



Tech and Integrity: Exploring the Intersection of Tech and Ethics

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Abstract

With the rapidly revolutionizing technological advancements, artificial intelligence and emerging technologies are finding strong footprints in all possible domains of life, leading to transformative industrialization and daily life. The article also serves to explore the major drivers of educational tech upsurge, fostering responsible innovation and digital citizenship. However innovative and life-transforming these technologies may be, they are prone to potential ethical interrogations which require cautious attention. This article dives into examining the different ethical considerations especially for digital educational solutions and suggests further directions of research in ethical considerations. By giving due regard to these ethical considerations and finding justified ways to address them, we can offer better directions to sail through the darker shades and the brighter tones presented by the emerging technologies, thus establishing a balanced and innovative future for both the teaching and the learning community at large.

Keywords: - Ethical considerations, emerging technologies, educational technology, digital educational solutions, transformations, digital era

I. INTRODUCTION

Modern society is comprised of digital natives and digital citizens with high levels of exposure to technological interventions across many sectors of life. Technology has brought every one of us to a crossroads when it comes to its utility. In fact, within the realm of education, technological interventions have always been welcomed with the view to aid in facilitating the instructional process that comprises teaching, learning, and evaluation with appropriate remedial actions. This in turn demands for capturing and processing of lots of user-based information in many ways (Marín & Tur, 2024). In such a scenario, ethics play a substantial role in placing innovative technologies into practice with due consideration in various dimensions. This chapter explores the significance of considering ethics in implementing technological interventions in education.

II. THE ASCENT OF EDUCATIONAL TECHNOLOGY

The landscape of education has been dramatically swept by adopting innovative technologies post-COVID pandemic in specific. 'Access data at any time and from anywhere' has become the tagline for the concept of educational technology. This has profoundly reinvented the ways of teaching, learning, and collaborating among the instructors, learners, and the content being learned. Let us explore the journey of educational technology.

- The notion of Programmed Instruction was introduced in the 1960s by using computers for the purpose of instructional process. This concept has been the foundation for the solid establishment of instructional technology.
- Broadcasting learning content in the form of audio-video mode through educational televisions came next in the 1970s to promote mass-level delivery and accessibility of the learning content.
- In the 1980s, standalone or dedicated digital educational applications and content were introduced using computer-assisted instructional systems.

- In the 1990s, learning through online mode using internet connectivity restructured learning by distance mode.
- Full-fledged, integrated digital instructional platforms and electronic instructional resources were launched to promote the management of instructional systems in the 2000s.
- In the 2010s, learning through mobile-based platforms and applications has granted learners the ability to learn on the move and collaborate with others through social media platforms.
- Decentralized access to high-quality content has been made possible by the launch of massive open online courses in 2012.
- Since 2015, adaptive and personalized instructional systems have been evolving with educational applications featuring artificial intelligence, multimodal experiences through virtual, augmented, and mixed reality, gaming elements, data-driven evaluation, and instantaneous feedback mechanisms in various educational processes.
- In addition, trends emerging in the instructional systems include 3D modeling, simulations, block-chain technology, 360-degree view, virtual tours, Haptic technology, cloud and edge computing, Internet of things, wearable technologies, 5G and advanced networking, and so on.
- Further, robotics and automation, and intelligent tutoring solutions are also playing substantial part in the evolution of educational technology in the recent years.

III. MAJOR DRIVERS OF EDUCATIONAL TECH UPSURGE

The upsurge of educational technology has been triggered by the following major drivers:

3.1. Advances in Technology:

Technological developments and innovations have the potential to provide quick, robust networking, highly absorbent multimodal learning experiences, intelligent tutoring, and adaptive evaluation with tailor-made solutions, scalability, and ubiquitous access to educational opportunities.

3.2. Infrastructural Headways:

Accessibility has been greatly rendered and supported by the advancing technological infrastructures by way of enhanced digital interconnectivity and networking, robust storage options taking the form of cloud, and versatile gadgetry support.

3.3. Government Initiatives and Financial Support

In the recent years, the national governments of various countries across the globe have been investing significantly in science and innovative technologies for their robust and practical complex solutions in the field of education and other major disciplines. Several initiatives of the various governments have paved ways for novel opportunities for the emerging technologies to flourish for the better.

3.4. Tech-Savvy Digital Natives:

Digital instructional platforms have been sprouting to satiate the learning demands of the digital natives who are technologically savvy. The extensive usage of mobile devices, computers and various other electronic gadgets have also become a part and parcel of their lives.

3.5. Altering Needs of the Learners:

Learners prefer anytime anywhere learning in the modern information era with the huge technological assistance offered by internet networking and social media. Further, the needs of the learners are highly fluid in terms of personal aspects such as interests, profession, ability, skills, knowledge base, accessibility, socio-economic status and know-hows, and instructional aspects such as style, modality and mode of learning.

3.6. Globalization and Networking:

Globalization has provided an intensive extended support for the field of education in specific, by providing multifarious opportunities for the learners, educators and institutions to connect and collaborate and to create and share educational resources across the globe at any time and from anywhere. This has also led to the emergence of transnational partnerships, student exchange programs, internationalization of academic curricula, educational opportunities for global citizenship and career readiness programs for worldwide employment options. This has established pathways for the advancements in the networking technologies for collaborating through online forums, social media platforms, professional networking, and various other collaborating tools.

3.7. Customizing Learning Opportunities:

Prioritizing individual differences in the educational realm has paved ways for offering tailor-made educational experiences and adaptive instructional assistance in the process of learning.

3.8. Cost as a Factor of Economic and Ecological Concern:

From the perspective of economic and ecological footprints, digital initiatives have been considered as better alternative forms of communication and record keeping to conserve natural resources. Also, the print forms of educational materials are quite heavy to carry and be safeguarded from damage and destruction. In order to promote paperless 'Go Green' strategies and

‘reducing the physical academic load’, initiatives to offer multimodal digital learning content at almost free or minimal cost have been put into place.

3.9. Data-driven Pedagogical Upgrades:

Analytics component in learning using technology is highly driven by data linked to learner performance. This in turn empowers instructors to accommodate their pedagogical approaches as per the demands and requirements of the instructional process and global demands.

3.10. Others Factors:

The other significant factors that are driving the advancements in educational technology include the increasing demands of open educational resources for the promotion of equal opportunities for access and usage for all beyond disparities. Further, social media has been playing a significant part in creating awareness and know-hows exploring the various technological options to the general public with the help of various collaborative and information sharing platforms.

IV. ETHICAL IMPLICATIONS

Technology is a kind of double-edged sword which when not handled or used properly, it can cause damage to the users at both the ends. This has created a huge difference of opinions among the public leading to the emergence of techno-optimists who view technology as social innovative solutions and techno-pessimists who view technology as problematic unpredictable challenge to humans. Even though technological advances have brought in many convenient options, they have carried a lot of concerns as well. This demands for a careful consideration of the benefits and the concerns in technology use within educational context (Aydin, 2024). The key concern lies in the privacy and confidentiality of the learner data (Dhirani et al., 2023). Also, besides ethical concerns, value systems, psychosocial development, physical and digital health of the users are also deteriorating. Further, poorly defined ethical practices and vague guidelines increases the risk of issues with data privacy and security breaches (Dhirani et al., 2023). The major themes of ethical impacts in the emergence of technology-led educational applications include the following:

- Concerns of data privacy and personal autonomy
- Concerns of in-person connectivity in real-time
- Socio-cultural sensitivity and biased discriminations
- Concerns with accountability and transparency of digital governance
- Potential economic concerns with automation and job displacements
- Erosion of free will and threats to human agency
- Concerns with misinformation and social threats
- Issues with cybersecurity and digital protection
- Digital disparities and concerns with accessibility and inclusivity
- Issues with copyrighting and academic integrity
- Exploitative digital marketing and financial impacts
- Non-compliance to global standards and cultural sensitivity.

V. ETHICAL CONSIDERATION

With the continuous progresses being seen in the educational technologies, it is highly imperative to consider the ethical factors for various reasons. The key ethical factors that are to be handled with utmost care and concentration can be grouped into the following categories:

- Instructional Ethics for Learners
- Instructional Ethics for Instructors/Educators
- Ethics related to EduTech Developers
- Ethics related to Information Capture and Management
- Ethics related to E-Content Development
- Ethics related to Tech Governance
- Ethics related Human-Centered Tech Solutions
- Ethics related to Tech Compliance and Complaint Management

5.1 Instructional Ethics for Learners

Instructional ethics for learners give its central focus upon the needs, rights and responsibilities linked to the learning community. This includes a wide spectrum of ethical considerations for promoting integrity, inclusiveness and due regard for the learning community with varying personal and educational qualities and demands. This category emphasizes a highly equity-based inclusive learning environment where intellectual autonomy and scope of personal development are not compromised and also ensures providing fair and enchanting educational encounters for the learners. Further, this prioritizes offering optimal and adaptive learning opportunities beyond individual differences. Besides these, it is highly imperative for the learners to maintain academic integrity, practice appreciable digital etiquettes and embrace respectful, sensible and responsible use of technology in the digital learning platforms. In addition, the learners should also be protected from information misuse, and harassments.

5.2 Instructional Ethics for Instructors/Educators

Instructional ethics for instructors serve to guide them in building an equitable and inclusive technology-enabled instructional environment. This involves treating all learners with equity and equality in terms of participation and accessibility to instructional content within tech-led learning settings thereby giving due regards for diverse learning needs and cultural sensitivity of the learners. Being objective, impartial and transparent to the learners with professional boundaries is also very important for offering productive and healthy instructional support and remediation. This also focus on professional ethics and intellectual property rights governing copyrights and appropriate practices for citing digital resources, thus promoting academic integrity. Further, safeguarding confidentiality and privacy of any dataset related to the learners is also an important consideration in this category.

5.3 Ethics for EduTech Developers

Ethics for EduTech developers focus on the norms and standards to be considered for the companies or organization that engage in the development of technology based educational solutions. These ethics essentially prioritizes the promotion of healthy boundaries for all its stakeholders comprising its employees, end-users and mediators of any form. In fact, the wellbeing of the users is to be kept at highest priority. The usability, affordability, accessibility, inclusivity, and adaptability of the digital products should be practically feasible for the users. Further, cultural sensitivity and diverse representation of the users are also to be considering when developing educational applications. The organizations should not pressurize its employees for the product development with keen focus on materializing the business alone. The employees should also be promised with healthy work ethics and norms in the smooth execution of these organizations. There should be appropriate and adequate mechanisms in place for handling incidents and responding to them. It is essential that they follow the legitimate industrial norms and standards put in place by the concerned authorities and regular auditing and assessment processes are to be ensured in practice. They should also refrain from unfair and exploitative practices of marketing.

5.4 Ethics related to Information Capture and Management

This category of ethical considerations throws spotlight on the capture and management of user data. Technology based digital solutions are made to provide adaptive learning experiences where difficulty adjustments and remedial actions are automated using artificial intelligence and machine learning by ways of algorithms. This in turn have both direct and indirect working on data related to the learners. In fact, customization of educational solutions are purely data driven. This demands for providing due considerations regarding what kind of data is being captured from whom for what purpose and how they are processed and managed. Adequate security, and confidentiality of the application user data being accessed and managed and safety of the user are to be ensured using robust protective mechanisms, obtaining informed consent from the user, minimization of data, and maintaining transparency when collecting and using the user data and at times of information security breaches if any (Zhai et al., 2021).

5.5 Ethics related to E-Content Development

E-content plays substantial part and is in fact the core of the digital learning platforms. It is ultimately the learning content that drives the technology led educational solutions. From this perspective, the learning content should be relevant, authentic, and appropriate for the learners. The e-content may be regularly updated to ensure accuracy. In addition, the technologies are used to supplement the traditional instructional process for offering immersive and enriching educational experiences in order to promote knowledge transfer, retention and application orientation among the learners. This also considers the cultural sensitivity and accessibility privilege for all learners. Further, compliance to data protection rights is also to be ensured. In addition, the e-content should be highly informative and devoid of exploitative or harmful content thus, promoting healthy development in learners.

5.6 Ethics related to Tech Governance

Tech governance is big area of concern. It is this aspect that ensures governance of data, measures of cybersecurity, fair and legitimate utilization of intellectual properties, digital rights, practices of sustainable environment, accessibility and inclusivity of resources, accountable, transparent and ethical administrative practices and leadership, and compliance to global standards. It governs the on-going practices and processes associated with digital technology governance and administration by ensuring regular auditing and assessments.

5.7 Ethics related to Human-Centric Tech Solutions

This category of ethical considerations gives due regard for the human component in terms of their wellbeing and dignity within the domain of technology driven educational applications, digital solutions and digital instructional practices that aid in offering ethically immersive educational experiences for the learners. This encourages practicing design principles centered on human wellness across dimensions such as digital health and safety. This also serves to ensure data privacy and confidentiality, and accessibility and inclusivity with fair educational opportunities with transparent and ethical considerations for all. Human-centric ethics further includes the considerations of social cultural aspects and the diverse user populations, thus promoting social cohesiveness in offering technology-based solutions for educational needs.

5.8 Ethics related to Tech Compliance and Complaint Management

The ethical considerations under tech compliance focus on adhering to legal regulations and frameworks, ethical design principles and practices, offering highly robust secure mechanisms for technological products and services, digital resources,

and user data access and management while embracing the digital divide and digital health among the end-users. Ethical action plans for non-compliance should also be designed and authenticated as part of the incident handling and response management system. Appropriate complaint tracking and management systems and grievance redressal mechanisms are also to be in place with due regard for all the stakeholders.

VI. FUTURE RESEARCH DIRECTIONS

There is no doubt that the emerging trends and technologies have been revolutionizing the educational experiences with their highly immersive content management and adaptive instructional support. They offer a great deal of strength to both the teaching and the learning community beyond space, pace, time, and geographical location with a rich set of digital resources and collaborative opportunities. However, they also bring in a lot of challenges in terms of confidential data, secured access to resources, inclusive and adaptive instructional practices, and henceforth. Further research works are essential to address the following aspects in offering technology-driven educational solutions:

- Ensuring transparency, confidentiality, and security mechanisms in digital educational suites
- Mitigating digital trauma and harassment, and addictive habits
- Embracing digital wellbeing and digital literacy
- Using ethical algorithmic practices and decision-making in application development
- Exploring neuroscientific implications of using digital educational solutions
- Developing eco-friendly technological practices in education

VII. CONCLUSION

Ethical considerations have due significance in promoting and managing socially responsible technology driven educational applications. As innovations happen in technological domain, challenges and limitations also continue to emerge and exist. This demands for effective integration of ethical principles and practices ensuring industrial standards and regulatory compliances both locally and globally. This helps in the smooth navigation of complex and challenging scenario that arise within the domain of education and the digital landscape, thereby protecting individual rights and collective wellness.

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