

An Efficient Pragmatic Approach to Digital Technology in the Education World

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Abstract

Technology is a foremost factor in all domains of our daily life. Education with or without digital technology was an old debate; nevertheless, it is the need of the hour in the current era. Digital technology provides more opportunities for all levels of learners to learn at their ease. Still, there are a lot of pros and cons in this scenario. This article proposes a framework that emphasizes the merits of digital technology usage and converts the demerits into innovative practice in the Education world. In this, the learners are motivated with advantages like growing with contemporary ability, spontaneous learning, and preparing for the future. However, in this framework, the disadvantages, like a distraction, discouraging creativity, etc., are overcome by renovating them into a helpful progression. Gamification is taken as a challenge elucidation to overcome the above-said drawbacks. Furthermore, this structure highlights the role of technology in amplifying holistic education that trains learners.

Keywords: Digital Technology, Higher Education, Online Learning, Gamification

Introduction

Digital technology refers to the use of electronic devices, computers, and digital media to store, process, and transmit information. It encompasses an extensive scope of tools and applications, that covers computers, smartphones, the internet, social media, and digital audio and video. Digital technology has a notable impact on society and changed the way we live, work, and communicate. Some of the ways digital technology is used in society includes:

- **Communication:** Digital technology has made it easier and faster to communicate with people around the world through tools like email, instant messaging, and social media.
- **Education:** Online learning platforms and digital resources have made education more accessible and convenient for people of all ages.
- **Business and commerce:** Digital technology has transformed the way businesses operate, allowing for faster and more efficient communication and transactions.
- **Entertainment:** Digital technology has revolutionized the entertainment industry, with streaming services, video games, and online content providing new ways for people to access and consume media.
- **Healthcare:** Digital technology has been used to improve patient care and streamline healthcare processes, such as electronic health records, remote monitoring and telemedicine.

- **Governance:** Digital technology has also been used to improve transparency and accountability in government by making public data more accessible and providing citizens with more ways to engage with government services.

Figure 1: Digital Technology for Society



These are just a few examples of how digital technology has been used in society. However, the usage of technology also carries some negative impacts such as privacy concerns, addiction to technology, and the digital divide.

Digital technology has a remarkable consequence on higher education, where it changes the students' learning perspective and institutions deliver format. Some of the ways digital technology is being used in higher education include:

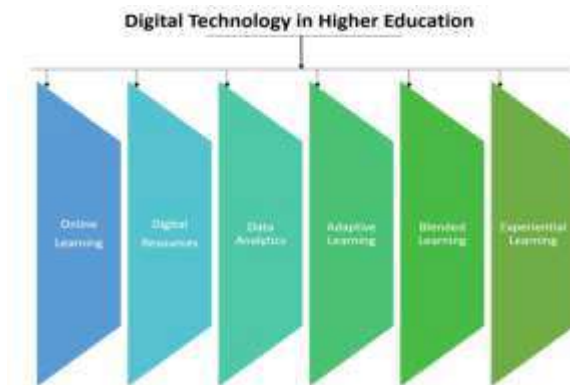
- **Online learning:** Many colleges and universities now offer online courses and degree programs, which allow students to complete their education from anywhere and at their own pace. Online learning platforms such as Blackboard, Canvas, and Zoom have become popular for synchronous and asynchronous teaching and learning.
- **Digital resources:** Digital resources such as e-books, videos, and interactive simulations are used to supplement traditional classroom instruction and anticipate students with extra opportunities to prospect and learn on their own.
- **Collaboration and communication:** Digital technology has made it easier for students to

collaborate and communicate with each other and with their instructors. Platforms like Slack, Microsoft Teams and Google Classroom have become popular for group work and online discussions.

- **Data and analytics:** Digital technology has also provided institutions with more data and analytics tools to help them better understand student behavior and success, and to make more informed decisions about instruction and program development.
- **Adaptive learning:** Adaptive learning technology uses data and machine learning to personalize instruction for individual students, providing them with feedback, resources and activities based on their positives and negatives.
- **Blended Learning:** Fusion of face-to-face and online learning is known as Blended learning that has become increasingly popular in higher education.

The following Figure 2 depicts the impact of digital technology on higher education.

Figure 2: Impact of DTHE



While these are some of the ways digital technology is being used in higher education, it also brings challenges such as digital divide, access to technology, and digital literacy. It is important for institutions to ensure that digital technology is used in a way that supports student success and enhances the overall learning experience.

Digital technology has become increasingly important in higher education as it allows for greater flexibility, accessibility, and collaboration. Online and distance learning programs, for example, make

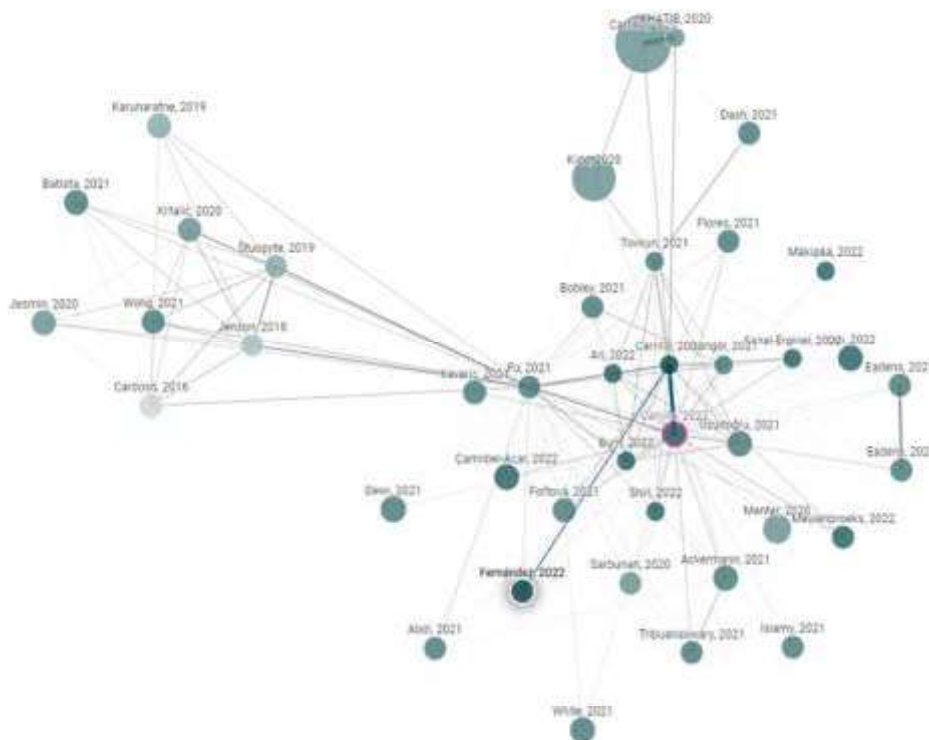
education more accessible to students who may not be able to attend traditional brick-and-mortar institutions. Digital tools such as learning management systems and virtual reality enhance the classroom experience, making it more interactive and engaging. Additionally, digital technology supports collaboration and communication between students and teachers, allowing for a more personalized and effective learning experience. Overall, digital technology has the potential to improve the eminence and accessibility of higher education.

- Objectives of this article
 - Identify the demerits of Education through Digital Technology
 - Overcome the demerits by implementing some specific techniques using Digital Technology

The succeeding section briefs the literature review that is divided into two different categories :

- Digital Technology used for teaching in Higher Education
- Digital badges in Higher Education

Figure 3: Related Article for Online Teaching using Digital Technology



The following are the articles that emphasize the challenges in online teaching and learning.

The pedagogical, institutional, and national responses to Portugal's March 2020 school and university closures are the primary focus of this paper [1]. A brief explanation and research of the capability and responses to the crisis are included. The article comes to a close with a debate on the imputation for teaching and teacher education in

these uncertain times, certainly with regard to the role of practice and mentoring in a practicum as "real practice". This article discusses how a California liberal arts college's graduate teacher education program prepared its faculty for the significant transition to a new educational setting and teaching methods in response to COVID-19. The faculty were adaptable to the upcoming shifts in remote/online education's teaching delivery models [2].

From the perspectives of four universities in England, this study looks at how Initial Teacher Education (ITE) was affected by the crisis caused by the Covid-19 lockdown of schools and universities. It suggests that the Covid-19 crisis provides an occasion to consider the possibility that practicum experience is a necessary but insufficient prerequisite for teacher education. In addition, it provides a model framework for a new digital pedagogy for ITE and discusses the opportunities and affordances that will emerge in the educational landscape following Covid [3].

This interpretative case study, which focuses on analyzing the difficulties and opportunities of this virtual teaching experience, involved 27 Chilean EFL teacher candidates. According to the findings, the participants' own learning processes were significantly impacted by a variety of factors, including the abrupt change in setting and the absence of direct interaction with other students. Student teachers suggested that, despite the difficulties they faced, this one-of-a-kind experience would benefit, at least in part, their teacher education and careers in the future. A number of suggestions for ITE programs are made in light of the findings of this study.

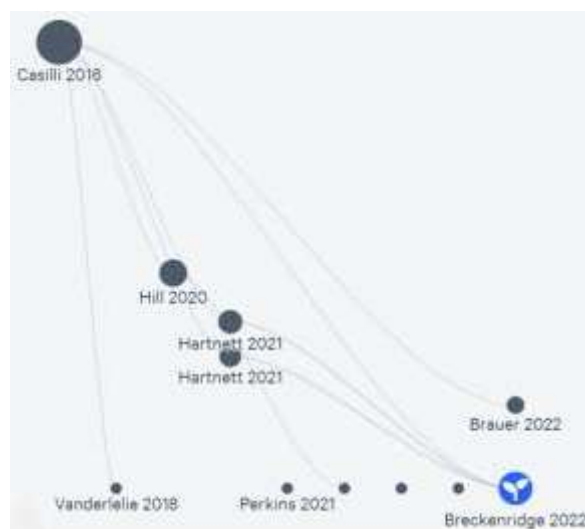
The following manuscripts present the pros and cons of experience during online learning.

According to the study, teachers' professional roles changed in a complex way. Additionally, they were given more responsibilities during the online teaching process, indicating a decrease in teacher satisfaction. After the COVID-19 pandemic, educational institutions must implement a blended teaching model. In the future, teachers should have sufficient digital literacy to meet the new requirements of the innovative educational model that is currently in use. The study also shows that teachers' levels of digital literacy, job satisfaction, and professional role are strongly correlated. It evaluated the extent to which the three elements affected online education. In the end, the study might offer some recommendations for educational and methodological approaches [4].

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Figure 4: Research Articles for Digital badges for Higher Education



For the past half decades, researchers have been focusing on digital badges [6-15]. The above figure 4 shows the related work of various articles that discussed digital technology in education.

In 2022 [14], the authors discussed the Alternative Digital Credentials (ADCs), also known as digital badges. The authors [15] aim to highlight advancements in ADC development in a public university setting to demonstrate how higher education institutions incorporate ADCs into traditional classrooms and more significant community initiatives like workforce development and non-credit offerings. The global technological innovation of digital micro-credentials makes possible the university's strategic response to the requirement for continuing professional education.

This article [16] focuses on increasing the value of Digital Badges for assessment and recognition in higher education by using a university as a case study. This study's primary goal is to increase comprehension of quality criteria for DB metadata for evaluation and recognition as factors increasing their value in higher education (HE). After the survey of the previous researchers' views, the following pros and cons were considered.

Advantages of digital technology in higher education include:

1. Increased accessibility: Digital technology makes education more accessible to a wider range of students, including those who may not be able to attend traditional brick-and-mortar institutions. This includes students in remote areas, those with disabilities, and working adults who need to balance school with work and family obligations.
2. Improved flexibility: Digital technology allows for greater flexibility in terms of when, where, and how students learn. Online and distance learning programs, for example, grant students to learn at their own time.
3. Enhanced interactivity and engagement: Digital tools such as learning management systems, virtual and augmented reality, simulations, and games makes the learning experience more interactive and engaging for students.
4. Greater collaboration and communication: Digital technology supports collaboration and communication between students and teachers, allowing for a more personalized and effective learning experience.

Disadvantages of digital technology in higher education include:

1. Limited social interaction: Digital technology limits the amount of live conversation between students and teachers, which negatively impacts the learning experience.
2. Technical issues: Technical problems with digital devices or internet connectivity disrupts the learning process and lead to frustration for students and teachers.
3. Digital divide: Not all students have access to the necessary technology or internet access, which creates a digital divide and puts these students at a disadvantage.
4. Dependence on technology: Over-reliance on technology makes students less independent learners, and more dependent on technology to learn.

5. Cyber security issues: as more and more education goes online, the risk of cyber-attacks on students' personal information and data breaches also increases.

From the study, it is concluded that the above-mentioned disadvantages have been considered and converted into an advantage to the learner's community in higher education.

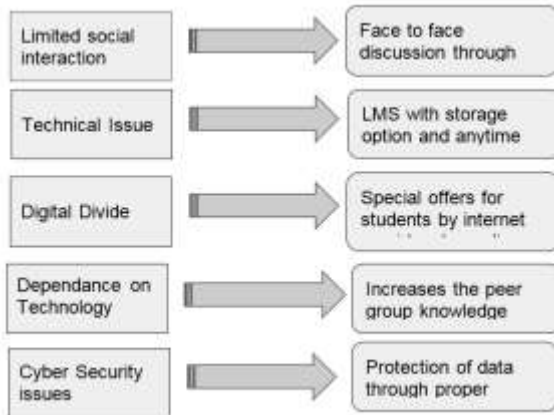
Proposed Framework

After the complete study of the impact of digital technology in higher education, to overcome the drawbacks of the same a framework is formulated. In this framework, the drawbacks are converted into efficient activity using digital technologies itself. The following are the techniques used to overcome the drawbacks found in DTHE shown in Figure 5:

- Social media has a significant impact on higher education in various ways. One way is by providing new opportunities for communication and collaboration among students and faculty, both within and outside of the classroom. Social media platforms such as Facebook, Twitter, and LinkedIn have been used to create online study groups, share class notes and assignments, and connect with classmates and professors. Additionally, social media has also been used to promote and enhance the reputation of universities and academic programs, as well as to increase student engagement and retention.
- A Learning Management System (LMS) is a program based tool for the administration, documentation, tracking, reporting, and delivery of educational courses, training programs, or learning and development programs. In higher education, LMSs are used to support the delivery of online and blended learning courses, as well as to facilitate communication and collaboration among students and faculty. LMSs typically provide a range of features, including the ability to upload and share course materials, create and administer assessments, track student progress, and facilitate communication through discussion boards and other tools. Some popular LMSs in higher education include Blackboard, Canvas, and Moodle. One of the main advantages of LMSs is that they provide a centralized location where students are able to access all of their course materials and assignments, and where faculty track student progress and provide feedback. Additionally, LMSs helps to increase student engagement and retention by

providing interactive and collaborative learning experiences.

Figure 5: FrameWork DTHE



- **Internet Service Providers (ISPs)** are organizations that give network access to users. For higher education students, ISPs typically offer a variety of plans and packages that are tailored to the specific needs of students, such as high-speed internet access, wireless networks, and unlimited data plans. Many colleges and universities have agreements with ISPs to provide discounted or specialized internet services to students living on campus or in university-owned housing.
- Gamification in science refers to the use of game based attributes, such as points, badges, and leaderboards, in non-game contexts, such as scientific research and education. The goal of gamification in science is to increase engagement, motivation, and learning outcomes among participants. Examples of gamification in science include citizen science projects, where members of the public are invited to participate in scientific research by collecting data or analyzing images, and educational games that teach scientific concepts and skills. Recent research says that Gamification is incorporated into vocational education and training. It is employed in all kinds of domains in higher education for the betterment of the students' understanding and learning [17],[18].
- Blockchain technology has the future to revolutionize various industries, including higher education. One of the main ways that

blockchain is used in higher education is through the creation of digital credentials, such as degrees, certificates, and transcripts. These digital credentials are stored on a blockchain, which provides a secure and tamper-proof way of verifying their authenticity. That helps to reduce fraud and ensure that employers and other organizations trust the credentials presented to them. Another way that blockchain is used in higher education through the creation of decentralized platforms for the sharing and exchange of educational resources.

Technology has the potential to play a significant role in amplifying holistic education by providing new and innovative ways of teaching, learning, and assessment. Some ways technology aids in holistic education includes:

Personalized learning: Technology provides customized learning experiences based on individual needs and abilities, promoting self-directed learning. **Engaging multimedia:** Interactive and multimedia content makes learning more engaging, helping students retain information better. **Collaborative learning:** Technology facilitates remote collaboration and communication, creating opportunities for peer-to-peer learning. **Access to a wealth of resources:** The internet provides access to a vast array of information and resources, enabling students to learn beyond the classroom. **Formative assessment:** Technology provides real-time feedback and evaluation to help students track their progress and identify areas for improvement. Integrating technology into education helps train learners to be creative, critical and innovative problem-solvers who are equipped to succeed in the digital age.

This paper focuses on the Gamification techniques used in different domains and its efficiency. For each subject different gamification is applied for the learning and evaluation process. Some of them are as follows:

Gamification in Different Courses

- **Language learning:** Games and simulations are used to help students practice their language skills in a fun and engaging way.
- **Math:** Games and puzzles are used to help students practice mathematical concepts and problem-solving skills.

- Science: Virtual labs and simulations are used to help students conduct experiments and explore scientific concepts in a safe and engaging way.
- History: Games and simulations are used to help students learn about historical events and figures in a more interactive and engaging way.
- Business: Gamification is used to teach students about business concepts and strategies, such as marketing, finance, and management.
- Gamification is applied to more specific subjects such as coding, game design, and project management.

It's also important to note that gamification is not only about adding games to the curriculum, but it's about using the principles of game design to create a more engaging and motivating learning experience that helps students to develop critical thinking and problem-solving skills. And it's not a one-size-fits-all solution and it's important to carefully consider the goals, audience, and context before implementing it. The following Figure 6 shows different gamification that are used for different courses for this study.

Figure 6: Gamification for different Courses



In the context of mathematics, gamification is used to make learning math more interactive and enjoyable by incorporating elements of gameplay, such as points, badges, leaderboards, and rewards. This is done through the use of mobile apps, online games, or even physical board games that incorporate math concepts. Additionally, gamification is also used to make math problems more engaging and to encourage learners to solve the problem and enhance their analytical thinking ability.

Gamification is applied in physics in a number of ways, such as:

- Simulation games: Physics simulations and interactive games are used to teach students about concepts such as motion, energy, and forces in a fun and engaging way.
- Physics-based puzzles: Gamified physics problems or puzzles help students improve their ability to think critically and solve problems.
- Virtual labs: Virtual labs and simulations provide students with hands-on experience with physics experiments and equipment, which is difficult or expensive to replicate in a physical lab.
- Augmented reality: Augmented reality games and apps used to create interactive physics experiments and demonstrations that helps students visualize and understand complex concepts.
- Gamified assessments: Gamified assessments such as adaptive quizzes, interactive flashcards, and progress tracking is used to monitor student progress and give them immediate feedback to improve their understanding of the subject.

Overall, Gamification helps students to understand physics in a more interactive, engaging, and meaningful way, and make the learning experience more fun and memorable.

Discussion

The above-said Framework is implemented to all levels of students. There are several advantages to using a framework in digital technology education: This Framework provides a set of standardized and pre-built components that are easily integrated into educational materials, saving time and effort. It provides a well-defined structure and set of best practices for building and organizing educational materials, making it easier to develop and maintain them over time. By using a framework, educators focus on the core educational content of their materials rather than getting bogged down in low-level implementation details. It includes built-in security features and recommendations for secure coding practices, helping to protect educational materials from vulnerabilities and attacks.

The following figures show the scoring sheets of the students from different programmes obtained by various forms of tests. For the analysis, a sample of 2700 students marks are taken in which the tests are conducted in various forms like subjective through written exam, objective through multiple choice test and Gamification through online games. Test was conducted for the same set of students with the same set of syllabus through different exam formats in each subject. In this all levels of students like poor to best are involved in the examination.

In Figure 7, the comparison of average marks obtained from different forms of Tests for various disciplines like Science, Languages and Education is shown. From the figure it is seen that the average marks obtained by the students for Gamification is more where the knowledge is tested in different ways. This is due to the fact that the students gain the knowledge in a simple and efficient way. Here for the analysis, varying games depending upon the domain are taken and given for the students for learning and examination.

Figure7: Comparison of different forms of Tests for different Disciplines

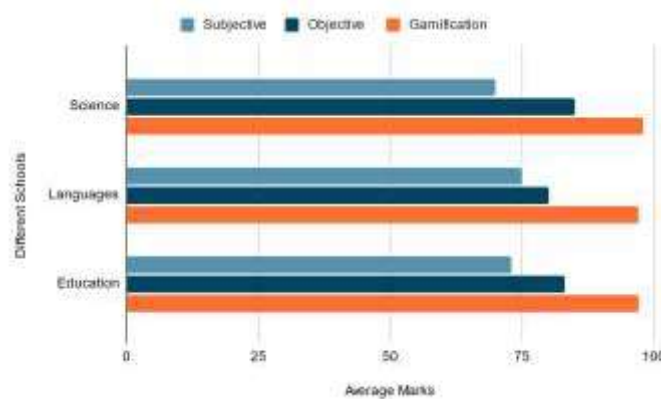
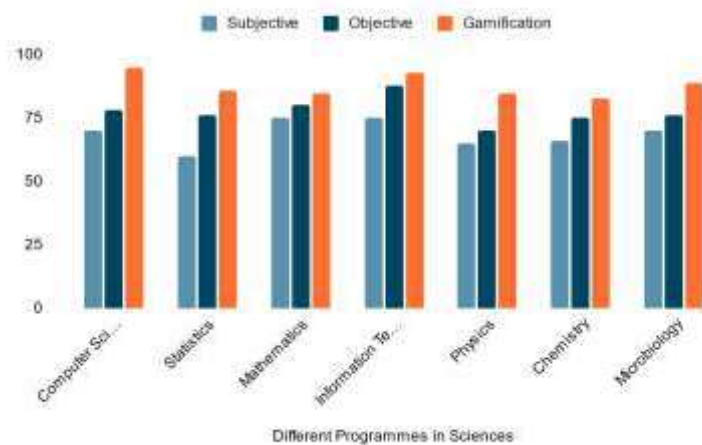


Figure 8 depicts the comparison of different formats of examination for Science Domain that includes Computer Science, Statistics, Mathematics, Information Technology, Physics, Chemistry and Microbiology. Results show the marks obtained in different science domains through gamification is much better than the other examination formats.

Figure 8: Comparison of Various forms of Tests for Science Domain



Thus the framework concludes that the negative impacts of digital technology are changed in such a way that it enhances the student’s knowledge in the current era.

Conclusion

The current era is facing different situations where the life of the individual has to be continued for survival. In this regard during the pandemic situation, digital technology was made to continue regular activity to some extent. As digital technology

rules all domains including education, there is a need of finding solutions for its negative impacts of it. This paper shows the efficient way of overcoming the drawbacks of digital technology through Gamification. This concludes that through gamification all levels of students are enhancing their knowledge with a lot of interest and confidence.

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