



Mobile phone technology and the commercialization of education: Knowing the Nexus, trends and Implication for Learning

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Abstract

The twenty-first century has given rise to a technological revolution where advanced mobile devices and intelligent applications have not only transformed daily life but also redefined the landscape of education. Mobile phone technology has penetrated deep into homes, communities, and schools, creating new possibilities for teaching and learning as well as linking education to broader processes of commercialization. Despite this, many educational institutions still rely on traditional integration models, which do not fully reflect the dynamic role of mobile technology. This paper presents a literature-based review and develops a conceptual framework aimed at analyzing the interrelationship between mobile phone technology and the commercialization of education. The findings from various studies show that mobile phones as multi-functional devices encourage communication, collaboration and personal learning and bring about a paradigm shift in educational practices. At the same time, their widespread use also promotes a market-oriented approach to education, raising important questions of equity, access and quality. The study concludes that mobile phone technology plays a dual role -on the one hand, it creates an innovative learning environment and on the other hand, it accelerates the commercialization of education. It is, therefore, necessary to have a critical dialogue on their balance so that the integration of mobile technology ensures effective learning as well as equitable and just educational development.

Keywords: Mobile Phone Technology; Education; Commercialization; Learning; Nexus

1. Introduction

Over the past two decades, mobile phones have increasingly become a fixture in educational settings. Today, most individuals carry mobile phones with remarkable computing capabilities, such as smartphones and e-book readers, showing to continuous advancements in mobile technology. This high level of computing power and portability, combined with wireless connectivity and context-aware technologies, makes mobile phones powerful tools for learning in both traditional classrooms and outdoor environments [1]. The integration of technological innovations into teaching and learning processes has been a recurring theme in educational technology literature since the 1980s. Technologies are frequently depicted as tools that offer solutions to educational challenges. They are closely associated with the emergence of new pedagogies and a renewed epistemological approach to the nature of knowledge and its construction [2]. Despite concerns about the potential negative impacts of internet access, social networks, and mobile device use on education [3]. Mobile phones have proven to be among the most cost-effective methods of educating young people. They serve as robust mechanisms for delivering a world-class learning experience to all students, regardless of their location [4]. Mobile technology enables educational institutions to capitalize on features such as flexibility, ubiquity, and portability, which are highly beneficial to both teachers and students in the digital age [5]. Educational technology companies are continuously developing innovative solutions to increase access to education for individuals who lack adequate educational facilities. mobile devices not only enhance engagement and flexibility but also contribute to the

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growing trend of market-driven educational models. Globally, about 57% of children aged 14–16 use smartphones for educational purposes [6]. The global mobile learning market, valued at USD 86.44 billion in 2024, is projected to grow to USD 109.64 billion in 2025, with a CAGR of approximately 26.8% [7]. Yet, less than half of students surveyed (43.9%) own a personal smartphone, with urban students enjoying greater access to additional devices than their rural counterparts [8]. Social media has also evolved into a significant learning tool, with many educators and students viewing it as an integral part of the e-learning experience.

In addition to the ability to disseminate information anytime and anywhere, social media platforms are invaluable resources for knowledge exchange on critical topics [9]. Educational technology firms play a crucial role in enhancing education through various technological advancements, particularly in addressing challenges such as accessibility and remote learning. Platforms such as eBooks and game-based learning apps have fueled the demand for a technology-driven student experience. Despite setbacks in venture investment, the educational technology sector is projected to be worth \$348.41 billion by 2030 [10]. These advancements have contributed to the growing appeal of mobile devices in education [11]. However, the increasing commercialization of education has significant and potentially harmful consequences for society. As education becomes more of a commercial product, the quality of education available often correlates with one's ability to pay. Every year, many students use educational apps to prepare for competitive exams and secure jobs in India. Consequently, there is a significant opportunity for educational technology firms to profit by offering courses for various competitive examinations. Unfortunately, in many cases, students feel misled or disappointed by the end of these courses. The commercialization of education poses a serious threat to equitable opportunities and limits access to education to those with financial means. If education continues to be commercialized, financial ability determines who has access to quality education, undermining the principles of freedom and equal opportunity¹¹. Additionally, the commercial competitive industry has driven manufacturers to continually introduce new, innovative features to their products [12].

This paper provides a comprehensive overview of mobile technology and the commercialization of education. The subsequent sections discuss the increasing integration of mobile phone technology in education, the concept of commercialization in education, the drivers and effects of commercialization, and the connection between mobile phone technology and commercialization. The paper also explores the implications of mobile phone technology integration for learning.

2. Literature Review

The commercialization of technological innovations is not a linear process but rather a flexible, continuous, and interconnected set of activities. As Gbadegeshin [13] emphasizes, “the USO commercialization process is not linear, but rather parallel, continuous or circular”, meaning that its success depends on adaptability and responsiveness to changing conditions. This perspective is highly relevant to the commercialization of mobile phone technology in education, where learning applications and digital platforms are continuously reshaped according to market demands and user expectations. Gbadegeshin¹³ further notes that “the commercialization process of USO can be termed as a transformation process, where the business opportunity of a new technology or knowledge is exploited,” highlighting that the real value of innovation is realized only when it is transformed into economic and social opportunities. Similarly, Mustar et al [14] argue that institutional support and an entrepreneurial culture are essential to the successful market integration of university-based innovations. Vohora et al [15] also identify four critical milestones in the spin-off process: opportunity recognition, entrepreneurial commitment, threshold of credibility, and threshold of sustainability illustrating that leadership and collaboration are as crucial as innovation itself. Shane [16] adds that the commercialization of university innovations represents a structured process of transforming knowledge creation into marketable products and services. In this context, mobile learning mirrors these dynamics, as it has reshaped traditional education into both a product and a service. Online courses, virtual classrooms, and educational apps exemplify this transformation, demonstrating how mobile technology has moved education beyond knowledge-sharing into a market-driven domain where innovation is directly linked with economic opportunities and global competition.

The impact of the Fourth Industrial Revolution on education has been profound, with mobile phone technology emerging as a central player in transforming classroom dynamics and educational methodologies. With increasing access to smartphones, they are proving to be extremely useful in the field of non-formal education. At the same time, their use for classroom activities by students in undergraduate courses is also increasing in formal education. Given the increasing use of mobile devices and the expansion of mobile connectivity to 5G technology, it is estimated that around 5 billion people will access the Internet from mobile devices by the year 2025. [17]. Technology in education has also been influenced by market-driven approaches, where mobile devices and applications are increasingly positioned as commercial products and services [18]. Marcial [10] highlights the significant influence of this technology, noting both its potential benefits and the concerns it raises regarding equity and commercialization. Research by Rice and Pearce

[8] revealed a positive correlation between the integration of mobile technology in classrooms and enhanced academic performance, suggesting that mobile devices can foster adaptability among students. Moreover, Bajpai & Sharma[12] emphasized the potential of smartphones equipped with educational materials to extend learning opportunities to disadvantaged areas, particularly India. Numerous nations including China, Singapore, Taiwan and Malaysia have developed appropriate infrastructure to promote the use of mobile devices in diverse fields of education[19]. Language learning has been a major area of use of mobile devices in developing countries[20]. As well as investing in infrastructure development, it is important for governments and educational institutions to consider how successful teachers are in using mobile technologies in classroom teaching[21].

However, research on mobile technology usage in classrooms over the past decade has produced conflicting outcomes. An analysis of research papers and newspaper articles indicates that while mobile technology has expanded access and opportunities in education, equity challenges remain. For example, a 2025 survey in Telangana reported that 77% of men above the age of 15 owned a smartphone, compared to only 68% of women, highlighting a gender gap in digital access [22]. Similarly, initiatives in rural India that provide free digital content in low-bandwidth areas for government school students reflect efforts to ensure equal opportunities [23]. In terms of quality, recent studies suggest that mobile learning tools improve students' learning outcomes and critical thinking skills. Johannsen [24] found that the system quality and information quality of mobile learning applications directly influence learner satisfaction and effectiveness. Thus, mobile technology affects both equity and quality dimensions in education on one hand expanding opportunities for marginalized groups, and on the other reshaping the depth and quality of learning experiences. Despite substantial investments in educational technology, a 2015 OECD report suggested that student performance in key subjects has not significantly improved in nations that heavily rely on this technology. Interestingly, some Asian countries that have less reliance on new technology do not necessarily exhibit lower academic outcomes. This raises questions about the efficacy of technology in education and whether its benefits are as widespread as often claimed. HolonIQ[25] underscores the significant financial impact of technology companies in the education sector, with global spending on education and training projected to reach USD 10 trillion by 2030. This projection highlights the extensive influence of companies providing hardware and software for educational purposes. McCarthy et al[26] further illustrate how these organizations adapt their offerings to align with technological trends, often providing a mix of free and paid services designed to support teaching, learning, administration, and strategic planning.

From the above discussion, it is evident that the literature on mobile phone technology and the commercialization of education often adopts a narrowly defined focus. The commercialization of technological innovations is a flexible and dynamic process, dependent on adaptability and transformation rather than linear progression. In education, mobile phone technology reflects this trend, as digital platforms and applications continuously evolve in response to market demands. . While examining the role of mobile phone technology in the commercialization of education, particularly in understanding the nexus, trends, and implications for learning, the findings remain mixed and inconclusive. The nexus between mobile phone technology and commercialization appears to be beneficial for education in many respects but also presents barriers, particularly for deprived children. One significant finding from the literature is the positive correlation between mobile technology integration and academic performance. Studies, such as those by Rice and Pearce [8], suggest that students with access to mobile devices tend to exhibit higher levels of innovativeness, alertness, cognitive skills, and technological understanding. This indicates that mobile technology can be a valuable tool for enhancing learning outcomes and fostering adaptability among students in an increasingly digitized world. However, alongside these benefits, the literature also raises critical questions about equity and commercialization. Marcial¹⁰ highlights serious concerns regarding unequal access to mobile technology among students, which can exacerbate existing educational disparities. Furthermore, the commercialization of educational technology creates ethical concerns about the commodification of learning materials and the possibility of profit-driven motivations influencing educational practices.

3. Research Methodology

For this conceptual review paper, a qualitative research design was used to delve into the complex dynamics of mobile technology and commercialization. The study technique was based on a comprehensive literature assessment, which served as the foundation for establishing a sophisticated grasp of the topic. An in-depth review of many research articles and press publications yielded insights into the multifaceted features of mobile technology and its commercialization. The secondary data gathered from these various sources supplied a wealth of knowledge, providing useful viewpoints and empirical evidence to inform the conceptual analysis conducted in this study.

4. Increasing Integration Matrix of Mobile Phone Technology in Education

Mobile technology is defined as the use of electronic devices or platforms, such as social media, multimedia, and mobile phones. With the use of mobile technology in education, the educational landscape has improved. Mobile learning is a learning technique that uses technology to complete the entire curriculum while allowing students to study quickly and efficiently[27]. The integration of mobile devices into the curriculum provides learners with increased flexibility in accessing learning content and information resources to fit their lifestyle[28]. Hence redefining how teaching is performed in traditional classrooms. The lifestyles of people are increasingly reliant on mobile devices. With more individuals using mobile devices for education, there is a great opportunity for mobile learning to improve educational results. Mobile devices can provide a plethora of information and assistance for a wide range of educational, health, and employment needs. E-learning providers can provide access to a wide range of services and programs, including online courses, online tutorials, relevant exercises and evaluations, virtual field trips, and other services, by utilizing mobile devices and applications [29]. When mobile technology is integrated into classrooms, it is simple to develop engaging and interactive online and interactive learning resources. This contributes to better learning outcomes for young people [30],[31]. When students can select technological tools to assist them in accessing information promptly, analyzing a and synthesizing the material, and delivering it professionally, they can integrate technology effectively. Technology should become an intrinsic component of how the classroom operates, similar to all other teaching tools [32].

One of the prerequisites for teachers in the twenty-first century is the ability to successfully incorporate instructional technology into teaching practices. Despite significant investment has been made on technology in schools, the training and professional development of teachers for proper integration of technology and pedagogical implementation does not reach the desired level[33]. Initially, technology integration in education was characterized as the use of technology only in classrooms. It is now described as a continuous and sustainable process that contributes to student learning. However, at this time, the issue of how to realize the integration process that can contribute to student learning is at the forefront. Understanding and implementing a complex, multidimensional, dynamic process such as technology integration is difficult, and various models have been produced to date[34].

The Technology Integration Matrix (TIM) presents a framework that helps in understanding and focusing on how technology can be used to enhance the quality of education. It includes five important and interconnected learning-environment features: Active, Collaborative, Constructive, Authentic and Goal-directed. These characteristics are associated with the five stages of technology integration: Entry Adoption Adaptation Infusion and Transformation. When these five learning properties and five technical integration levels are combined, it creates a 25-bracket matrix, which is detailed in Table No. The interpretations of TIM are equally applicable to both online teaching and face-to-face teaching. It was developed by the Florida Center for Instructional Technology (FCIT) in 2005 and is currently in its third edition (2019).

Table 1 Level of Technology Integration

 Entry Teachers start presenting the course material to the students through techniques.	 Adoption Teachers guide the students in the traditional and systematic use of technological tools.	 Adaptation Teachers guide and inspire students to discover and use technological resources.	 Infusion Teachers create the learning environment, while students choose the technological tools themselves.	 Transformation Teachers encourage students to use technology in innovative ways so that they can perform high-level learning activities that would not be possible without technology.
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Source: LibGuides: Technology Integrated Lesson Plan Development: Technology Integration Matrix (TIM), (2021)

There are numerous matrixes (Figure 1) in which technology is integrated into education. Only a few of these matrixes are described here, although new trend technology tools and concepts arise daily.

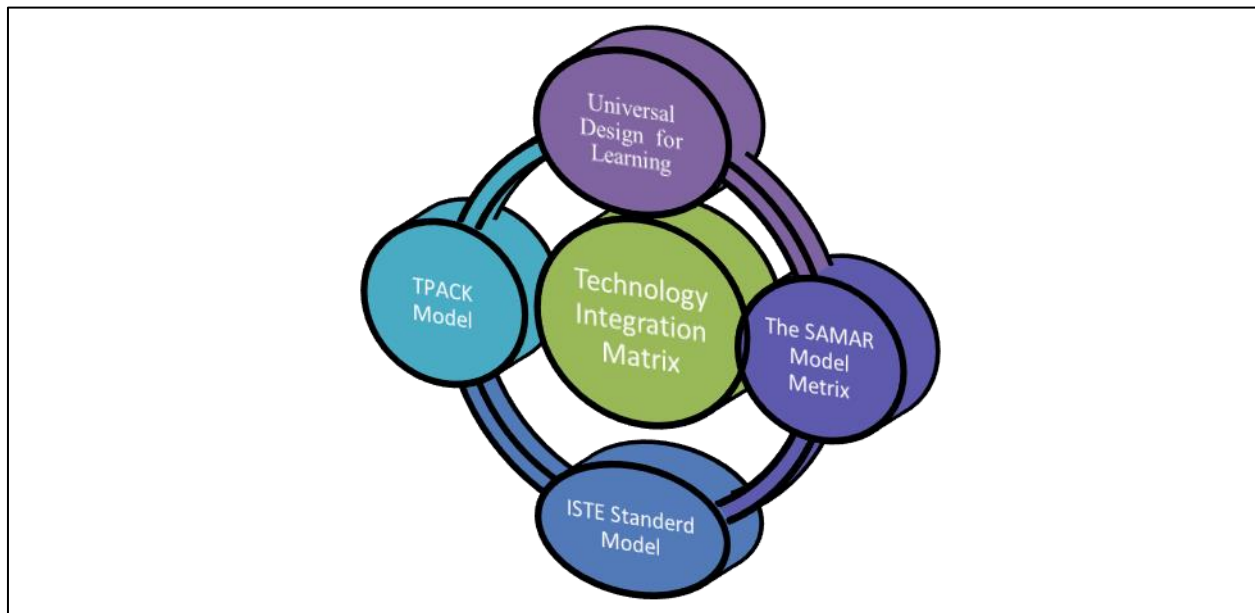


Figure 1 Technology Integration Matrix. Source: Own elaboration

In this section, the matrix and definitions in the literature regarding technology integration into learning-teaching processes are examined.

4.1. Universal Design Learning and Technology Integration Matrix

According to the CAST.org website, "UDL is a framework for guiding the design of learning environments that are accessible and challenging for all." Finally, the principal goal of UDL is to enable learners to become "expert learners," who are clear-headed and motivated, rich in knowledge and resources, as well as strategic and goal-focused. UDL pays special attention to providing each student with the opportunity and choice to participate. The TIM emphasizes choice as a technique for developing higher-order cognitive abilities. As a result, both frameworks provide quite identical recommendations.

4.2. SAMAR Model and the Technology Integration Matrix

Ruben Puentedura developed the SAMR model. SAMR is an abbreviation that stands for Substitution, Augmentation, Modification, and Redefinition. Technology is utilized to enhance a task in the first two levels, and technology is used to transform a study into the second two. Like TIM, it is not believed that teachers will work up to the "highest level" and then regularly teach at that level for the rest of their careers. Instead, it is recognized that lessons have a proper place at every level. The TIM emphasizes that when introducing a new topic or technology, the entry or Adoption levels are frequently appropriate before classes at higher levels. A similar idea applies to the SAMR model, where "SAMR ladders" are built to increase the level of tasks throughout a series of lessons[28].

4.3. ISTE Standards Model and the Technology Integration Matrix

ISTE, the International Society for Technology in Education, has published guidelines for a wide range of stakeholders, including students, educators, administrators, and coaches. These are parallel sets of standards, so you have the ISTE Standards for Educators and the ISTE Standards for Students, both of which cover the same topics and may be used interchangeably. The ISTE standards are vast, and they include a plethora of tools to help with efficient technology integration [28].

4.4. TPACK and the technology integration matrix

TPACK is a well-known framework for technology integration. Its origins can be traced back to Lee Schulman's work in the 1980s when he observed that knowing pedagogy and the substance of their teaching area as independent disciplines was insufficient. Teachers must comprehend the overlap of those two areas-the pedagogical practices particular to their

targeted subject area-to be successful. The technology integration matrix, like TPACK, was created in the early 2000s and was initially published in 2005. Both models were developed in response to the educational community's demands during a period when technology was being widely utilized without adequate preparation [28].

To summarize, the increasing integration of mobile phone technology in education implies a paradigm shift in how learning is conceptualized, delivered, and experienced. Educators and educational stakeholders may develop inclusive, personalized, and engaging learning environments that equip students to flourish in the digital age by capitalizing on mobile technology's revolutionary potential. However, realizing the full potential of mobile technology in education necessitates tackling issues such as digital fairness, privacy, and pedagogical integration, as well as cultivating an environment of creativity, collaboration, and lifelong learning.

5. Concept of Commercialization of Education

The dictionary definition of 'commercialize' is to make a commercial, to make a matter of trade, or to be subject to commercialism. To use a commercial or business manner, to use or exploit primarily for profit, particularly at the expense of quality, or to imbue with commercialism. Thus, the term commercialization implies that profit is the primary motivation behind any endeavor [35]. The commercialization of education is essentially a process in which educational institutions are owned and run by the private sector, and the investment made in it is for the purpose of making profit. The decade of the 2000s have been associated with processes of expansion, privatisation and internationalisation of higher education. These changes are reflected in various government policies, including reduction in government support, private ownership and management of higher education (both for-profit and not-for-profit), and entry of foreign educational providers. The commercialization of education is a relatively new trend in India, resulting from the country's educational reform over the last two decades. It manifests mostly in the mushrooming of private schools, public schools, and private colleges, as well as at the higher education level. In some ways, it has introduced a monetary component to the qualifications of attending private schools and public and private colleges [36]. Owing to the commercialization of education, there are many problems, particularly for students who do not fall into the category of reservation, because they will have to pay higher fees than usual, and the course fees for admission to private college courses will be higher than their own. They pay according to their desires therefore only financially rich students are admitted to the course, whereas promising candidates are denied entry owing to their inability to pay the course costs. In such a case, students must overcome their reservations and enroll in another course [37]. The impact of education commercialization on students is that it changes not only the quality of education but also the perceptions of educational institutions in general.

The commercialization of education refers to the increasing integration of market concepts and profit objectives into the educational sector, which profoundly alters the character and dynamics of learning institutions and practices. This phenomenon takes many forms, ranging from the expansion of private schools and for-profit colleges to the proliferation of online learning platforms and corporate-sponsored educational programs. In a commercialized education system, education is frequently seen as a commodity to be purchased and sold, resulting in increasing institutional competition, the monetization of educational material and services, and the prioritization of market-oriented goals over educational values and principles.

Furthermore, the influence of corporations and businesses in shaping education policy, curriculum development, and funding decisions contributes to the commercialization of education, as corporate interests frequently prioritize profit generation and market expansion over educational equity and quality. While commercialization can lead to innovation, efficiency, and choice, it also creates substantial issues and criticisms about educational access, equity, and social justice. Balancing market competitiveness with educational principles necessitates careful consideration of the social, economic, and ethical implications of commercialization, as well as a commitment to promoting inclusive, equitable, and high-quality educational opportunities for all students.

6. Commercialization of Education: Factors and Effect

The commercialization of education refers to the increasing influence of market forces and profit motives in the field of education:

6.1. Factors

Market Demand: The growing demand for education, driven by the need for higher qualifications and skills in the job market, encourages private institutions to offer a wide range of courses. In 2022, the Indian school market was worth USD 43.5 billion. In the future, the IMARC [38] As per estimates, the market is expected to reach USD 87.3 billion by

2028, with a compound annual growth rate (CAGR) of 12.1 per cent over the period 2023-2028. India also hopes to increase its gross enrollment rate (GER) from 27% to 50% by 2030. In an August interview with the media, Union Education & Skill Development Minister Dharmendra Pradhan stated that the government would issue new guidelines to allow the admission of foreign businesses into the education industry.

Profit Motives: Education has become a lucrative industry, attracting investors and entrepreneurs looking to make a profit through tuition fees, coaching classes, and related services. The Indian Coaching classes industry has developed tremendously as a result of the rising student population across the country and the evolution of new courses/curricula and competitive exams. Private coaching sessions provide training for nearly all disciplines, classes, and areas of study, including school and college levels, civil services tests, and entrance exams for professional courses. Students are also prepared for international admission examinations and language proficiency exams through coaching classes. The Indian coaching market has traditionally been distinguished by the presence of various players (mainly-, city- or course-specific players), resulting in a fragmented market [39].

Globalization: As a result of globalization, India faces strong competition in the education sector on a worldwide scale. Another factor contributing to the commercialization of education in India is the increase in the number of private educational institutions as the population grows. The number of students pursuing secondary education in India is steadily expanding, creating strong opportunities for educational institutions with profit-making motives[40]. The global expansion of education providers, including international universities and online platforms, has intensified competition and commercialization.

Government Policies: The Indian government encourages private sector involvement in education as a way to reduce the burden on public budgets. The new education policy promotes the unfettered commercialization of education. It not only allows privately owned schools and colleges to collect fees but is also in line with the dictates of the World Bank, IMF, and WTO recommendations. These international organizations have recommended that the government should not regulate private institutions since they are “not profit or public-spirited bodies.” As such, the new education policy is meant to exacerbate the privatization of the education system in the country [41].

6.2. Effects

Increased Access: The commercialization of education has both positive and negative effects on education. Although private schools and colleges have more tuition and different requirements, they have assisted many students who were unable to overcome the high entry barriers of government institutes. There are numerous causes for this, including reservations, limited seating, and insufficient infrastructure. Except for a few, there are government institutions to which one can aspire Shukla[42] Commercialization can lead to greater access to education, as private institutions often expand educational opportunities beyond what public institutions can provide.

Quality Concerns: The commercialization of education has an impact on educational quality. Educational institutions aim to maximize their earnings by increasing the number of students per class. Overcrowded courses reduce educational quality because professors are unable to provide individual attention to each student. Students are also unable to concentrate on their studies. The entire globe is currently discussing the personalization of education, which will contradict this goal [43]. In addition, commercialization can sometimes compromise the quality of education, as profit motives may prioritize enrolment numbers over educational outcomes.

Higher Coast: Education is becoming increasingly expensive as a result of the commercialization of education. Many private institutions charge exorbitant fees, making them inaccessible. With the commercialization of the education industry, students have essentially become consumers [44]. If education is permitted to be commercialized, most educational institutions will see it as a profitable venture. Educational institutions aim to extract as much money from each student as possible to maximize their profit margins. Other linked industries, such as publishing, transportation, and accommodations, may follow suit. As a result, education become increasingly costly and may be out of reach for many children [43].

Innovation: Schools and universities are required to respond to society's social and economic requirements more than ever before, such as promoting graduate employability, contributing to economic growth and local development, assisting innovation, and stimulating the formation of new businesses[45] On the positive side, commercialization can drive education, such as the development of online learning platforms and new teaching methods.

The commercialization of education, fueled by market demand, economic motives, the rise of globalization, and government policies, has profoundly altered the educational environment. In India, the education market is expanding

rapidly, with the government intending to increase gross enrolment and attract international investment. This expansion is driven by increased demand for education, notably in the form of private coaching sessions and online learning platforms that cater to a diverse student base. However, commercialization raises questions regarding educational quality, accessibility, and affordability. While private colleges may provide more educational choices, they sometimes charge exorbitant fees, which raises prices and creates financial barriers for many students. Furthermore, commercialization might jeopardize educational quality by putting profit above pedagogy, resulting in overcrowded classrooms and standardized teaching approaches. Despite these limitations, commercialization has the potential to spur educational innovation, resulting in the creation of new teaching methods and technologies. Overall, the commercialization of education involves a complex interaction of factors and effects, with substantial implications for educational access, quality, and equity in India and beyond.

7. Integration of Mobile Phone Technology and the Commercialization of Education

Commercialization of the new economic context, information, the growing role of innovation, and the significance of technological integration [46] have changed the traditional balance between customers and suppliers. The combination of mobile phone technology and the commercialization of education resulted in the creation of new teaching methods and practices [47]. They are important in providing science-based solutions to overcome teaching-learning problems and nourishing the competitiveness of EdTech firms. It begins with a dynamic technical shift brought about by innovation and is followed by technological integration and standardization [48]. Linking mobile technology to the possibilities of education is beneficial for all age groups, as it reinforces the potential of real and scientific research methods, which may include study outside the classroom. The main reason for this is that mobile technology has become a part of the daily life of most students today [49]. In addition, the rise of online platforms and massive open online courses (MOOCs) has enabled educational institutions and content providers to reach a global audience. They can offer courses and educational materials for a fee, creating new revenue streams [50]. Thus, the proliferation of educational technology startups led to the development of innovative products and services such as learning management systems, interactive e-books, and personalized learning apps. These startups often seek investment and generate revenue through subscription models or sales to schools and universities [51]. Educational institutions are increasingly adopting digital textbooks, content, data analytics, certification and credentialing, virtual reality and augmented reality, gamification, and resources. This shift reduces the cost of publishing and distribution, making educational content more commercially viable. The purpose of digital marketing is to reach out to potential clients by using educational information that they are interested in. Content is typically posted to a website and then disseminated through social media, email marketing, search engine optimization, or pay-per-click campaigns. Blogs, eBooks, online courses, infographics, podcasts, and webinars are considered to be the major mediums of content marketing [52]. To summarize, the use of technology in education has provided an abundance of business prospects. However, it raises concerns about access, equity, data privacy, and educational quality. The education business faces a challenging problem in balancing the benefits of commercialization with these concerns.

8. The Nexus between Mobile Phone Technology and the Commercialization of Education

The development of any nation is mostly determined by the quality of its educational system and technological innovation. Today, the paradigm change in education from service to business is a growing source of concern [53]. They additionally alter educational and learning expectations, demands, and possibilities. This dynamic setting is increasing the demand for new information and skills. As a result, the amount of material that must be mastered is rapidly increasing and frequently becomes obsolete at the same rate. All of these considerations highlight the need to deliver education and training in a distributed manner [54]. Another way mobile technology has benefited education is by making a wide range of instructional resources available. There are several applications, websites, and online courses available to assist kids in learning subjects ranging from arithmetic to history to foreign languages [55]. These tools are frequently free or inexpensive, making them available to anyone with a mobile device and an internet connection. Mobile phone technology has gradually become among the most important pillars of the economy. Mobile telephony stimulates economic growth and its impact has been observed to be almost twice as high in developing countries as in developed countries [57]. They contribute to economic progress by encouraging company development and expanding educational market access. Mobile phones, as technology progresses, not only allow users to make voice calls but also provide simple access to a breathtaking selection of creative applications. They establish opportunities for people to acquire market information, monitor health care, transfer money, and encourage education in developing countries.

The nexus between mobile phone technology and the commercialization of education is a complex and dynamic relationship that has significantly shaped the business landscape. AI combined with current well-validated digital educational technologies could provide a new opportunity for disruption [57]. The market is now being driven by the

increasing penetration of digitalization trends in the education sector, as well as the growing popularity of IoT-based smart devices. Furthermore, the increasing popularity of science, technology, engineering, and mathematics (STEM)-based education apps is propelling market expansion. The increasing integration of education apps with various complex technologies [58]. Such as Figure 2, shows, gamification & virtual goods, internet connections, content providers, mobile learning apps, Books & Digital textbooks, online tutorials & coaching, online course platforms, mobile devices, subscription models, language learning apps, corporate training & professional development, attractive educational gadgets, educational content marketplaces, and learning management systems.

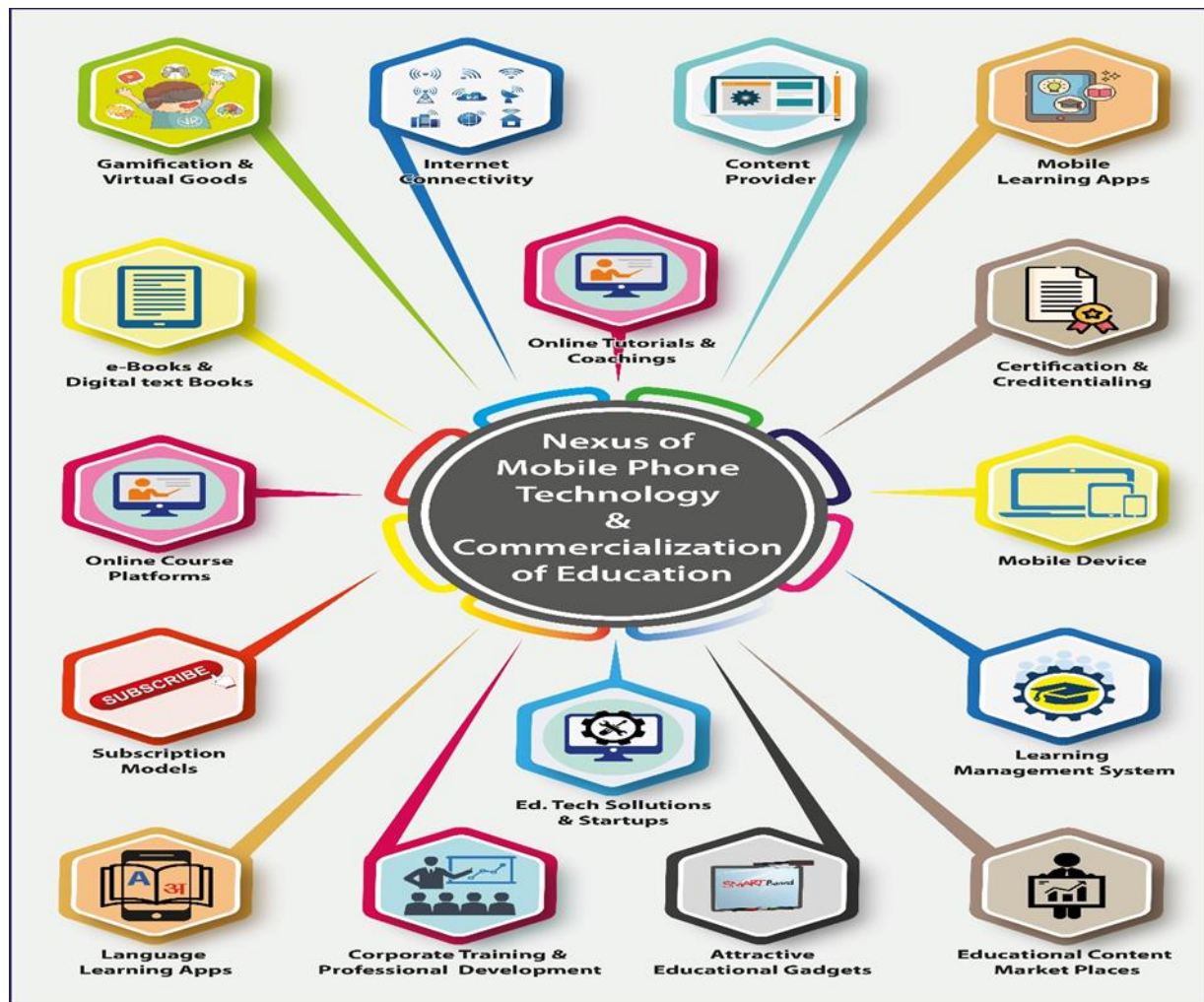


Figure 2 Example of nexus between mobile phone technology and commercialization of Education. Source: Own elaboration

Furthermore, mobile phone technology has played an important role in the growth of skill development and certification programs, especially in the field of online education. With the growth of e-learning platforms and digital credentialing systems, people may learn new skills and knowledge quickly and economically from the convenience of their own mobile devices. In terms of mastering a programming language, learning a new instrument, or gaining professional certification, mobile technology has made lifelong learning more accessible and achievable than ever before. Educational companies capitalize on this potential to commercialize their offerings by charging for access to premium content, certification examinations, and other learning resources. The demand for skill development and certification in an increasingly competitive employment market has spurred the commercialization of education. In addition to offering educational content, mobile phone technology is an effective marketing and distribution platform for educational institutions and enterprises. Organizations can reach a global audience by using mobile applications, social media platforms, and digital advertising to market their courses, programs, and educational products. The capacity to reach out to prospective learners at any time and from any location has allowed educational companies to rapidly extend their reach and consumer base. Furthermore, the rise of freemium models, in-app purchases, and subscription-based services has provided new revenue streams for educational firms, accelerating the commercialization of

education. However, the development of marketing and monetization tactics has generated concerns about the commodification of learning and the preference for profit over pedagogy.

The nexus among all of these factors is found in their collaborative and complementary functions within the greater commercialization of education and mobile phone technology. They collaborate to build a comprehensive learning environment that brings together students, educators, content creators, and technology to promote effective learning experiences.

9. Trends in Mobile Phone Technology Integration and Implications for Learning

The learning model has changed dramatically in recent years. The way students are taught today is vastly different from how they were taught a few decades ago. Mobile phone technology has influenced how education is given and received in a variety of ways [59]. Mobile learning has also arisen as a new technological achievement and educational trend that offers numerous options to both teachers and learners [60]. As a teaching-supportive tool, mobile phones offer many advantages in the education process. They not only increase individual participation in teaching-learning activities but are also useful as supplementary learning tools. At the same time, they facilitate planning and management of learning and students accept mobile applications as a mandatory prerequisite [61]. Mobile technology developments in education have influenced schools and universities to use the latest educational technology to improve the teaching and learning process [59]. Mobile phones and PDAs are the most commonly used mobile learning devices, but they may be superseded in the future by new developing technologies. Mobile learning most frequently helps students in professions and applied sciences, followed by the humanities and formal sciences [62]. Adapting e-learning systems to new trends such as mobile apps has made access to digital education more convenient and helped in faster adoption. Additionally, special learning resources such as animation, games and AI-based systems have been created for the purpose of edutainment only. Technology-based innovations have contributed to making the learning process seamless and effective across different age groups and disciplines. The importance of data aspects and the application of analytics to learning are important but often underestimated aspects of educational technologies [63].

The following list of the top mobile technology developments (Below Table no-2) that will shape learning shortly may be useful for teachers, students, and mobile software developers. Examine the list of major trends to learn something new and generate new ideas [64]. A successful e-learning program user interface should be built on minimalism, content visualization, and learning optimization. The following are the main design trends in education.

Table 2 Top Education App Design Trend

Artificial Intelligence (AI)	AI assists teachers in providing individualization and invigorating the learning process. In the virtual classroom, AI-powered chatbots can serve as teacher assistants.
Augmented Reality and Virtual Reality	AR and VR technology are used to create the most modern EdTech apps. It increases engagement and works especially well with children. Imagine studying without images made by your imagination, yet you can see it all.
Content visualization	Learning platforms' content visualization and interactivity boost user attention and engagement. Designers of educational technology attempt to replace lengthy texts with high-quality infographics and videos
Edtech minimalism	When working on educational technology apps, designers stick to simple interfaces with open areas and clear limits. Complex shadows and textures are replaced by a few accent colours. Designers use the motto "less is more" when creating online and mobile applications.
Gamification	Game aspects are particularly common in educational technology design - educational apps designed with games in mind guarantee a high degree of interactivity, motivation, and engagement.
Personalization	Allowing users to customize the platform interface is a trend in UX application design. This trend is also extensively exploited in the development of e-learning apps.
Dark mode.	This is also an early general trend for app design in 2023, although it is actively used in the development of educational apps. Currently, approximately 82% of smartphone users find dark mode useful and utilize it daily. They can usually change the brightness, colour tones, shutdown times, and other settings.

Source: <https://shorturl.at/hkr23>

10. Discussion

In this article, we attempt to provide a critical examination of a reality that is too prevalent in today's educational context, namely, the usage of mobile phone technology and the nexus between the commercialization of education. The levels of technological advancement and education in each nation significantly impact its development. Education is the most effective and efficient method of instilling fundamental behavioral changes in students or society. It is a priceless tool for the nation's social, cultural, and economic development. In the classroom, mobile phone technology refers to a wide range of applications and gadgets meant to aid students with unique accessibility needs. Effective technology integration must take place throughout the curriculum in ways that research shows deepen and improve the learning process. It must support four important components of learning in particular: active engagement, group participation, frequent interaction and feedback, and connectedness to real-world experts. Mobile technology has a dramatic impact on education, transforming the way we teach and learn. Students and instructors have new tools to enhance the learning experience because of mobile technology's flexibility, access to resources, communication, collaboration, and engagement. As technology advances, we may expect many more educational breakthroughs that will change how we study for years. The current trend in mobile phone technology signifies a shift towards more flexible, participatory, and accessible education, but these trends have also provided several economic opportunities. However, it raises concerns about access, equity, data privacy, and educational quality. Balancing the advantages of commercialization with these issues is a difficult task for the education business.

11. Conclusion

This study clearly indicates that mobile phone technology has significantly expanded access and opportunities in education and has presented the quality of learning in a new form. Various research findings suggest that mobile devices enhance student engagement and learning outcomes; however, inequalities still exist based on gender, rural-urban, and socio-economic factors. Additionally, the nature of education is rapidly becoming market-oriented, which is leading to significant economic implications at the global level. This situation underscores the need to establish a balance between technological innovation, equality, and quality in educational policies. It is essential for educational institutions and policymakers to strategically plan and properly integrate mobile technology into the curriculum. This requires identifying the technical needs of students and teachers, selecting appropriate tools and programs, and aligning technological initiatives with broader educational goals. Additionally, investing in infrastructure to ensure reliable access to devices, internet connectivity, and adequate training and support for teachers should also be a priority. The curriculum should be redesigned in such a way that mobile technology encourages active participation, collaboration, feedback, and real-life connections. To ensure equity, it is also necessary to provide devices and internet access to disadvantaged students and to offer support for students with special needs. Furthermore, clear policies and regulatory compliance for data privacy and security are mandatory, along with ongoing review and development to maintain the quality of educational content available on digital platforms.

Ultimately, it is extremely important to balance educational excellence with the economic opportunities generated by commercialization. Mobile technology has immense potential to transform education into a global and market-oriented sector, but it also comes with challenges that demand renewed attention to inclusivity and quality. Since this study was based on secondary data, future research should incorporate classroom-based empirical evidence to conduct an in-depth analysis of the long-term socio-economic impacts of mobile learning. Keeping these aspects in mind, mobile technology can be utilized in a way that empowers teaching and learning while also ensuring equity, justice, and high educational standards.

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest to be disclosed.

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