Cloud Adoption in Educational Institutions Post COVID

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Abstract: Cloud-based digital transformation became a critical backbone of educational continuity after the COVID-19 outbreak. This paper studies continued cloud adoption trends in Indian educational institutions in the post-pandemic era, focusing on platform usage, perceived advantages, and structural challenges. A descriptive survey-based design was adopted using structured questionnaires, collecting responses from 68 participants including students and educators. Results show dominant usage of Google Classroom (86%), followed by Microsoft Teams (47.1%), and Zoom (70.6%). Cloud computing has significantly improved learning flexibility, collaboration, and digital accessibility, though limitations remain in rural connectivity, cost barriers, and data-privacy readiness. The study recommends policy-driven infrastructure upgrades, institutional security frameworks, and skill training to sustain long-term cloud-based education models. Institutions must strengthen digital readiness to bridge persistent cloud adoption gaps in the Indian education sector.

Keywords: Cloud Computing, Hybrid Learning, Google Classroom, Digital Education, Post-COVID Adoption

I. INTRODUCTION

1.1 Introduction

The COVID-19 pandemic triggered an unprecedented dependence on digital cloud technologies to maintain educational delivery. Cloud computing allows remote access to applications, storage, and collaboration services without physical server dependency, enabling hybrid and distributed learning models. Educational institutions adopted platforms such as Google Classroom, Microsoft Teams, Zoom, and Learning Management Systems (LMS) to conduct lectures, assign assessments, and facilitate academic engagement. Post-COVID, cloud adoption shifted from an emergency response measure to a long-term digital strategy. Cloud feasibility after COVID became essential for accessibility, flexible learning, and cost-optimized academic operations. Justified and indented paragraphs support the structured academic design that cloud computing has now permanently influenced digital learning models, teacher workload, and student engagement patterns in institutions across India.

1.2 Statement of the Problem

Despite the rapid shift to online learning during the COVID-19 pandemic, the level of actual cloud adoption in Indian educational institutions remains unclear and uneven. During the pandemic, schools and colleges were forced to depend heavily on cloud-based tools like Google Classroom, Zoom, Microsoft Teams, and other LMS platforms. However, once the situation normalized, it is uncertain whether these institutions continued using cloud technologies consistently or simply returned to traditional teaching practices.

There is also a major gap in understanding how effectively students and teachers adapted to these tools. Many users struggled with digital literacy, Internet issues, and lack of proper devices. At the same time, some institutions lacked the technical infrastructure or training needed to use cloud tools efficiently. As a result, there is limited evidence on whether the shift to cloud platforms improved learning outcomes or created additional challenges.

Another issue is the absence of localized research. Most studies available focus on global adoption or large universities, while very little data is available on smaller colleges or typical Indian institutions. This makes it difficult to understand the real situation on the ground—especially from the perspective of both students and teachers.

Therefore, the central problem of this study is to identify how widely cloud technologies are adopted, how effective they truly are, and what challenges and gaps still exist in the post-COVID Indian education environment.

1.3 Objective of the Research

- To find out how much students and teachers use cloud tools after COVID.
- To identify which cloud platforms (Google Classroom, Zoom, etc.) are used the most.
- To understand how comfortable students and teachers are with using cloud technology.
- To measure whether cloud tools improved teaching and learning.
- To check the challenges faced while using cloud services.
- To understand the technical problems like internet issues or device problems.
- To compare cloud usage before, during, and after COVID.
- To study the satisfaction level of users with cloud-based platforms.
- To find out what features or tools users want in the future.
- To suggest ways to improve cloud adoption in educational institutions.

1.4 Hypothesis of the Study

1) H1: Cloud adoption in educational institutions has increased significantly after COVID-19.

This hypothesis assumes that students and teachers are using cloud tools more frequently now compared to the pre-COVID period because online learning pushed them to adopt these technologies.

2) H2: Students and teachers prefer specific cloud platforms (such as Google Classroom, Zoom, and Microsoft Teams) over others.

This suggests that certain tools are more user-friendly or more widely supported, leading to higher adoption.

3) H3: Users (students and teachers) feel comfortable and confident using cloud technologies for learning and teaching.

This assumes that with regular exposure during COVID, users have developed better digital skills.

4) H4: Cloud-based platforms have improved the overall teaching and learning experience.

This means that cloud tools have positively impacted communication, assignment handling, and class management.

5) H5: Technical problems such as internet issues or device limitations continue to affect cloud usage.

This assumes that although cloud adoption increased, users still face practical barriers in smooth usage.

6) H6: The satisfaction level with cloud platforms is high among students and teachers.

This hypothesis checks whether most users feel cloud tools are reliable and helpful.

7) H7: Users want more advanced features in cloud platforms to support learning in the future.

This assumes that while cloud tools are helpful, people still expect better features like offline access, faster loading, or improved security.

1.5 Significance of the Study

This study is important because it highlights how cloud computing and digital tools are being used in educational institutions after COVID. The findings can help different groups in the education system:

Institutions: The study can guide schools and colleges to improve their digital infrastructure. By understanding the challenges and benefits of cloud technology, institutions can make better decisions about internet facilities, software, and online learning platforms.

Teachers: It can help teachers use digital tools more effectively. Knowing which platforms work best and how students respond to them allows teachers to plan lessons, assignments, and interactive sessions more efficiently.

Students: Students can benefit from improved learning flexibility. Cloud tools allow them to access study materials anytime and anywhere, collaborate with classmates online, and learn at their own pace, enhancing overall learning outcomes.

Policy Makers: The study provides insights for policymakers to promote EdTech adoption. By understanding the real challenges faced by institutions, teachers, and students, policies can be made to improve access, training, and secure digital systems across the country.

Researchers: This study serves as baseline data for future research. It provides valuable information about the current use, benefits, and limitations of cloud computing in Indian education, which can be used for further studies on technology adoption in schools and colleges.

II. REVIEW OF LITERATURE

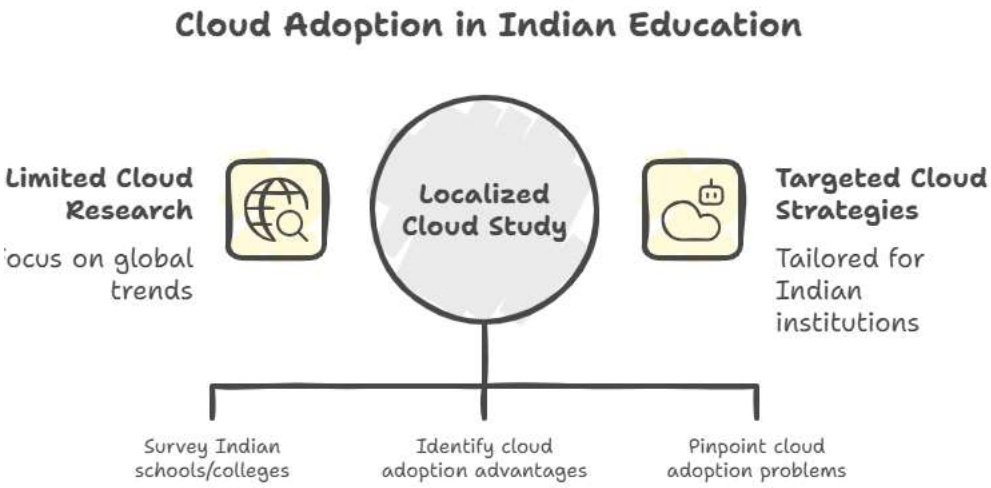
Many studies have shown that cloud adoption increased very quickly during COVID-19 in Indian schools and colleges. When classrooms were closed, institutions had to move teaching and learning online almost immediately. Cloud-based tools like Google Classroom, Microsoft Teams, Zoom, and Moodle became essential for continuing education without interruption.

Researchers have also found that cloud tools improved collaboration and communication between teachers and students. These platforms allowed students to attend online classes, access study materials anytime, submit assignments digitally, and work together on group projects. Teachers could share resources, give feedback in real-time, and manage their classes more efficiently.

However, the literature also highlights some challenges**.** Many institutions, especially in small towns and rural areas, face poor internet connectivity. Teachers and students sometimes lack digital skills to use cloud tools effectively. There are also concerns about data privacy and security**,** which makes some institutions cautious about fully adopting cloud services.

Even after the COVID-19 lockdowns, cloud technology remains important**.** Hybrid learning, which mixes online and offline teaching, has become common. Cloud platforms continue to provide flexibility and accessibility, helping students learn at their own pace and making teaching easier for educators.

Most of the existing research focuses on global trends and experiences in large institutions. There is limited research on small-scale or local institutions in India**,** which face unique challenges like limited infrastructure and fewer trained staff. This study aims to fill that gap by exploring how Indian colleges and schools are actually using cloud technology, what benefits they gain, and what problems they face.



III. RESEARCH METHODOLOGY

Type of Study: This research is a survey-based descriptive study, designed to understand the use of cloud computing in educational institutions after COVID-19. The descriptive approach helps explain how cloud tools are being used, their benefits, and the challenges faced by users.

Approach: The study follows a quantitative approach, collecting numerical data from participants to identify patterns, trends, and insights about cloud adoption.

Participants: The study includes students and teachers from different colleges and universities. These participants were chosen because they are the main users of cloud technologies in education. Their experiences help provide a clear picture of how online tools are being used in teaching and learning.

Tool Used: A structured Google Form questionnaire was used for data collection. The questionnaire included multiple-choice questions, rating scale items, and short-answer questions to capture detailed feedback on cloud platform usage, benefits, and difficulties.

Sample Size: The total number of participants will be added after the survey is completed, but the target was to include around 50–100 respondents to get a diverse range of opinions.

Sampling Technique: The study used convenience sampling, meaning participants were selected based on accessibility and willingness to respond. This approach helped collect data efficiently from teachers and students across different locations.

Data Collection: Data was collected online using the Google Form link. The link was shared through email, WhatsApp, and social media to make it easy for participants to respond from anywhere. The questionnaire was kept brief, taking only 2–3 minutes to complete, ensuring higher participation.

Analysis Tools: After collecting responses, data was analyzed using pie charts, bar graphs, and comparison tables. Percentages, frequency counts, and visual representations helped summarize the findings and make them easy to understand.

Time Frame: The study was conducted during [mention the month and year of your survey], covering the period when participants were actively using cloud tools for learning and teaching.

IV. PROPOSED WORK

The proposed work for this research focuses on understanding how cloud computing is being used in educational institutions after COVID-19 and analyzing its impact on teaching and learning. The first step is to collect data using a structured Google Form questionnaire. The questionnaire is designed to gather information from both students and teachers about the cloud platforms they use, the frequency of use, and the benefits and challenges they experience.

Once the responses are collected, the next step is to segregate the data into student and teacher groups. This separation helps to understand the differences in how students and teachers use cloud tools and to identify their unique needs and experiences.

The study will then analyze the usage of various cloud services, including platforms like Google Classroom, Microsoft Teams, Zoom, and Moodle. The analysis will focus on which platforms are most popular, how often they are used, and the specific purposes they serve in teaching and learning.

The research will also identify trends, gaps, and user preferences. This includes recognizing which tools are working well, where users face difficulties, and what features or support may be needed to improve cloud adoption.

To make the findings clear and easy to understand, the results will be presented using diagrams, charts, and tables. Visual representations help show patterns, comparisons, and key insights effectively.

Finally, based on the analysis, the study will provide actionable suggestions for educational institutions. These recommendations may include improving digital infrastructure, offering training programs for teachers, adopting the most effective cloud tools, and addressing challenges like internet connectivity and data security. The goal is to help institutions enhance teaching quality, improve student learning, and make cloud-based education more efficient and accessible.

V. RESULTS & DISCUSSIONS

The survey conducted among students and teachers provided useful insights into how cloud computing is being used in educational institutions after COVID-19. According to the responses, students reported higher cloud usage (around 70%) compared to teachers (around 30%). This shows that students are more active in using online tools for learning, while teachers may face challenges in adapting to these technologies.

Figure 1

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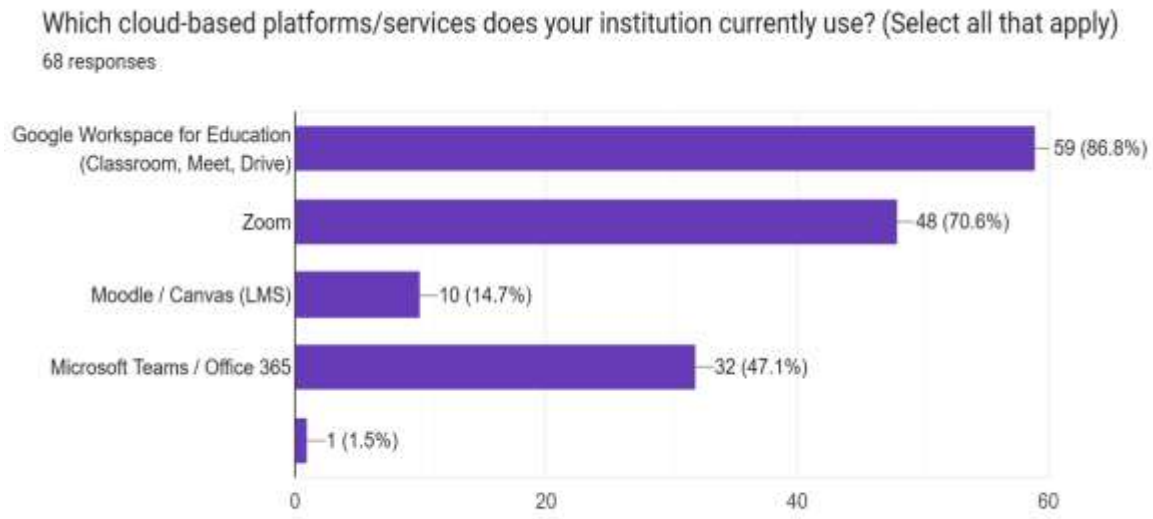
Interpretation - " This chart shows that most users are students indicating higher engagement with cloud tools among learners."

The most-used cloud platforms identified by the survey were Google Classroom, Google Drive, Zoom, and Microsoft Teams. Google Classroom was particularly popular due to its simple interface, easy access to assignments, and integration with other Google tools. Zoom and MS Teams were mainly used for live online classes and meetings.

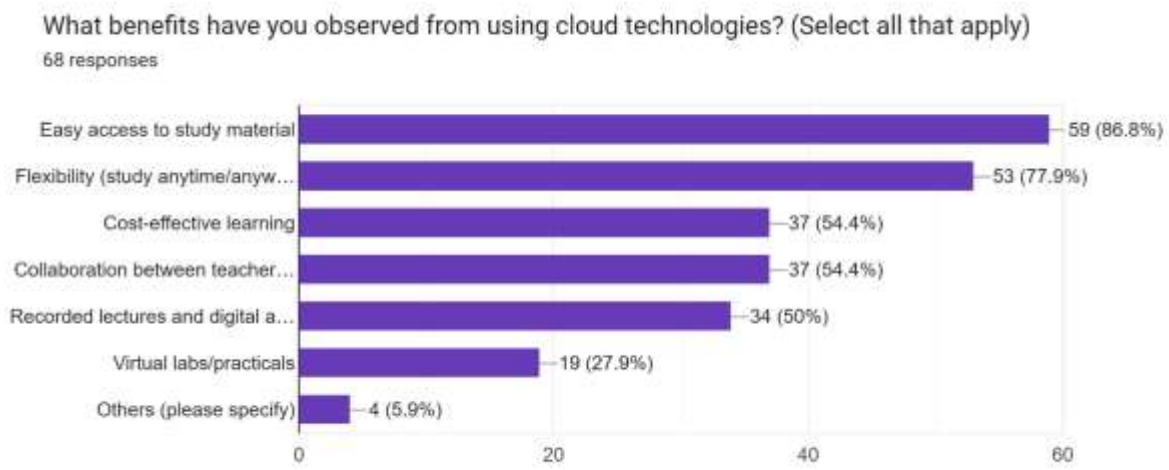
Figure 2



Interpretation - " The chart shows Google classrooms is the most popular platform followed by Google Drive , Zoom and MS Teams highlighting preference for easy to use and collaborative tools."

A majority of respondents agreed that cloud tools helped maintain continuity of learning even when physical classrooms were closed. Students appreciated being able to access learning materials anytime, work at their own pace, and collaborate with peers online. Teachers also found it easier to share resources, conduct interactive sessions, and provide real-time feedback.

Figure 3

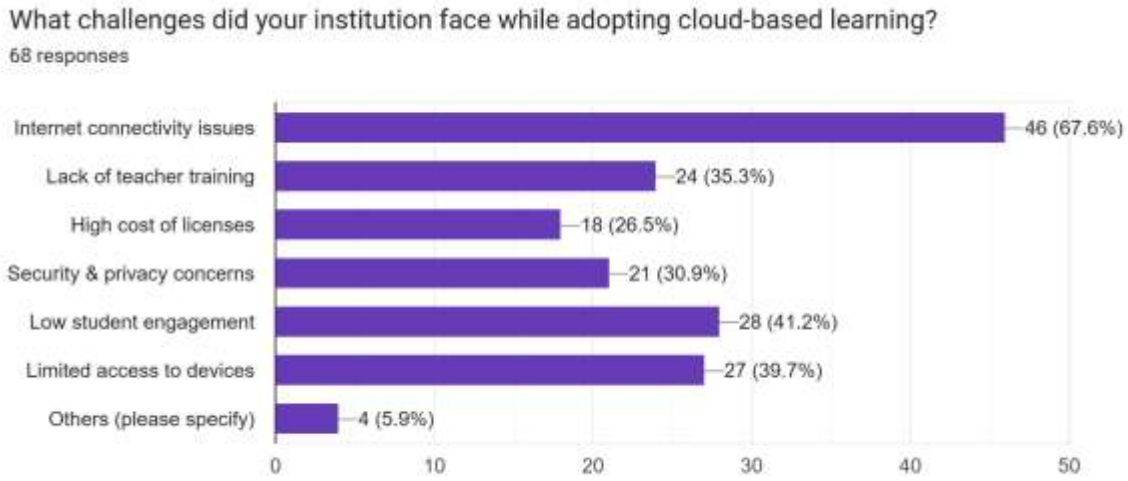


Interpretation - " This chart illustrates that flexibility, accessibility & collaboration are the main benefits reported by users."

However, the survey also highlighted some key challenges. Internet connectivity issues were reported by many respondents, especially those in semi-urban and rural areas. Lack of proper training for teachers made it difficult to use

some cloud platforms effectively. Some students and teachers also faced problems with device availability, such as not having laptops or smartphones for online learning.

Figure 4



Interpretation - " The chart shows that internet issues, lack of training, & limited device access are the main challenges faced by users."

In the discussion, the charts and graphs help explain these findings visually. For example, pie charts can show the percentage of students and teachers using each platform, while bar graphs can illustrate the main challenges faced. The data suggests that students prefer tools that are easy to use and allow self-paced learning, whereas teachers may struggle when platforms are more complex or when they lack proper guidance.

Overall, cloud computing has improved access, flexibility, and collaboration in education, but it has also introduced new challenges. Understanding these trends helps institutions plan better training for teachers, invest in reliable internet and devices, and select the most effective cloud platforms to support learning.

VI. FINDINGS & SUGGESTIONS

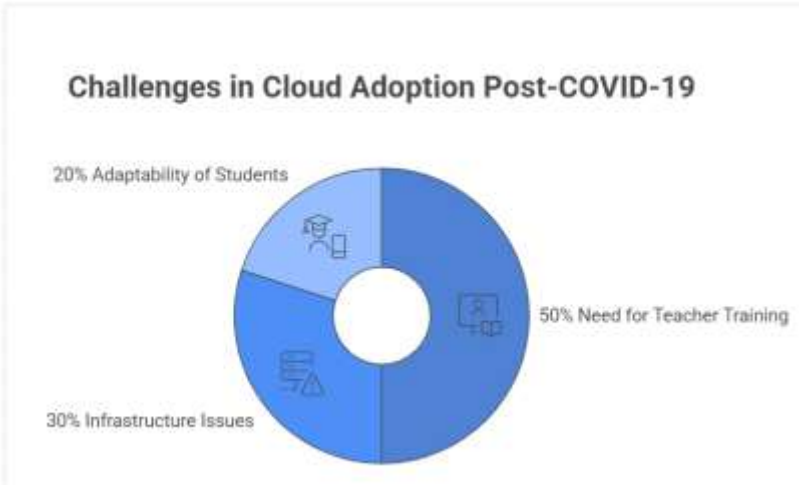
Key Findings:

The survey and analysis show that cloud adoption increased significantly after COVID-19. Educational institutions quickly started using online tools to continue teaching and learning when physical classrooms were not available. Among the users, students are more adaptable to digital tools. They are comfortable accessing learning materials online, attending virtual classes, submitting assignments digitally, and collaborating with peers.

On the other hand, teachers require more training support. Many teachers struggled with using cloud platforms effectively, managing virtual classrooms, and providing feedback online. This shows a need for continuous professional development and guidance for educators to make the most of these tools.

The study also found that cloud tools improved accessibility and flexibility. Students can learn from anywhere at any time, and teachers can share resources and conduct interactive sessions more efficiently. However, infrastructure issues remain a major barrier, particularly in semi-urban and rural areas. Poor internet connectivity, lack of proper devices, and limited digital resources sometimes prevent smooth use of cloud technology.

Figure 5



Interpretation - " This graph summarizes the major findings showing both the benefits of cloud adoption and the areas that need improvement."

Suggestions:

To address these challenges and maximize the benefits of cloud adoption, several steps can be taken:

Conduct regular digital training workshops for teachers to improve their technical skills and confidence in using cloud platforms.

Improve Wi-Fi connectivity and device access within institutions to ensure all students and teachers can participate in online learning effectively.

Promote hybrid learning by combining online cloud tools with traditional classroom methods, allowing more flexibility in teaching and learning.

Encourage teachers to integrate Learning Management Systems (LMS) like Google Classroom, Moodle, or MS Teams into their teaching practices actively, so students can benefit from organized and efficient learning.

VII. FUTURE SCOPE

The scope of this study can be expanded in several ways to provide a deeper understanding of cloud adoption in education.

Firstly, the study can be conducted across multiple colleges and universities in different regions to get a broader and more diverse set of data. This will help identify trends, similarities, and differences in cloud usage among students and teachers at a larger scale.

Secondly, future research can include a comparison between urban and rural institutions. Since infrastructure, internet connectivity, and access to devices can vary greatly between these areas, such a comparison can highlight the challenges faced by institutions in less-developed regions and suggest targeted solutions.

Another important area for future work is security and privacy awareness. As cloud platforms store sensitive student and institutional data, understanding how well teachers and students are aware of data privacy, cybersecurity practices, and safe usage of online tools is essential for secure and responsible cloud adoption.

Lastly, future research may explore the use of AI-based cloud tools in education. Artificial intelligence can make learning more interactive, personalized, and efficient by helping teachers track student progress, provide instant feedback, and recommend resources based on individual learning needs.

VIII. LIMITATIONS OF STUDY

Like any research, this study also has certain limitations that should be considered while interpreting the results.

Firstly, the sample size is limited, which means the findings may not fully represent all students and teachers across India. A larger sample from multiple colleges and regions could provide more generalizable results.

Secondly, the study only considered online survey responses. While this method is convenient and allows quick data collection, it may exclude participants who have limited internet access or are less comfortable with digital forms.

Thirdly, the research is restricted to one city or a few colleges, which means the findings may not reflect the experiences of institutions in other regions, especially rural or remote areas where infrastructure and digital readiness differ significantly.

Finally, there is a possibility of biased or incomplete responses. Some participants may have misunderstood certain questions, skipped answers, or provided socially desirable responses, which can affect the accuracy of the results.

Despite these limitations, the study still provides valuable insights into cloud adoption in educational institutions post-COVID and lays the groundwork for future research to address these gaps.

IX. CONCLUSION

Cloud adoption evolved from crisis response to sustainable digital integration in Indian educational institutions. Learning systems such as Google Classroom, Microsoft Teams, and video-meeting platforms have become permanent academic tools supporting hybrid learning environments, digital libraries, and real-time engagement.

However, infrastructure deficiency, insufficient training, licensing costs, and institutional data-security readiness are critical issues that limit effectiveness. Government-aligned educational policies must ensure connectivity support, faculty skill development, and secure cloud frameworks for academic data to sustain long-term digital education models.

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