction, promotes interdisciplinary thinking, and develops critical 21st-century skills like problem-solving, flexibility, and collaboration. The paper also looks at how India's National Education Policy (NEP) 2020 supports and aligns with the adoption of such pedagogical innovation. Through the blending of theoretical and practical perspectives, the study calls for a radical change in higher education—where classrooms are turned into professionalism incubators through co-teaching, peer-to-peer learning, and ongoing exposure to industry skills.

Keywords: Collaborative Teaching, Higher Education, Social Constructivism, One Teach One Assist, Industry-Academia Gap, NEP 2020, Experiential Learning, Vygotsky.

Introduction

As India's employment landscape continues to evolve, it faces a fundamental challenge: a growing mismatch between higher education and employability. The India Employment Report 2024 points out that while the education level of the youth has improved over the past 20 years, the unemployment rate for graduates, and technical graduates continues to remain high. According to Periodic Labour Force Survey in India (PLFS) 2023-24, around 65% of workforce is without any vocational training, or more specifically, industry-specific enabled abilities, a gap in skill development and preparedness for industry (Rau, 2025). Poor educational outcomes are correlated with low-skilled workers.

This disconnect certainly makes the argument better that there is a clear disconnect in the coursework that is offered in schools and universities and what industries require. In this respect, there is a direct need for effective education reforms, which advocate for practical and job-oriented training, and not purely theoretical frameworks. Education must also emphasize lifelong learning and skills up-grading platforms.

Simultaneously, the need to rethink teaching practices within higher education is also increasing. Vygotsky's Social Constructivism Theory, which emphasizes learning as a social process and the importance of scaffolding, indeed offers a strong foundation for collaborative, contextual pedagogy. One of the co- teaching models based on collaborative strategies is One Teach, One Assist model which must be taken into consideration and implemented as it encourages direct co-teaching and supporting learning as it happens. This theoretical model is a way to reach across the academic-industry divide in a constructive manner by facilitating a student-centered, skill-based learning that could enhance outcomes for all students. This research therefore explores how collaborative teaching rooted in constructivist theory can serve as a catalyst for aligning higher education outcomes with career readiness—an imperative highlighted in both the National Education Policy 2020 and current employment data.

Theories of Learning:

Lev Vygotsky's Social Constructivism

Lev Vygotsky, a foundational figure in developmental psychology, offered the theory of Social Constructivism which claims that learning is a social endeavor. While cognitive theories emphasize the ability of individuals to learn through independent exploration, Vygotsky argued that knowledge is co-constructed through interaction with others, notably knowledgeable others (e.g., teacher, peer, adult).

Vygotsky in his social constructivism learning theory, explains the core concept of the 'Zone of Proximal Development' (ZPD). ZPD is the zone between where the learners require certain external assistance to complete their task. In ZPD, the learner performs tasks with guidance and assistance from a MKO (more knowledgeable other) like a teacher or a peer. Essentially, ZPD highlights the potential for cognitive development through social interaction in a structured manner and focuses on the importance of teaching that is responsive to the learner's potential. The notion of scaffolding is another important concept of Vygotsky's Constructivism. It refers to the facilitation or scaffolding provided to the learners by teachers (MKO) which allows them to achieve tasks that are in their ZPD. When the learner becomes competent, the scaffolding is taken away and the learners are encouraged to become independent and competent. Scaffolding is provided only when necessary. Language, too according to social constructivism, plays an essential role in the thinking and learning process. In Vygotsky's view, when learners are involved in dialogue and communication, they are beginning to internalize new concepts and processes. Language serves as both a medium of learning (to make sense of experience) and as a cognitive tool (used to enable knowing).

Therefore, through the lens of Social Constructivism learning is an active, culturally embedded process driven by collaboration and communication. This paradigm positions our role as educators toward an environment that promotes an ongoing dialogical approach through interaction and shared experience to support a meaningful construction of knowledge.

One Teach, One Assist (OTOA) Model

In the One Teach, One Assist cooperative co-teaching model, two teachers who are present in the same classroom share teaching responsibilities. While one teacher teaches the class, the other provides additional support students, either individually or in groups, helping them to understand the lesson.

The "Lead Teacher" creates and delivers the primary content instruction in the OTOA model. Along with introducing new ideas and facilitating a range of learning activities, this teacher also oversees the classroom environment.In the meantime, the "Assist Teacher" moves around the classroom, watching how the students behave, helping those who require more help or clarification, and encouraging understanding and disengagement without interfering with the Lead Teacher's lesson plan.Without removing them from the general education setting, this arrangement guarantees that all students, particularly those with various learning needs, receive prompt assistance. Since the support teacher can quickly address behavioral or academic issues of the respective students, this model also fosters inclusive teaching and enhances classroom management.

The One Teach, One Assist collaborative strategy is useful in diverse classrooms. It was initially designed for special education and even today applied in inclusive education, where students with disabilities or other learning challenges are taught in the same classroom as their peers.

Therefore, the One Teach, One Assist model can be a good collaborative teaching strategy as it offers students extra support and personalized instruction. However, for its successful implementation, this co-teaching model requires strong communication and planning between co-teachers to avoid the assist teacher being underutilized or perceived as an aide rather than a co-equal educator.

Analysis of Vygotsky's Social Constructivism and One Teach, One Assist Model

Vygotsky's Social Constructivism provides a convincing reinterpretation of learning from a research perspective. It highlights that knowledge is actively created through social interactions rather than passively absorbed. By emphasizing communication, teamwork, and cultural context, the theory questions conventional, individualistic learning models. The key concept of the Zone of Proximal Development (ZPD) indeed highlights the value of guided learning and helps bring out the learner's hidden potential. Research shows that this theory introduces a more learner-centric approach to education thereby broadening the role of the educator.

Instead of acting as the only authority, the teacher becomes a scaffold for deeper understanding and a facilitator of thought. Another significant aspect that provides insights into how communication influences thought is the role that language plays as a mediating tool in cognitive development. Vygotsky's theory is known for its wide range and flexibility when discussing current educational literature, including support for learner-centered and culturally responsive learning.

The One Teach, One Assist model is simple and practical to implement and is the perfect model for collaborative teaching. Collaboration creates the presence of two teachers in the classroom with one teacher providing learning directions as the other teacher provides on-the-spot learner support - a division of duties which provides an inclusive and flexible model to manage many learning needs.

It has been observed that this co-teaching model can be beneficial in the classroom. The second educator allows for deeper student engagement, timelier feedback, and more proactive classroom management—but it is important that the second educator is not viewed as a "substitute," but rather as a co-teacher in the process. However, one source of difficulty can be the role discrepancy. When properly implemented, the supporting teacher should not generate the idea that they are merely a passive participant in the probable co-teaching model. To maximize the potential of the model, it is essential to maintain equity in collaboration, preparation, and the recognition of the roles is necessary. In general, the OTOA model is recognized for creating a shared sense of accountability in the classroom, and it has the unique capacity to enable differentiated instruction. It is also viewed as an entry point for more complex co-teaching models and has been valued simply because it reinforces the idea that teaching is often a team effort, and, therefore collaborative in nature.

In conclusion, the One Teach, One Assist model and Vygotsky's Social Constructivism both emphasize the significance of teamwork and proactive assistance in the learning process. While OTOA offers a useful framework for shared teaching, Vygotsky offers a solid theoretical foundation for social interaction in knowledge building. When combined, they support a more successful and inclusive teaching strategy that is in line with contemporary learner-centered objectives.

Application of Learning Theories across Disciplines in Higher Education

The One Teach, One Assist (OTOA) model and Vygotsky's Social Constructivism form a powerful combination for transforming higher education into an open, engaging, and career-relevant learning environment. Vygotsky's theory emphasizes that knowledge is socially constructed through guided interaction. Thus, he provides teachers the fundamental ways to scaffold learning and interact with students in their Zone of Proximal Development (ZPD). Furthermore, the OTOA model provides an effective educational strategy to have two teachers share responsibilities and with one providing timely support while the other teachers provide instruction, maintaining individual focus for every student.

The theory of constructivism along with OTOA co-teaching model can be applied across various disciplines in the higher education. For instance, one teacher could provide content instruction while the other could provide professional training by imparting practical knowledge of the subject.

Applying social constructivism in fields like Engineering and Technology results in project-based learning and collaborative labs where students work in groups under the direction of teachers who help them solve problems rather than just impart knowledge. For example, this approach might include peer programming sessions and expert mentoring used by engineering faculty to support students in dealing with complex design problems, all the while engaging creativity and critical thinking. Engaging students in real world engineering situations reinforces attributes of industry skills, such as collaboration, technical communication, and agile project management. The OTOA model builds on these attributes and minimizes learning gaps and deepens learning by allowing one educator to lead the theoretical explanation while an assisting educator provides real-time support to students who are struggling to engage in technical concepts within design problems.

In terms of social constructivist thought, it does impact clinical education in the Health Sciences to the extent that learning is practical and student-led using group case discussions or simulated cases. Ultimately, students studying medicine or nursing learn the most when they work in teams to investigate patient cases alongside an educator facilitating helping groups refine their clinical reasoning in the case. The OTOA that occurs in this case lends itself to practice-oriented, inclusive, and responsive teaching where students' learning pace may differ. For example, one educator could provide the demonstration, while the other can assist students working on practical skills or addressing their questions.

The primary ways that Business and Management education integrates real-world issues into classroom settings are through role plays, group projects, and internships with an industry focus. Mock business scenarios in the classroom must be created to help students develop industrial skills like data-driven decision-making, negotiation, and strategic thinking. Through peer collaboration and constructive feedback from the instructor, Vygotsky's emphasis on social interaction helps students develop their leadership and communication skills. The OTOA model improves this by allowing one teacher to lead the theoretical explanation while the supporting teacher provides immediate feedback to students struggling to understand technical concepts. By doing this, learning gaps are filled and deeper understanding that complies with industry standards is encouraged. Social constructivism is reflected in the Humanities and Social Sciences through collaborative seminars, debates, and peer review processes that value discussion and cultural context as essential components of knowledge creation. Reflective conversations led by faculty members enable students to grapple with meaning and cultivate critical viewpoints. This develops industry skills that are essential for jobs in media, public policy, or education, such as critical analysis, cultural literacy, and ethical reasoning.

Through OTOA's shared teaching responsibilities, all students can fully engage with disciplinary content and professional competencies. One educator can moderate debates while the assisting teacher provides targeted support to students who need assistance with complex texts or theoretical frameworks. These examples illustrate how the OTOA co-teaching model and Vygotsky's Social Constructivism theory can enhance disciplinary instruction by encouraging inclusive learning, individualized scaffolding, and active engagement—all of which are important components that develop vital 21st-century abilities like cooperation, flexibility, and problem-solving.

National Education Policy (NEP 2020) in Alignment with Collaborative Teaching Models

Through learner-centered, adaptable, and holistic approaches, the National Education Policy (NEP) 2020 seeks to transform India's educational system and equip students for both the unknown and a rapidly evolving future. Supported by Vygotsky's Social Constructivism and the One Teach, One Assist approach, the NEP emphasizes the significance of moving education away from memorization and towards critical thinking, creativity, and experiential learning. NEP 2020's Alignment with the Collaborative teaching strategies is reflected as follows.

1. Facilitating Active and Collaborative Learning: The NEPs emphasis on discussion-based, exploratory and experiential learning embodies Vygotsky's main idea that all knowledge is socially constructed. This encourages institutions to thoughtfully design learning experiences including peer engagement, problem-solving, and capitalizing on authentic experiences— found within constructivist pedagogy.
2. Equity and Differentiated Instruction: By enabling teachers to offer individualized support in a diverse classroom, the OTOA model responds to the NEP's call for educational equity. Building on the NEP's goal of universal access to education, the assisting teacher assumes a dynamic role in ensuring that students with different learning styles are not left behind.
3. Interdisciplinary and Multidisciplinary Learning Integration: NEP intends to dismantle rigid discipline-based academic structures to allow a holistic approach to teaching and learning in departments. For instance, the faculty will have the ability to engage in collaborative learning experiences such as in OTOA co-teaching model, where teachers from more than one discipline co-design and co-construct the content together so students can see the richer connections and more coherence amongst different concepts. Thus, this teaching methodology is rooted in constructivist theory and co-teaching.
4. Faculty Development and Professional Collaboration: NEP 2020 strongly believes in constant professional development of teachers. By enabling educators to collaborate in real time, OTOA promotes a culture of mentorship, knowledge sharing, and reflective teaching, all of which are essential for putting NEP's recommendations into practice.

5. Industry-Academia Collaboration: The collaborative and experiential components of the two models undoubtedly encourage the formation of knowledge ties to business practices. Both models support students in enhancing their employability skills while bridging their learning from academia to the world of industry. In other words, students can better synthesize theory and practice when having the opportunity to use real-world circumstances to collaborate and demonstrate the general principle of teaming.

These pedagogical approaches are closely aligned with India's National Education Policy (NEP) 2020, which prioritizes a learner-centered, multidisciplinary approach to education that connects classroom learning to employability. The focus in the NEP on mentorship, experiential learning, continuous formal assessments, co-teaching, and collaboration is highly consistent with Social Constructivism and OTOA, which suggest that institutions encourage collaborative learning environments for everyone (students and educators) to collaboratively learn through engaging in contextualized, meaningful social relationships, co-participation, and instructional responsibility, as opposed to learning in a passive reception manner.

Conclusions

Linking industry to academia is no longer a choice - it is a necessity. Workforce demands are changing more quickly than traditional educational systems can adapt. The following research study has shown that collaborative teaching models—more especially, One Teach, One Assist (OTOA) and Vygotsky's Social Constructivism—offer useful and revolutionary solutions for higher education. Vygotsky's theory builds the pedagogical foundation by emphasizing socially mediated learning, scaffolding, and the development of critical thinking through interaction. The OTOA model operationalizes classroom collaboration to support differentiated instruction, real-time support, and enhanced student engagement. When used in a variety of fields, including engineering, health sciences, management, and the humanities, these models not only enhance scholarly knowledge but also instill vital industry-relevant abilities like problem-solving, communication, cooperation, and flexibility. Their value is further supported by their alignment with the National Education Policy (NEP) 2020, which promotes flexible, multidisciplinary, and experiential learning pathways that equip students for success in both their personal and professional lives. This will guarantee that students are not only academically proficient but also adequately equipped to handle the challenges of the contemporary workplace.

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Empowering Education through Digital Innovation

Anisa Nadar
B.Ed. Student Teacher, St. Xavier's Institute of Education (Autonomous), Mumbai
2024anisa@sxie.in

Shraddha Kota
B.Ed. Student Teacher, St. Xavier's Institute of Education (Autonomous), Mumbai
2024shraddha@sxie.in

ABSTRACT:

Internet innovation has come a long way from being a vanguard advantage to a central force of education in the current era. This article is regarding the promising promise of e-learning for a wide range of academic studies spanning from Teachers' Training to Engineering to the Humanities, both through a reading of promise and limitation. Survey data indicate that 90.9% of learners use digital tools (e.g., educational apps, learning platforms, video conferencing) almost daily, while 95.5% rely primarily on YouTube and educational videos for learning. In addition, 93.2% of learners affirm that these digital tools enhance their understanding of academic subjects. Despite these encouraging advantages, several challenges continue to face the digital learning platform. Foremost among these challenges are poor internet connectivity, the challenge of using digital platforms, poor interaction with teachers, and several online diversions.

The report identifies the twin-edged potential of digital innovation as both an accelerator of greater scholarly involvement and an image of present inequalities — demanding policy measures focused on targeted responses and comprehensive teacher education to achieve its full potential. Placed against the backdrop of national policy revamps like India's National Education Policy 2020 and the pressure of the COVID-19 pandemic-induced digitalization, the paper is certain about the relevance of building teachers' systemic capacity and curriculum transformation. Research attests to the fact that there is emphasis on digital technologies as the pivot of reform in education but shifting adoption to an activity of addressing systemic issues to using technology innovation to propel inclusive and sustainable learning environments.

Keywords: Digital Innovation, Online Learning, Educational Transformation, National Education Policy, Digital Literacy, Teacher Development, Educational Equity.

INTRODUCTION

Educational digital innovation is the use of new and sophisticated technologies like AI, e-learning platforms, virtual and augmented reality, and collaboration software to empower teaching, learning, accessibility, and educational administration. They enhance the quality of learning by offering it in interactive, immersive,

and tailored manner. They offer adjustable, self-learning depending on the needs of individual learners, and also enable the teachers to follow more innovative and effective pedagogy. Digital technologies also span time and space and afford equal access to education for remote or under-served communities and towards greater equity. Automated grading and student information systems also assist schools to cut administrative headaches and optimize the utilization of resources.

With such advantages, digital innovation brings teachers and learners the digital skills necessary in the contemporary workforce. It promotes collaboration and communication through internet sites and forums, deepening parents', teachers', and students' relationship. Spanish, Australian, and British case studies on institutions are exemplary examples of successful pragmatism such as enhanced performance of learners and inclusion of disabled learners. There are, nonetheless, challenges to be met, such as providing teachers with ongoing training, using technology as a means and not an end, and equilibrating access to the new digital technologies. Overall, technological innovation can help make education more inclusive, more efficient, and more visionary.

LITERATURE REVIEW

Challenges and Opportunities of Digital Learning in India.

This article is by Ramavath. N (2021), addresses revealing challenges and prospects of digital learning from the Indian perspective and its effect on 21st-century education. Population size, poverty, teacher training, pedagogy, cost implications being some of the key considerations in this scenario of digital education.

From this review, studies on e-learning, accessibility issues, and government initiatives bringing technology into education were considered. Though digital learning has brought flexibility and accessibility into the picture, the paper brings in critique of infrastructural gaps and disparities with respect to digital literacy, especially in rural areas. Therefore, these findings imply that a well-orchestrated policy intervention and a technology push would fill these gaps and make education more inclusive and effective.

Digital Learning in the Context of NEP 2020: A Comprehensive Analysis.

The paper by Manas. D (2023) begins by sketching out scholarship development in its discipline, starting from pioneering research that initially clarified key concepts and theoretical frameworks. Early research is uncovered to have theorized key guidelines currently defining the field of study, tracing controversy and prevailing methods of early periods. The above context sets the stage by illustrating how the initial findings fed into further elaboration and the exploration of the subject field.

Shifting gears to more recent literature, the review identifies trends towards integrative and multidisciplinary approaches. Contemporary research is examined skeptically—not merely for what they offer in terms of innovative techniques and empirical practice but also for the way they reveal the limitations of earlier models.

Synthesis through the review shows how more recent tendencies are reconfiguring old paradigms with innovative thinking that balances earlier theories with fresher analytic tools. This development is central to comprehending today's state of research and the remaining gaps. Overall, the literature review is commendable on its balance critique and brevity. With a convergence of historical and current viewpoints in synthesis, it encloses an elaborate perception of the research landscape. Authors do make a good argument for more research by illustrating where previous research meets and where it falls short, thus establishing a good platform for future research. This integrative approach not only defends the methodological stance of the study itself but also serves as a model for future research in the area.

Digital transformation in education: A systematic review of education 4.0.

The article by Esin. M and Gülçin. B (2023), explores innovation adoption and technological foresight, looking at the way organizations adopt new technologies as part of their strategic thinking. The article overviews key research in decision-making models, risk assessment, and policy frameworks, highlighting the nexus between market forces and institutional readiness. Most recent works emphasize predictive analytics and scenario planning, emphasizing how firms leverage data-driven insights to react to uncertainty and technological change. Although there are some works advocating agile adaptation, there are works which criticize the barriers to applying such an approach, such as regulatory constraints and organizational beingness. The studies suggest that proactive governance and cross-disciplinary coordination are needed for long-term innovation.

Digital Transformation in Education Sector: The Way Forward For India.

The article by DR. Sumita. S (2021) describes a digital revolution in Indian education occasioned by the COVID-19 pandemic. The sudden surge in online education highlighted the systemic strengths and flaws. This testing situation in the great adoption of technology pushed the institutions, still slow in attempting it, into seeing infrastructural inadequacies and availability provisions, not to mention gross illiteracy in digital technology. The review discusses seminal works on virtual classrooms, e-learning technicalities, policy interventions, and how, on the whole, on a macro level, digitization helps improve the quality and accessibility of education. But the argument made in the review is for bridging this gap between urban and rural areas through solutions that are inclusive and scalable. The Indian system of education might metamorphose into a more flexible and future-proof form of learning if digital solutions are implemented properly.

Research on Digital Transformation in Higher Education: Present Concerns and Future Endeavours.

Imam, F. R. (2024) says, entering the digital transformation of higher education, it is emphasized that institutions develop new means and strategies to survive competition in a technology-centered environment. The paper, therefore, emphasizes the established systematic literature review using the PRISMA model to have core concerns, best practices, and future directions in digital education. The review provides insights into the barriers hindering digital transformation and lists resistance from the institutions, lack of leadership, and problems in technological integration.

The role of pedagogical innovation, maturity assessment based on sound evidence, and organizational measures is then considered as the factors facilitating successful digital adaptation. The findings point to transformational leadership and unifying technological landscapes to be the factors creating sustainable models of digital education.

RESEARCH OBJECTIVES

1. To examine the relation between the use of digital tools and students' perception of increasing scholarly knowledge.
2. To identify the primary difficulties (e.g., limited internet access, simplicity of tool utilization, lack of teacher interaction, and cyber distractions) obstruct effective utilization of digital instruments in education.

RESEARCH HYPOTHESES

Hypothesis 1 (Descriptive): The majority of students (around 93.2%) feel that daily utilization of digital education tools contributes to their academic knowledge, reflecting a positive attitude towards technological integration into education.

RESEARCH METHODOLOGY

To carry out this study, the survey method was adopted as the main source of data collection. The survey was administered on a varied group of respondents, focusing on students from different academic majors, namely, teacher education, engineering, and humanities—to obtain diversified opinions and individual experiences regarding the integration of digital tools in learning. This method not only offers a wide perspective on the subject but also inspiration from individuals currently applying digital innovation to education.

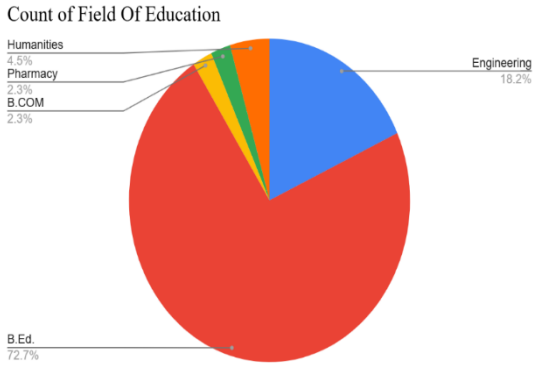
The descriptive survey research is suggested to investigate the perceptions of learners towards digital innovation in education. The instrument gathered qualitative data on the frequency of use of digital instruments (where 90.9% of the students use digital instruments almost daily and 95.5% use YouTube/educational videos primarily), the academic value perceived from the tools (as 93.2% of the students exhibit heightened understanding of academic content), and the issues encountered—such as no access to the internet, difficulty in accessing the tools, reduced interaction with teachers, and excessive online distraction.

The information was processed using descriptive statistics to present responses and correlation analysis to determine relationships between digital tool use and perceived academic improvement. Neutral language, avoiding leading questions, was used in avoiding any bias toward certain assumptions. Effective data collection and analysis were ensured, which enabled the production of measurable, comparable data and the drawing of meaningful conclusions about the effect of digital innovation in education.

Findings of the Research

Figure 1: Field of Education

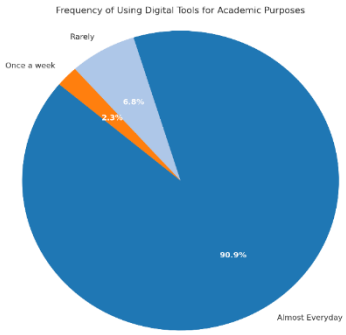
The pie chart shows a commanding preponderance of the B.Ed. sector, representing 72.7% of the allocation, highlighting strong emphasis placed upon teacher education. Next is Engineering at 18.2%, indicating significant interest in technical subjects, and Humanities, Pharmacy, and B.COM each occupying small proportions of 4.5%, 2.3%, and 2.3% respectively. Such skewed allocation may indicate focused educational agendas that would have a bearing on policy and resource allocation.



1. How often do you use digital tools for academic purposes?

Figure 2: Frequency of Using Digital Tools for Academic Purposes

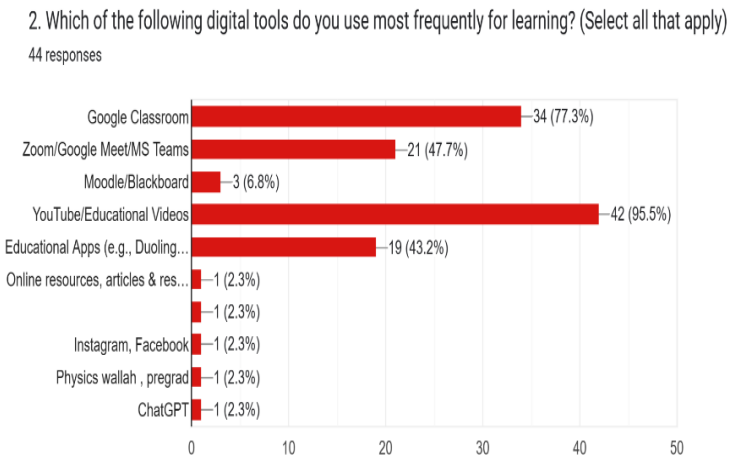
This pie chart is proof that an overwhelming 90.9% of students use digital tools almost every day. This speaks volumes about the extent to which technology has become embedded in students' day-to-day academic activities. Contrast this with a mere 6.8% who use the tools from time to time and a smaller percentage, 2.3%, that use them weekly and so on. These figures certainly indicate that virtual platforms are the center of modern learning procedures. They are now part of students' learning processes.



2. Which of the following digital tools do you use most frequently for learning?

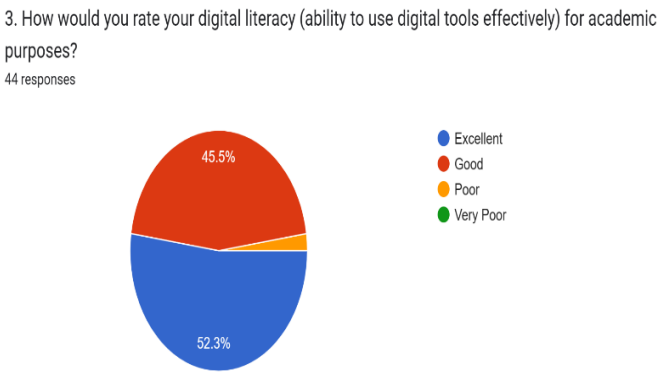
Figure 3: Frequency of Using Digital Tools for Learning

The bar graph shows that 95.5% of the respondents use YouTube educational videos every day, while 77% use Google Classroom. Nearly 48% use online learning platforms and 43% use other educational apps. This decidedly unequivocal majority indicates a tremendous degree of digital engagement from the students and testifies to the use of digital assistants and networks as an integral part of the very nature of modern pedagogy.



3. How would you rate your digital literacy for academic purposes?

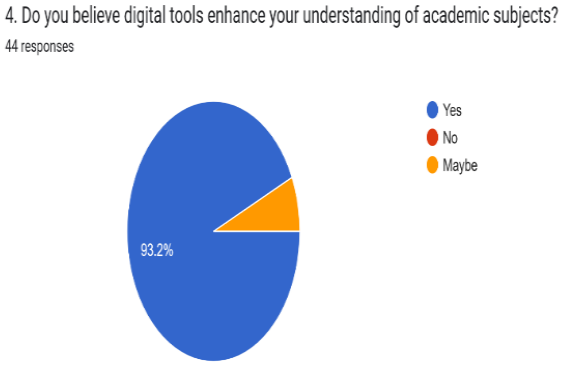
Figure 4: Self Digital Literacy



Data from the pie chart, assures that most of the respondents provide positive responses to their digital skills. 52.3% of them rank themselves excellent in digital literacy, and 45.5% of them rank them good, which reflects very high total confidence in being able to use digital tools for academic purposes. These students are technologically aware and are poised to exploit technology to be successful in studies.

4. Do you believe digital tools enhance your understanding of academic subjects?

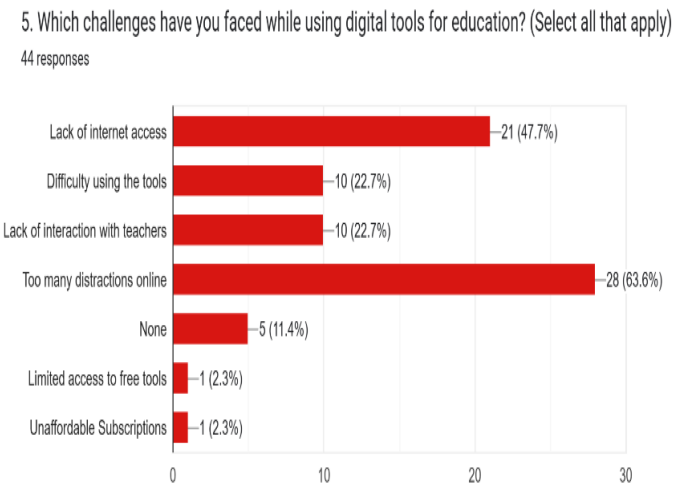
Figure 5: Digital tools improve one's comprehension of academic subjects.



The pie chart reveals a very positive consensus among the respondents. A resounding 93.2% are convinced that digital tools do improve their knowledge, reflecting high confidence in the powers of technology in learning. This evidence points to the key contribution of digital tools in augmenting academic understanding in contemporary learning platforms.

5. Which challenges have you faced while using digital tools for education? *(Select all that apply)*

Figure 6: Challenges while using Digital Tools for Education



The bar graph shows that a majority of 64% face too many distractions, and 48% have frequent infrastructure issues. Nearly 23% students find it difficult to use digital tools and a significant 23% of the participants need more interaction with teachers.

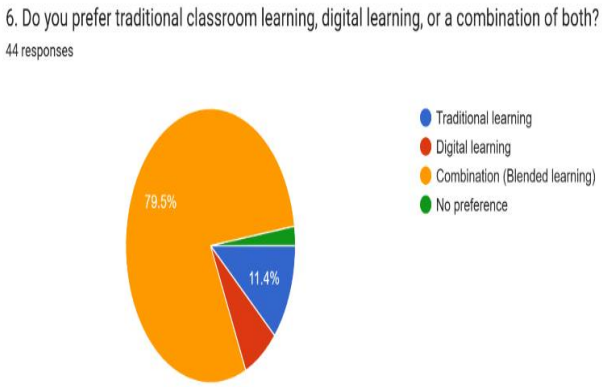
Overall, the bar chart shows that even though digital tools have been used intensively, technical and environmental issues continue to constrain maximum learning capacity.

6. Do you prefer traditional classroom learning, digital learning, or a combination of both?

Figure 7: Traditional Classroom Learning

This pie chart reveals a strong inclination towards blended learning, as 79.5% of responders prefer a mix of conventional and digital methods. 11.4% prefer traditional, while 6.8% prefer exclusively digital means.

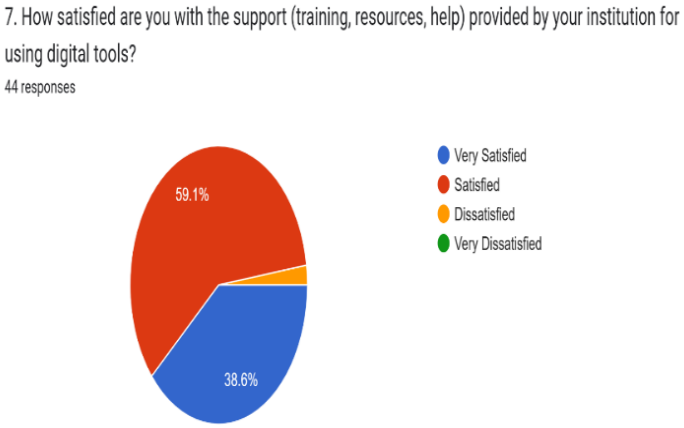
This is a consistent trend toward hybrid forms of learning, indicating a preference for flexibility, engagement, and the advantages of both in-classroom and technology-based learning.



7. How satisfied are you with the support (training, resources, help) provided by your institution for using digital tools?

Figure 8: Satisfaction about institutional support

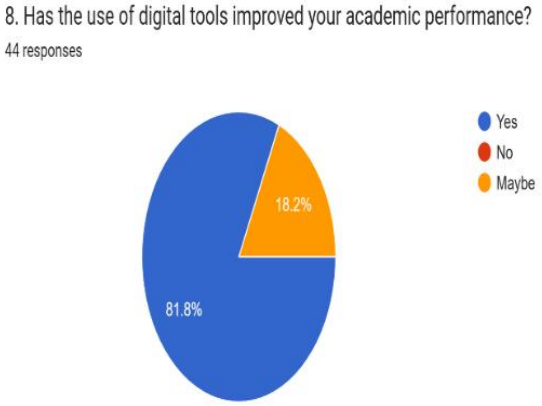
The pie chart shows that a majority of 59.1% declared it to be satisfied, while 38.6% said they were very satisfied, showing the mostly positive response, indicating that most institutions are equipping students in training, resources, and assistance for digital learning. This is a desirable level of institutional preparation and support for digital learning.



8. Has the use of digital tools improved your academic performance?

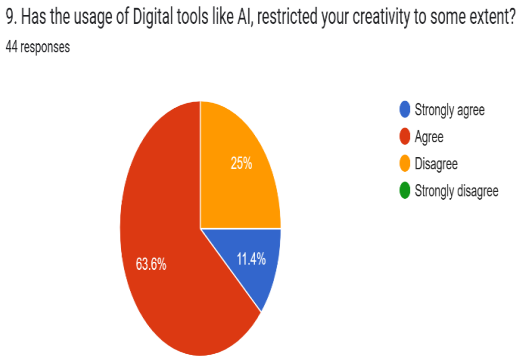
Figure 9: Use of Digital tools for improvement in academic performance

The pie chart indicates a strong 81.8% of the participants agree that digital tools have made a positive contribution to their academic achievement. 18.2% are unsure, a "maybe" answer. One interesting observation is that none of the interviewees answered with a negative contribution. This largely positive view reflects that digital tools are largely accepted to improve academic performance, indicating their smooth incorporation into the study schedule of the students.



9. Has the usage of Digital tools like AI, restricted your creativity to some extent?

Figure 10: Usage of Digital Tools



The pie chart indicates that overwhelmingly 63.6% of users have an opinion that online tools like AI have restricted their imagination to some extent, 11.4% agreeing strongly. On the contrary, 25% disagree. This is indicative of the fact that overall, users are concerned that although online tools are helpful, they may in effect shut down creative thought or imaginative discovery and require restraint and judicious use.

The Implications of these research findings

The implications of this study for teaching and learning in the age of information are immense. To begin with, the widespread use of digital tools, particularly among B.Ed. students, indicates increased dependence on technology to facilitate both learning and teaching delivery. Increased utilization of platforms such as YouTube, Google Classroom, and AI software such as ChatGPT and Canva is a pointer to the shift towards visual, interactive, and personalized learning. This increased use of technology is not without challenges, though. While the most prevalent response was that of positive effect on knowledge as well as academic performance, concerns regarding distraction, uneven access to stable internet connection, and absence of adequate training in usage of digital tools will deter learning outcomes. In addition, although the majority of them did not agree with the perception that AI tools suppress creativity, a large percentage reported that they feared becoming too dependent, and this places emphasis on ensuring the balance in usage.

Suggestions and Solutions for increased use of digital tools improved your academic performance

At the curriculum level, AI concepts like perception, reasoning, and ethics must be interweaving all subjects with systemic concepts like AI4K12's Five Big Ideas. Well-crafted learning objectives and the use of formative assessments like projects and debates allow teachers and students to ensure students gain some grasp of the technical as well as ethical aspects of AI, and can, in the classroom, also learn collaboration, creativity, and critical thinking competencies. AI integration also enables learning with personalized tools that allow students to adapt to individual needs (e.g., Math Pathway, Smart Sparrow) and enables inclusivity through accessibility tools such as Help Me See. AI can be introduced in schools to provide pre-emptive intervention for at-risk learners through performance data monitoring to act pre-emptively. Most importantly, the ethical use of AI should be promoted through strong policies for privacy, data balance, and critical thinking skills evaluation.

Teachers need to look at the incorporation of technology not only but also to digital literacy, critical thinking, and creativity. Institutions can also offer formal training, institutions can offer access at a lower cost, and the assignments can be created to make the students engage in active learning instead of passive watching. Finally, a mindful, hybrid approach, combining the older pedagogy and the new web-based strategies, can offer the highest level of engagement, accessibility, and teaching quality.

Education should be experiential and engaged by project-based learning and simulated genuine work environments in experiments. There needs to be constant evaluation, curriculum renewal, and strong leadership support, e.g., the formation of AI task forces and research funding. Each of these steps creates an education system geared to the future that is moral, inclusive, and responsive.

CONCLUSIONS

Implementing AI in education needs to be comprehensive and combine teacher training, curriculum reform, ethical behavior, and the implementation of AI tools for personalization and augmentation of learning. Effective case studies indicate that AI has the potential to empower teachers, engage students, improve outcomes, and provide timely interventions. Policymakers and educators should collaborate to foster AI literacy, ensure accountability, and constantly reassess strategies to realize the true potential of AI in education This method enables learning through digital innovation by enhancing the performance of learning, rendering it adaptive and inclusive and enabling futureproofing of learners for the AI-dominated world.

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