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Impact of COVID-19 on Students' Learning Patterns: A Three-Phase Study (Pre-COVID, During COVID, and Post-COVID)

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Abstract

The COVID-19 pandemic caused an unprecedented disruption in the education system worldwide, forcing a sudden transition from traditional classroom learning to online modes of education. This research paper analyses three major phases of student learning: pre-COVID (traditional learning), during COVID (online learning), and post-COVID (blended/hybrid learning). The study focuses on changes in learning methods, growth in online education (in percentage terms), and the impact of these changes on students' mental health. The findings reveal a significant rise in online learning adoption during and after the COVID-19 pandemic, along with mixed psychological effects on students, including increased stress, improved adaptability, and enhanced digital competence.

Keywords: COVID-19, Online Learning, Student Mental Health, Hybrid Education, Educational Transformation

Introduction

Education systems worldwide have historically relied on face-to-face classroom instruction. Before 2020, digital tools played only a supportive role in learning. However, the outbreak of COVID-19 and subsequent lockdowns forced educational institutions to rapidly adopt online platforms. This sudden shift created challenges related to access, learning effectiveness, and mental well-being. Post-COVID, education has not returned completely to its earlier form; instead, a hybrid or blended learning approach has emerged. This paper aims to compare students' learning behaviors across three phases and evaluate growth in online education along with its psychological impact.

Objectives of the Study

- To analyze how students studied before COVID-19, during COVID-19, and after COVID-19.
- To estimate the percentage growth of online education across the three phases.
- To examine the impact of these changes on students' mental health.
- To identify long-term trends in the education system post-COVID.

Research Methodology

This study is based on secondary data collected from educational reports, surveys conducted during and after COVID-19, and existing academic literature. A comparative and descriptive research approach is used. The analysis focuses on three time period[6]:

- Pre-COVID period (before 2020)
- COVID period (2020–2021)
- Post-COVID period (2022 onwards)

Learning Patterns Across Three Phases

Pre-COVID Learning Scenario

Before COVID-19, students primarily depended on:

- Physical classrooms and face-to-face teaching
- Printed textbooks and handwritten notes
- Fixed schedules and structured academic routines
- Limited use of digital tools (mainly for presentations or reference)
- Online learning penetration during this phase was relatively low, estimated at around 10–15%, mostly in higher education and professional courses.
- **Mental State of Students:**
  - Stable routine and social interaction
  - Low screen time
  - Moderate academic stress but better peer support

Learning During COVID-19

During the pandemic, lockdowns forced a complete shift to online education:

- Classes conducted via video conferencing platforms
- Heavy dependence on smartphones, laptops, and internet connectivity
- Online assignments, exams, and digital content
- Self-learning increased due to reduced teacher-student interaction
- The adoption of online learning increased rapidly to nearly 90–100%, as it became the only mode of education.
- **Mental State of Students:**
  - Increased stress, anxiety, and isolation
  - Eye strain, fatigue, and lack of physical activity
  - Unequal access to devices and the internet caused frustration
  - Some students developed self-discipline and digital skills

Post-COVID Learning Scenario

After COVID-19 restrictions were lifted, education systems adopted a blended approach:

- Combination of classroom teaching and online resources
- Recorded lectures, digital notes, and Learning Management Systems (LMS)
- Greater flexibility in learning schedules
- Increased acceptance of online certifications and courses
- Online learning usage stabilized at around 40–60%, indicating a net growth of approximately 30–45% compared to the pre-COVID period.
- **Mental State of Students:**
  - Improved social interaction compared to the COVID period
  - Reduced anxiety but continued academic pressure
  - Better adaptability and confidence in using technology
  - Awareness about mental health and well-being increased

Comparative Analysis of Online Learning Growth

Table 1. Comparative Analysis of Online Learning Growth.

Phase	Mode of Learning	Online Learning Usage
Pre-COVID	Traditional	10–15%
During COVID	Fully Online	90–100%
Post-COD	Hybrid	40–60%

The data clearly indicates that COVID-19 acted as a catalyst for digital education, accelerating online learning adoption by more than 3–4 times compared to the pre-pandemic era.

Growth of Online Learning Across COVID Phases

- Pre-COVID → very low online study
- During COVID → almost complete online shift
- Post-COVID → stable hybrid model

Figure 1: Growth of Online Learning Across COVID Phases

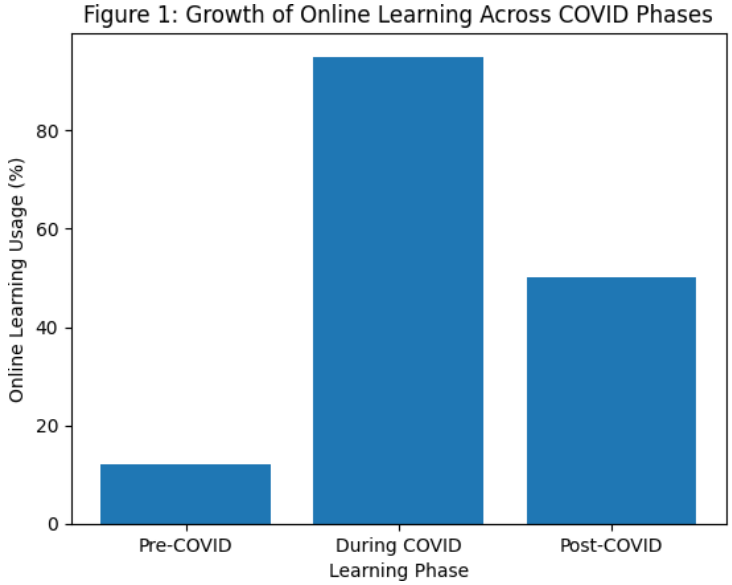

Figure 1. Growth of Online Learning Across COVID Phases. Figure 1 shows a sharp rise in online learning during the COVID-19 period compared to the pre-COVID phase. Although post-COVID usage declined from its peak, it remains significantly higher than before the pandemic, indicating permanent adoption of digital learning.

Impact on Students' Mental Health

The transition in learning modes had a strong psychological impact:

- Negative impacts: stress, anxiety, loneliness, digital fatigue, and reduced motivation (especially during COVID).
- Positive impacts: improved digital literacy, independent learning skills, adaptability, and resilience.
- Post-COVID, although stress levels reduced, academic competition and performance pressure remain concerns, highlighting the need for counselling and mental health support systems in educational institutions.

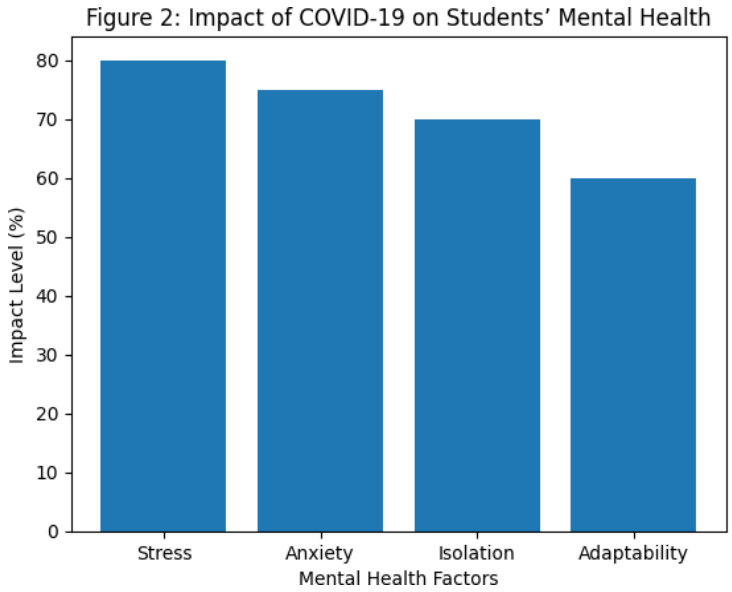

Figure 2. Impact of COVID-19 on Students' Mental Health. Figure 2 highlights the psychological impact of COVID-19 on students, with stress and anxiety levels being the most affected. At the same time, adaptability emerged as a positive outcome, reflecting students' ability to adjust to digital learning environments.

7 Learning Effectiveness Across Three Phases

The effectiveness of learning varied significantly across the three phases of education. Before COVID-19, classroom learning ensured high concept clarity and student engagement due to direct interaction with teachers. During the COVID-19 period, although self-learning skills improved, student engagement and conceptual understanding declined because of limited interaction and digital fatigue. In the post-COVID phase, the hybrid learning model restored concept clarity and engagement while retaining the benefits of self-learning, indicating a balanced and effective learning environment.

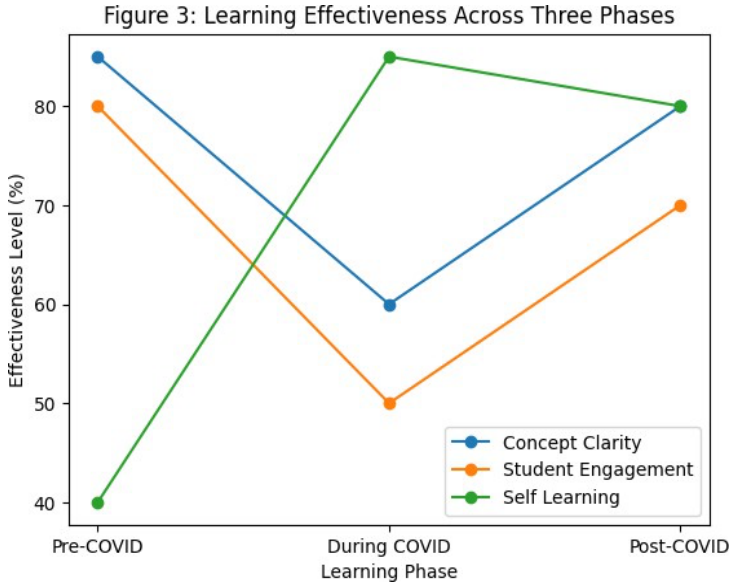

Figure 3. Figure 3 illustrates variations in learning effectiveness across pre-COVID, during COVID, and post-COVID phases. While self-learning peaked during the COVID period, concept clarity and engagement were highest in pre- and post-COVID phases, highlighting the effectiveness of hybrid learning.

Hybrid Learning Sustainability Model

Based on the comparative analysis, this study proposes a Hybrid Learning Sustainability Model that integrates classroom instruction with online learning tools. Classroom learning supports conceptual understanding and peer interaction, while online learning provides flexibility and self-paced study opportunities. A mixed assessment approach ensures fair evaluation, and controlled screen exposure supports students' mental well-being. This balanced model is considered sustainable for future education systems.

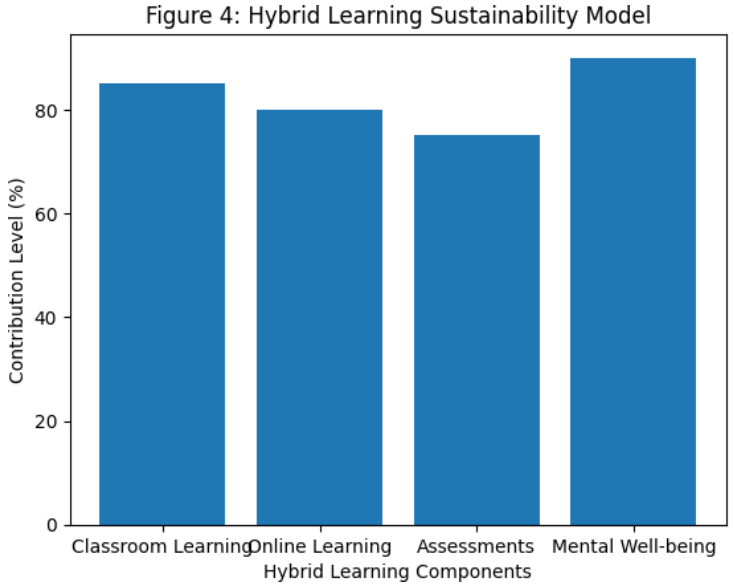

Figure 4. Figure 4 represents the contribution of different components of the hybrid learning model. Mental well-being and classroom learning show the highest contribution, emphasising the importance of balance between digital and traditional education.

Results

The analysis of this study highlights that the COVID-19 pandemic brought a fundamental shift in the education system and students' learning behavior. A clear difference can be observed when comparing learning patterns before COVID-19, during the pandemic, and in the post-COVID period. The findings show that online learning usage was minimal before COVID-19 but increased drastically during the pandemic, as it became the primary mode of education. Even after the pandemic, the dependence on online learning did not return to earlier levels, indicating that digital education has become a permanent component of the learning process. The evaluation of learning effectiveness reveals that traditional classroom learning supported better concept clarity and student engagement before COVID-19. During the pandemic, although students developed strong self-learning abilities, overall engagement and understanding declined due to reduced interaction and prolonged screen exposure. In the post-COVID phase, the hybrid learning approach improved academic effectiveness by restoring interaction while maintaining the benefits of self-directed learning. From a psychological perspective, students experienced high levels of stress, anxiety, and social isolation during the COVID-19 period. However, the post-COVID phase shows noticeable improvement in mental well-being, supported by increased adaptability, confidence in digital tools, and renewed social interaction. These results suggest that a balanced learning environment is essential for both academic success and mental health.

Future Scope of the Study

The scope of this research can be expanded in several directions. Future studies may include primary data collection through questionnaires, interviews, and longitudinal surveys to gain deeper insights into students' academic and psychological experiences. Comparative studies between rural and urban regions can further explore issues related to digital accessibility and infrastructure[5] Additional research may focus on testing the proposed Hybrid Learning Sustainability Model in real educational institutions to measure its effectiveness in improving learning outcomes and student well-being. Long-term studies can also examine how extended exposure to hybrid learning influences academic performance, motivation, and mental health. Moreover, future research can investigate the integration of emerging technologies such as artificial intelligence, adaptive learning systems, and virtual laboratories in hybrid education. Policy-based studies may also help in designing inclusive education strategies that ensure digital equity and mental health support for students.

Conclusion

This study concludes that the COVID-19 pandemic has caused a lasting transformation in students' learning methods and the overall structure of education. The pre-COVID education system was largely dependent on face-to-face instruction, while the pandemic forced an immediate shift to fully online learning. The post-COVID phase reflects a more evolved system where hybrid learning has emerged as the most practical and sustainable approach. The findings confirm a significant long-term increase in the adoption of online education compared to the pre-pandemic period. Although students faced considerable mental health challenges during COVID-19, including stress and isolation, the experience also enhanced their digital skills, independence, and adaptability[7] The Hybrid Learning Sustainability Model proposed in this study emphasises the need to balance classroom interaction, digital learning resources, fair assessment practices, and students' mental well-being. By implementing such an integrated approach, educational institutions can support effective learning while safeguarding psychological health.

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