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Innovation in teaching and learning with the use of modern computational tools: A Post Covid experience

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ABSTRACT

The traditional teaching and learning model have long been centered around face-to-face classroom instruction, complemented by hands-on activities in laboratories and the use of physical educational equipment within schools and universities. However, the onset of the COVID-19 pandemic brought about an unprecedented disruption to this model, compelling educational institutions worldwide to transition abruptly to online learning environments. This shift significantly altered the dynamics of both teaching and learning, introducing new digital platforms, tools, and methodologies. While it enabled continuity of education, it also revealed several challenges including reduced student engagement, technological barriers, and adaptation difficulties for both educators and learners. This study examines the major transformations observed during this critical period, highlighting the impact of the pandemic on educational practices, student behavior, and instructional delivery, and explores the implications for the future of hybrid and digital learning ecosystems.

Keywords: Covid 19; E-Learning; Teaching; Learning; System; Development; Education; Culture; Digital; Platforms; IoT; Software.

1. Introduction

The general teaching and learning model comprise of traditional classroom teaching, which includes working with laboratory and equipment in the school or universities [1,2]. However, with the global pandemic Covid 19 these paradigms of working have been drastically shifted to online learning exclusively. There has been a variety of significant changes that are observed during this critical time:

a. Use of MOOC's (Massive Open Online Courses): Massive Open Online Courses (MOOCs) have transformed the educational landscape by making quality education accessible to a global audience. These courses, often offered by prestigious universities and organizations, allow students to learn at their own pace from anywhere in the world. MOOCs offer a wide range of subjects and skills, often for free or at a low cost, making lifelong learning more attainable [3]. Platforms like Coursera, edX, and Udemy provide interactive content, peer assessments, and even certificates, enabling both students and professionals to upgrade their skills and improve their career prospects.

b. Growth in the use of LMS Systems: Learning Management Systems (LMS) have seen exponential growth in both academic and corporate settings. These platforms—such as Moodle, Blackboard, and Canvas—enable institutions to deliver, track, and manage educational content efficiently. LMS systems support blended learning environments by integrating tools for video lectures, discussion forums, quizzes, and grading [4]. They also offer analytics features that help educators monitor student progress and tailor instruction accordingly [5]. This increased reliance on LMS systems signifies a move toward more organized, scalable, and tech-enabled learning experiences.

c. E-learning industry expansion: The e-learning industry has witnessed rapid expansion over the past decade, driven by advancements in digital technology and changing learning preferences. The industry now encompasses a wide range of sectors, including K–12 education, higher education, corporate training, and personal development [6]. Innovations like gamification, AI-powered adaptive learning, and virtual reality have made e-learning more

engaging and personalized [7]. The COVID-19 pandemic accelerated this growth, making online learning a necessity and highlighting its potential as a long-term solution. Projections suggest continued double-digit growth in the sector, fueled by increased internet penetration and demand for flexible learning options.

d. Online assessment of students: Online assessment tools are becoming central to evaluating student performance in digital learning environments. These tools offer flexibility in conducting quizzes, exams, and assignments, and they can support various formats such as multiple-choice, short answers, or interactive problem-solving. Technologies like AI-powered proctoring ensure academic integrity by monitoring student behavior during exams [8]. Additionally, real-time feedback mechanisms help students understand their strengths and weaknesses, while enabling instructors to identify knowledge gaps and provide targeted support. Online assessments are not only time-efficient but also scalable and data-driven.

e. Digital mode of assignments and evaluations: Digital platforms have revolutionized the way assignments are submitted and evaluated. Tools such as Google Classroom, Microsoft Teams, and Turnitin allow students to submit work electronically, which instructors can then grade, annotate, and return online. This approach streamlines the entire process, improves transparency, and reduces administrative workload [9]. Furthermore, digital submission systems can integrate plagiarism detection, version control, and collaborative feedback features, promoting academic honesty and continuous improvement. The digital format also helps maintain comprehensive records, making it easier for educators to track student progress over time.

f. Online knowledge delivery and certification by organizations: Many leading organizations, including tech companies like Google, IBM, and Microsoft, now offer online training programs and certification courses. These programs are designed to bridge the gap between academic learning and industry requirements. They often focus on practical, job-relevant skills in areas like cloud computing, data analytics [10], cybersecurity, and project management [11,12]. Certificates earned through these programs are increasingly recognized by employers and can significantly enhance a candidate's employability. The trend reflects a shift toward continuous, skills-based learning, where credentials from industry-recognized programs are as valued as traditional degrees.

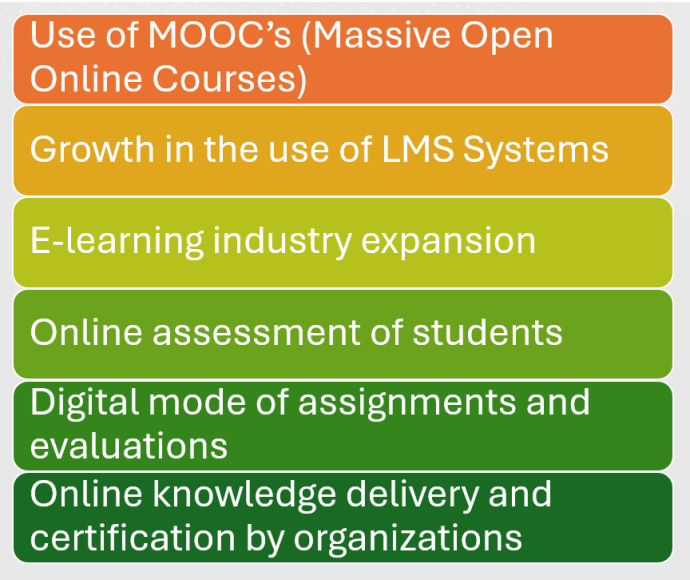

Figure 1. Adapted Technologies Post Covid 19 in Teaching and Learning

1.1. Study Objectives

The main underlying objectives for the study are as below:

1) Understanding the traditional system of education.

2) Finding the need for new and updated modern system of education.

3) Identification of several new platforms for teaching and learning.

4) Awareness of use of new and modern methodology for educational resources.

2. Associated Problems Post Covid 19

There have been certain significant problems that were observed during this online learning era. The complete learning experience, comprises of various pros and cons [13]. The problems associated with the learning can be summarized as:

a. Lack of attentively participation of the students: In virtual or blended learning environments, maintaining students' focus is a major challenge. The absence of physical presence and the distractions at home—such as mobile phones, social media, or television—often result in students logging in but not actively participating [14]. This passive engagement undermines the effectiveness of learning and reduces interaction with teachers and peers.

b. Neglect of studies: Online learning offers greater flexibility, but this often leads to procrastination and a casual attitude toward academic responsibilities. Without strict classroom discipline or regular in-person monitoring, some students may neglect their studies, skip deadlines, or fail to prepare adequately for assessments, resulting in poor academic performance.

c. Improper use of assignments submission techniques: Many students struggle with the technical aspects of digital platforms used for submitting assignments. Common issues include incorrect file formats, failure to upload properly, or misunderstanding platform deadlines. Additionally, some students misuse the system by submitting plagiarized or AI-generated content, which diminishes the credibility of the learning process [15].

d. Increase in the planner's value of the submitted work: With the widespread availability of planners, templates, and AI tools, the originality and effort in students' submitted work have declined [16]. Many students rely on pre-made content or editing tools to enhance the appearance of their work without truly understanding or engaging with the subject matter, which undermines the purpose of education.

e. Lack of IQ skills: The over-reliance on digital tools and automated systems may negatively impact students' cognitive development. Instead of developing problem-solving and critical thinking skills, students may become dependent on quick solutions or pre-formulated answers, leading to a decline in intellectual curiosity and analytical reasoning abilities.

f. Inappropriate use of digital media: Digital media can be a powerful tool for learning, but its misuse is widespread among students. Many use online platforms for entertainment rather than education, spending hours on social media, gaming, or irrelevant browsing [17]. This behavior not only wastes time but also increases the risk of exposure to harmful content or misinformation.

g. Increase in the waste of time, which was earlier invested for learning: The shift to digital learning has, in many cases, led to inefficient time management. Without a structured routine or classroom discipline, students often spend more time navigating platforms, facing technical issues, or getting distracted online, reducing the overall time and quality of actual learning [18].

h. More Google prone behavior of student instead of several innovative ideas: Students today tend to turn to Google or ChatGPT for immediate answers rather than attempting to understand or analyze problems themselves. This behavior discourages innovation and creativity, as students rely on readily available solutions rather than developing original ideas or applying critical thinking skills.

i. Difficulty of teachers for creating assessments: Designing fair, effective, and cheat-proof online assessments is a significant challenge for educators. Creating diverse question formats, ensuring content validity, and managing different student abilities—all while using digital tools—requires extra effort and technical proficiency, often without adequate training or support.

j. Monitoring issues during the classes as well as in the exams: Ensuring academic integrity during online classes and assessments is difficult. Teachers face challenges in monitoring student behavior through webcams or screen-sharing tools. Students can easily engage in dishonest practices, such as using hidden devices, collaborating during exams, or browsing answers, which affects the credibility of results [19].

k. Loss of punctuality and values in education and learning: The lack of structured classroom schedules and face-to-face teacher-student interactions has led to a decline in punctuality, discipline, and respect for the learning process. Students may join classes late, skip sessions entirely, or submit assignments carelessly, which weakens educational values and accountability.

The sudden shift from traditional classroom-based education to online learning during the COVID-19 pandemic brought significant changes to teaching and learning. While digital platforms enabled academic continuity, several challenges emerged.

Students often showed a lack of attentiveness and engagement, leading to neglect of studies and improper use of assignment submission tools [20]. The value of submitted work decreased due to over-reliance on pre-made planners and digital assistance, hindering critical thinking and IQ development. Increased screen time led to misuse of digital media and wasted learning hours. Students became overly dependent on quick online searches rather than developing innovative ideas. Teachers faced difficulties designing effective assessments, while monitoring student behavior during online classes and exams proved challenging. Moreover, there was a noticeable decline in punctuality, discipline, and educational values, raising concerns about the long-term impact on academic quality and integrity.

The observations that were taken are common for all the universities and schools. There is a requirement for upgradation of these [21]. There are certain suggestions that can be followed for handling the situation to make teaching and learning methodology more exciting. The premium concern during the teaching process is to provide quality lectures and sessions to the students [22]. Thereby making sure that they participate with attention. It requires techniques to create interest of the students in the teaching and learning process.

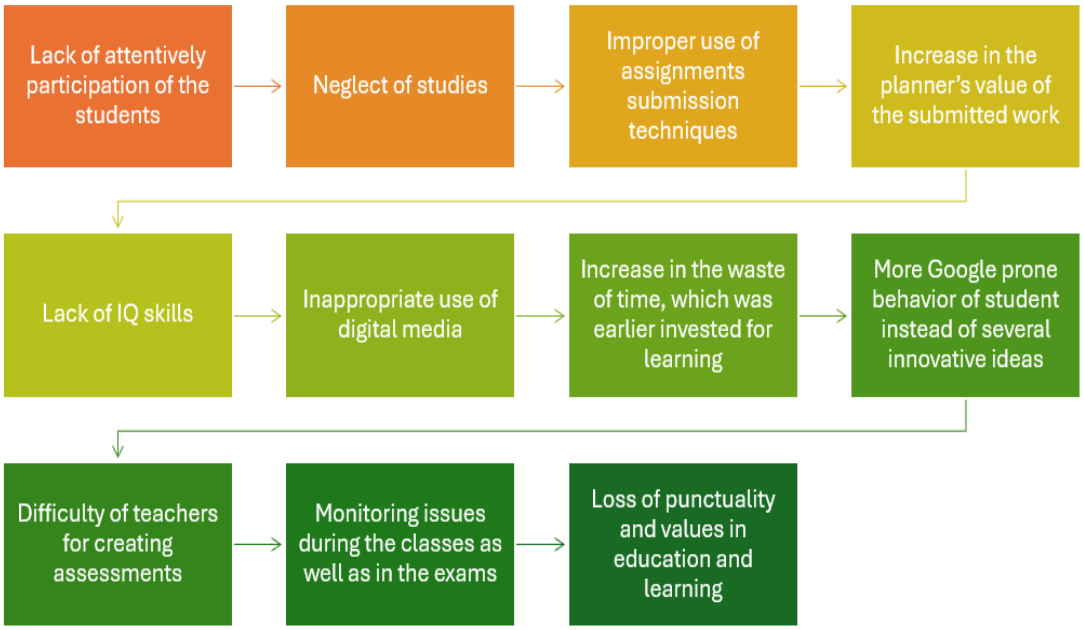

Figure 2. Problems Associated with the Previous Methodologies of Learning and Teaching

3. Innovations as a Remedy to Problems

The innovations that can be brought into the teaching and learning methodology that will be helpful in the future are as below:

3.1. This section is in reference to the facilitation of services expected by school/university

a. Use of blended learning techniques.

b. Safe browser exams.

c. Use of a premium level e-learning system which guarantees all the modules that are required for teaching and learning process.

d. Develop system which works with only computer or laptops instead of mobile phones to guarantee that the student achieves 100% knowledge instead of wasting time.

e. Use of artificial intelligence to evaluate student behavior (digital image processing is a good option to make sure that a student is attentive during the class instead of investing his time somewhere else).

f. Assessment monitoring with the help of IOT based devices.

g. Setting up of Virtual labs, irrespective of the subject and the topics under concerned.

h. Providing innovative means of techniques which will find the interest of the student during the sessions.

i. New grading policy that will make sure that all the students participate equally during the online classes (redistribution of marking techniques/use of special applications like Socrates, to engage the entire class for answering specific questions and retrieving the correct answer, thereby giving the winner more marks.) [23]

j. Plagiarism check as well as logic check softwares are required to make sure that students submit the assignments without copy and paste methods.

To enhance the quality and integrity of online education, several innovative strategies are being implemented [24]. Blended learning techniques are gaining popularity, combining the flexibility of online learning with the effectiveness of face-to-face interaction. Safe browser exams ensure secure testing environments, while premium-level e-learning platforms provide comprehensive modules to support structured teaching and learning. Limiting access to educational systems via computers or laptops rather than mobile phones helps reduce distractions and promote deeper learning. Artificial intelligence, including digital image processing, is increasingly used to evaluate student attentiveness, while IoT-enabled devices aid in real-time assessment monitoring [25]. Virtual labs are being developed across disciplines, enabling practical learning regardless of the subject. New, engaging teaching methods aim to capture student interest, and innovative grading policies promote equal participation through interactive tools like Socrates. Additionally, the integration of plagiarism and logic-checking software ensures academic honesty and encourages original, thoughtful student submissions.

3.2. This section is in reference to the improvements of the facilitation of services expected by staff

a. Creation of assignments which are unique in nature.

b. Making online submissions with integrated plagiarism check to avoid Google based results.

c. Creation of new questions for examination or assessments without copying from any book or online material.

d. Methods to monitor the complete batch of students during the session.

e. Methods to engage the complete class by providing new and improved techniques of answering bullet questions. These questions must be solved by all the students which guarantees the participation.

f. Integrating methods to identify the IQ level of a student and its growth.

g. Solving student's problem in additional Sessions that can be termed as doubt clearing sessions.

To improve the effectiveness and authenticity of online education, a range of innovative academic practices is being adopted. Assignments are now designed to be unique, reducing the chances of plagiarism and encouraging original thinking. Online submissions are increasingly integrated with plagiarism detection tools to discourage reliance on Google-based answers. Examinations and assessments feature newly created questions that are not sourced from textbooks or online materials, ensuring originality. Comprehensive monitoring systems are being employed to supervise the entire class during sessions, while interactive techniques—such as mandatory bullet-style questions—are used to ensure full student participation. Additionally, methods are being developed to assess and track students' IQ levels and cognitive growth over time [26]. To further support learners, dedicated doubt-clearing sessions are conducted, offering personalized assistance and reinforcing concepts outside regular class hours.

4. Conclusion

In conclusion, the shift to digital and blended learning has reshaped the educational landscape, presenting both challenges and opportunities. While issues such as reduced student engagement, improper use of digital tools, and declining academic values have highlighted the limitations of online learning, the integration of advanced technologies offers promising solutions. By adopting blended teaching methods, secure assessment tools,

AI-driven monitoring, and IoT-based proctoring, institutions can enhance learning effectiveness and maintain academic integrity. The development of virtual labs, unique assignments, interactive grading systems, and personalized doubt-clearing sessions further supports student engagement and cognitive growth. Moving forward, a well-balanced, innovation-driven educational model—rooted in originality, participation, as well as accountability—can ensure quality learning outcomes and prepare students for a more dynamic and digitally connected future.

5. Future Works

After analyzing the current and previous educational structure, we can predict that the need for the blended learning is gaining popularity. Several suggestions for future research include:

1) Empirical study for the adaptation of new methods of learning by students.
2) Staff and administration professional perseverance of using the modern teaching and learning methodology.
3) Use of modern methods including AI and IoT for teaching and evaluation of students.
4) Identification of proper means of resources to start the use of blended learning including hardware and software.
5) Development of software resources for the integration of modern systems with traditional mode of learning.

Declarations

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No internal or external funding was obtained for this study.

Competing Interests Statement

The authors declare no competing financial, professional, or personal interests.

Consent for publication

The authors declare that they consented to the publication of this study.

Authors' contributions

All the authors took part in literature review, analysis, and manuscript writing equally.

Ethical Approval

Not applicable.

Informed Consent

Not applicable.

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