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Research Article

"The Impact Of COVID-19 Pandemic On Science Subjects With Reference To Physics In Howraghat Development Block Of Karbi Anglong District"

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ABSTRACT

The COVID-19 pandemic has caused unprecedented disruptions to education systems worldwide, with science education, particularly Science subjects in secondary level (Physics, Chemistry, mathematics and biology) facing unique challenges due to their reliance on practical and experiential learning. The sudden shift to remote learning posed significant obstacles for subjects requiring laboratory experiments, fieldwork, and hands-on activities. This study examines the impact of the pandemic on science education in the Howraghat Development Block of Karbi Anglong district, Assam. Employing a mixed-methods approach, it investigates the accessibility of online learning, challenges faced by teachers and students, and the implications for academic performance and engagement. For physics, the inability to conduct experiments and visualize concepts like mechanics, optics, and electromagnetism created significant learning gaps. Similarly, botany and zoology education faced setbacks as students were unable to participate in fieldwork and practical activities such as plant identification and herbarium preparation. Socio-economic disparities, technological barriers, and limited teacher preparedness further compounded these issues. This study highlights the disproportionate impact on rural students, with a focus on the systemic issues exposed by the pandemic. The findings underscore the need for innovative solutions, including virtual labs, teacher training, and infrastructure development, to ensure continuity in science education during future crises. Recommendations for mitigating such challenges in the future are also discussed.

Keyword – Education, Science education, Corona Pandemic

Introduction

The COVID-19 pandemic disrupted traditional classroom-based teaching, pushing educators and students to adopt remote learning methods. Science education, and specifically physics and botany, requires a combination of theoretical instruction and hands-on experimentation, which posed significant challenges in transitioning to online platforms. The Howraghat Development Block, characterized by its rural setting and socio-economic diversity, exemplifies the difficulties faced in ensuring continuity in science education. The challenges were exacerbated by the region's lack of access to digital infrastructure, economic vulnerabilities, and a significant digital divide.

In Assam, the pandemic's effects on education were manifold. The sudden lockdown in March 2020 forced schools and colleges to shut down, leaving educators scrambling to adapt to new methods of instruction. While urban areas in Assam experienced some degree of continuity through digital platforms, rural areas like Karbi Anglong faced severe disruptions. Many students in these areas did not have access to smartphones, computers,

or stable internet connections, making it nearly impossible to transition to online education. Teachers also struggled to adapt to online teaching, especially for subjects like physics and botany that require practical demonstrations and field-based learning.

For physics education, the inability to conduct experiments and provide hands-on experiences was a significant hurdle. Concepts such as optics, thermodynamics, and electromagnetism, which require laboratory equipment and interactive teaching methods, were difficult to convey effectively through virtual platforms. Similarly, botany and zoology education suffered as students were unable to participate in essential fieldwork activities, such as studying plant anatomy, ecological surveys, and herbarium preparation. The lack of practical exposure not only affected students' understanding but also diminished their interest in these subjects.

The socio-economic diversity of the Howraghat Development Block further complicated the situation. Many families in the region rely on agriculture and daily wage labor for their livelihood, and the pandemic-induced economic hardships forced many students to prioritize household responsibilities over education. Female students, in particular, faced additional challenges, including increased domestic duties and restricted access to technology due to gender norms. These factors contributed to a widening educational gap, with marginalized students being disproportionately affected.

The psychological impact of the pandemic also played a crucial role in shaping the educational experiences of students and teachers. The prolonged isolation, uncertainty about the future, and the stress of adapting to new learning methods took a toll on students' mental health. Many reported feelings of anxiety, lack of motivation, and disengagement from studies. Teachers, too, faced significant stress as they navigated the dual challenges of adapting to online teaching and addressing the diverse needs of their students.

Despite these challenges, the pandemic also brought to light the resilience and adaptability of educators and students. In some cases, teachers in Howraghat used innovative methods to engage students, such as conducting classes over phone calls, distributing printed study materials, and organizing small group sessions while adhering to COVID-19 safety protocols. These efforts, however, were limited in scope and could not fully compensate for the lack of comprehensive digital infrastructure.

The impact of the pandemic on education in Assam highlights the urgent need for systemic reforms to address the vulnerabilities exposed by this crisis. Investing in digital infrastructure, providing targeted support for marginalized students, and training teachers in digital pedagogy are crucial steps to ensure the continuity of education in the face of future disruptions. This study aims to explore these challenges in detail, focusing on the experiences of students and teachers in the Howraghat Development Block and proposing actionable recommendations for building a more resilient education system.

Objectives of the Study

1. To identify the specific challenges faced by students and teachers in teaching and learning of science subjects.
2. To assess the impact of these challenges on students' academic performance and engagement with reference to physics.

Literature Review:

Impact on Accessibility to Education

Several studies have highlighted the challenges in accessing education during the pandemic. Ahmed et al. (2021) found that in Assam, only 30% of rural households had access to smartphones or other digital devices, creating significant barriers to online education. Similarly, Baruah and Saikia (2022) reported that limited internet connectivity in rural areas exacerbated the digital divide, leaving a majority of students unable to participate in virtual learning. These studies emphasize that accessibility was a critical determinant of educational continuity during the pandemic.

Shift to Online Learning and Teaching Methodologies

The sudden transition to online learning posed challenges for both students and teachers. A study by Gogoi (2021) revealed that 68% of teachers in Assam were not adequately trained to use digital tools for teaching, leading to reduced effectiveness of online classes. In addition, Sharma et al. (2021) observed that subjects requiring practical demonstrations, such as science, were particularly impacted, with teachers struggling to replicate laboratory experiments in a virtual environment. These findings indicate that the shift to online teaching highlighted a lack of preparedness in adopting digital pedagogy.

Student Engagement and Learning Outcomes

Research on student engagement during the pandemic underscores a decline in learning outcomes. According to Das (2022), students in Assam reported decreased motivation and engagement due to prolonged isolation and the lack of interactive learning opportunities. Furthermore, Singh and Dutta (2022) found that students' academic performance in subjects like mathematics and science significantly declined, with rural students being the most affected. These studies suggest that the lack of direct interaction between teachers and students adversely impacted learning outcomes.

Socio-Economic Challenges

The pandemic's economic repercussions disproportionately affected students from low-income families. Bora and Kalita (2021) documented that many students in Assam were compelled to take on household responsibilities or part-time jobs, reducing their focus on education. Gender disparities were also evident, with female students facing additional barriers, such as increased domestic duties and restricted access to technology (Saikia, 2021). These socio-economic challenges further widened the educational inequality in the state.

Psychological Impact on Students and Teachers

The psychological toll of the pandemic was significant. Hazarika (2022) noted that students in Assam experienced heightened anxiety and stress due to uncertainties surrounding exams and future academic prospects. Teachers, too, faced challenges, including adapting to online teaching while managing their own stress and workload (Baruah, 2022). The pandemic underscored the need for mental health support for both students and educators.

Government and Institutional Responses

In response to the challenges, the Government of Assam initiated measures such as television-based classes and distribution of printed study materials to bridge the gap for students without digital access (Department of Education, Assam, 2021). However, these efforts had limited reach and effectiveness, as noted by Sharma et al. (2021). The need for a comprehensive policy framework to address the systemic issues exposed by the pandemic remains critical.

The literature highlights the multifaceted impact of the COVID-19 pandemic on Assam's education sector, revealing significant challenges in accessibility, teaching methodologies, and socio-economic equity. While the government and institutions made commendable efforts to mitigate these challenges, the pandemic underscored the urgent need for systemic reforms to build a more resilient and inclusive education system. Future research should focus on evaluating the long-term impacts of these disruptions and identifying sustainable strategies for bridging the educational divide.

Methodology:

This academic study analyses the behaviour and response of students to the sudden changes in education sector in order to assess the impact of the Coronavirus pandemic on them. The study was conducted in Howraghat block area in Karbi Anglong district. Mainly Assamese, Karbi, Bengali and Adivasi community peoples are there in Howraghat. Howraghat Pin code is 782481 with latitude 26.1101164 and longitude 93. 0325765.. As of 2001 India census, Howraghat had a population of 95649. Males constitute 58% of the population and females 42%. Howraghat has an average literacy rate of 80%, higher than the national average of 59.5%: male literacy is 85%, and female literacy is 73%.

The study uses both primary and secondary data for an elaborate analysis on the topic. The primary data was collected by conducting interviews, survey using detailed questionnaires. The questions were dominantly designed as multiple-choice questions for ease of the responders. The secondary data used for the analysis has been collected from a variety of books, journals, newspapers, government records, records of international organisations, websites etc. The method of analysis used for the data collected is statistical analysis conducted using MS Excel.

The various information obtained from the respondents have been analysed and represented using graphical techniques. A variety of pie charts, bar diagrams, and line charts have been used for a detailed analysis of the objectives.

Analysis and Findings:

The COVID-19 pandemic forced a shift to online education, but accessibility varied greatly among students due to several factors:

1. Access to Resources

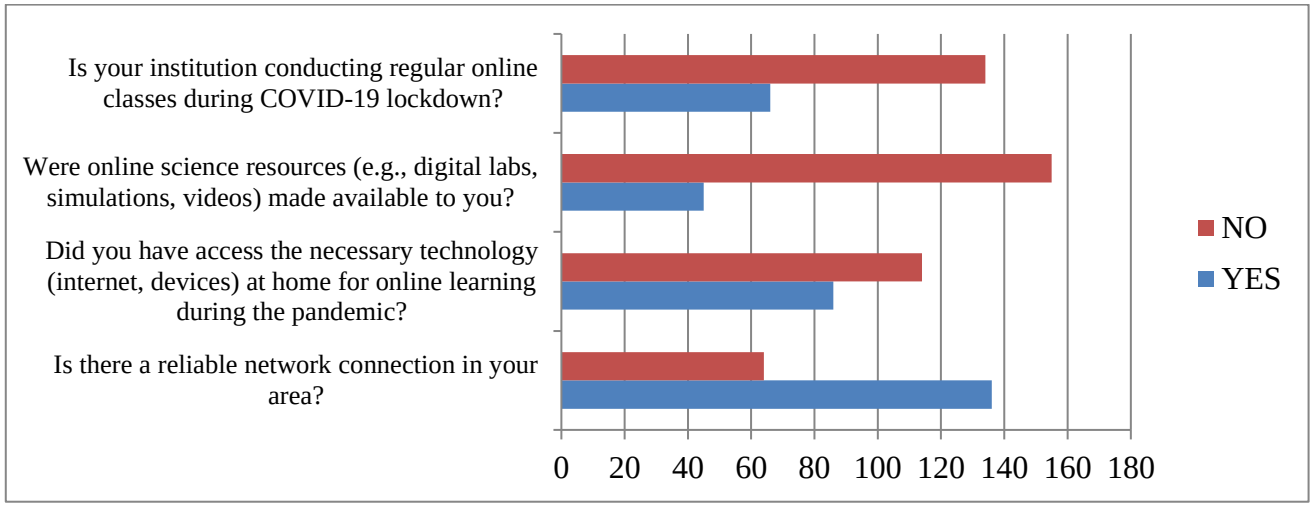
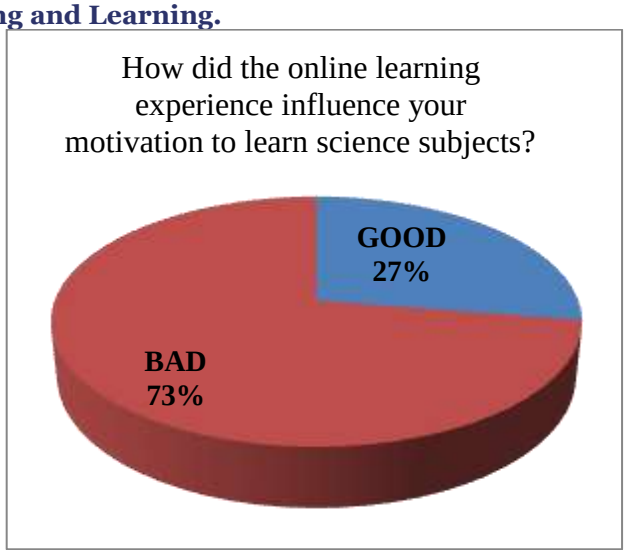
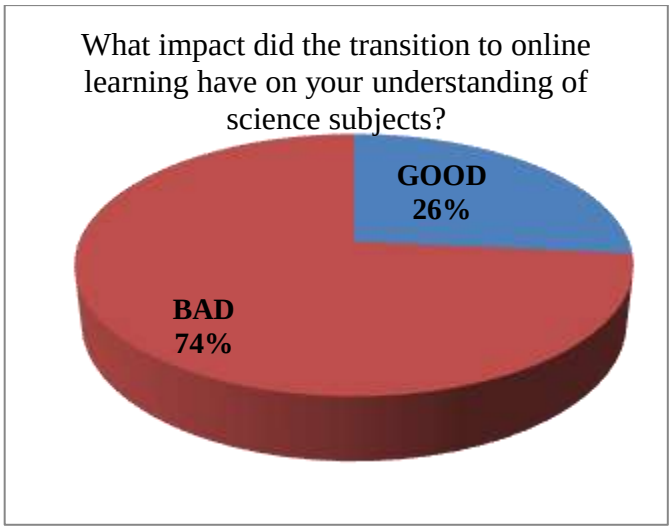


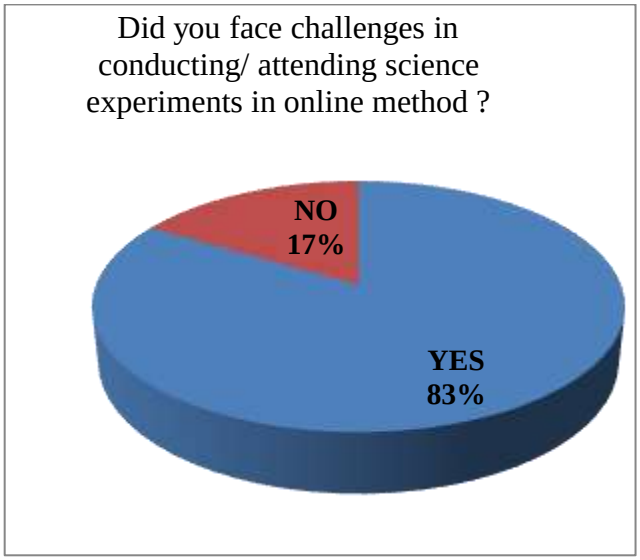
Fig.1: Graphical representation of access of resources

Figure 1: According to response recorded the area has a good network and internet connectivity. Out of 200 respondent 70 % respondents mention that they have access to good network and good internet connectivity but there was a lack of knowledge to use in teaching learning process for both teachers and Students. During the pandemic virtual class (online class) was the only method to connect to the students.50% of teachers unable to conduct regular classes.

2. Challenges in Teaching and Learning.







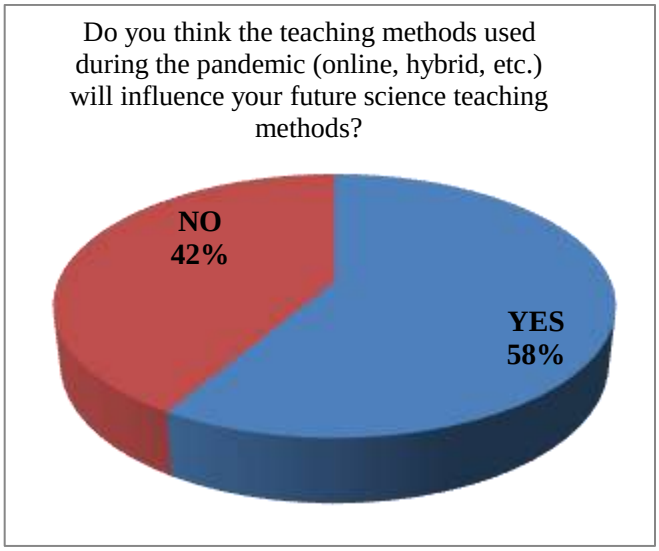
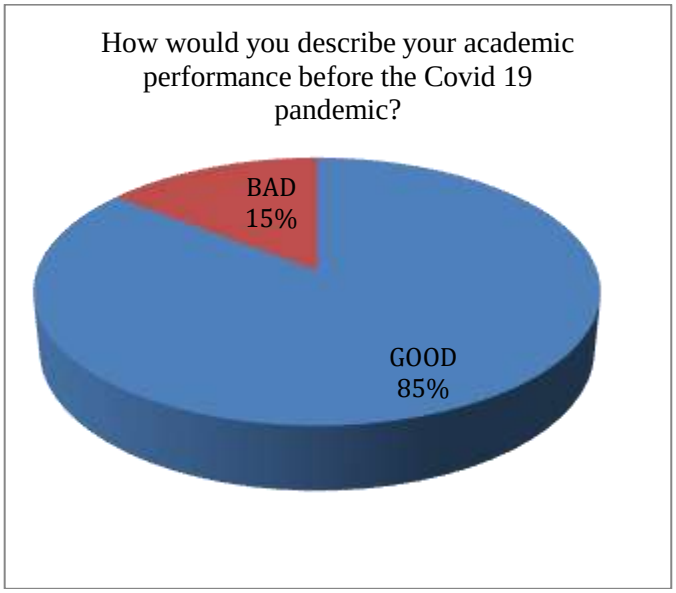
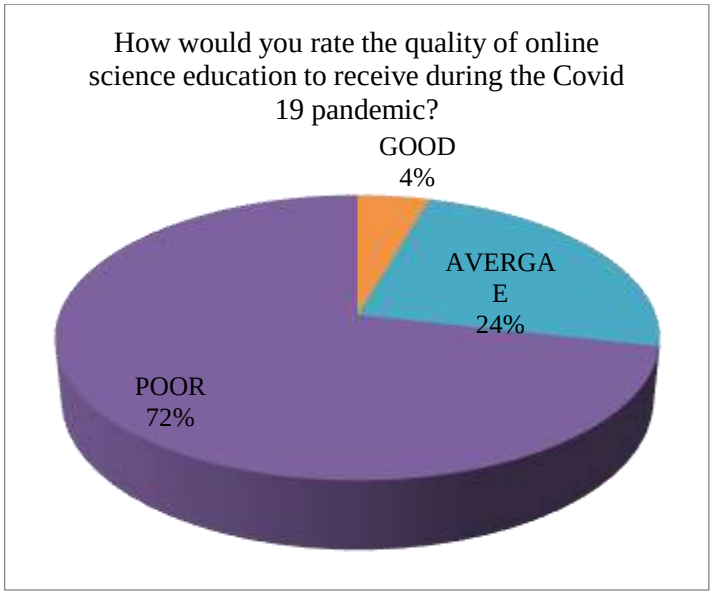


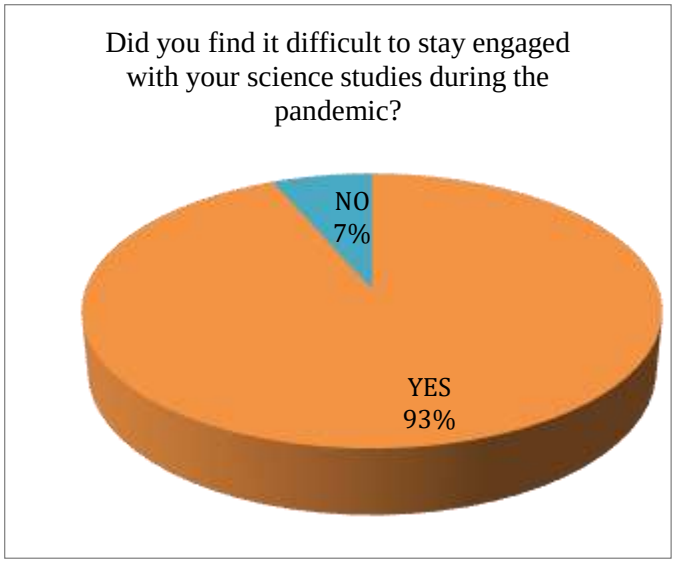
Fig.2: Graphical representation of Challenges faced in teaching and learning

The figure highlights the challenges in teaching and learning science subjects during the pandemic through four key aspects:
Understanding of Science Subjects: 74% of participants reported a negative impact from the transition to online learning, while only 26% found it beneficial.
Motivation to Learn: Online learning reduced motivation for 73% of respondents, with just 27% experiencing increased motivation.
Challenges in Experiments: A significant 83% faced difficulties conducting or attending science experiments online, compared to 17% who did not.
Influence on Future Methods: 58% believe pandemic teaching approaches (online, hybrid) will influence future teaching methods, whereas 42% disagree

Impact on Academic Performance


How would you describe your academic performance before the Covid 19 pandemic?
BAD 15%
GOOD 85%


How would you rate the quality of online science education to receive during the Covid 19 pandemic?
GOOD 4%
AVERGA E 24%
POOR 72%


Did you find it difficult to stay engaged with your science studies during the pandemic?
NO 7%
YES 93%

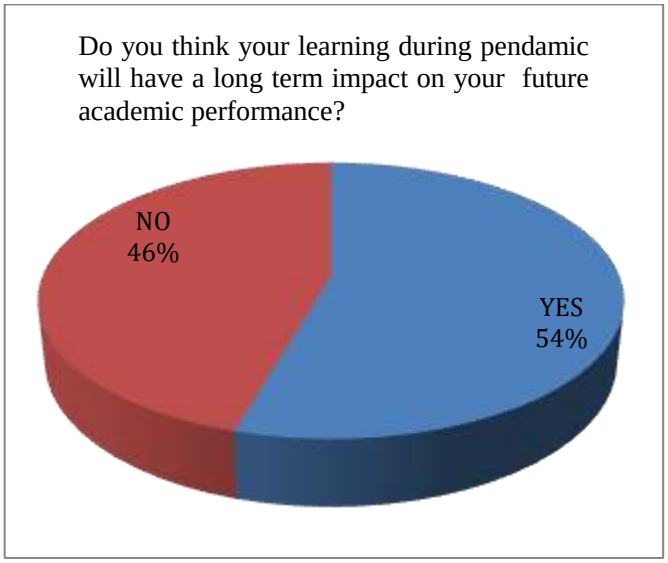


Fig.3 Graphical representation of Impact on Academic performance

The figure illustrates the impact of the COVID-19 pandemic on academic performance through four pie charts. Before the pandemic, 85% of participants reported good academic performance, while 15% described it as bad. The quality of online science education during the pandemic was rated as poor by 72%, average by 24%, and good by only 4%. A significant 93% found it difficult to stay engaged with their science studies during the pandemic, compared to 7% who did not face such challenges. Additionally, 54% believe their learning experience during the pandemic will have a long-term impact on their academic performance, while 46% disagree.

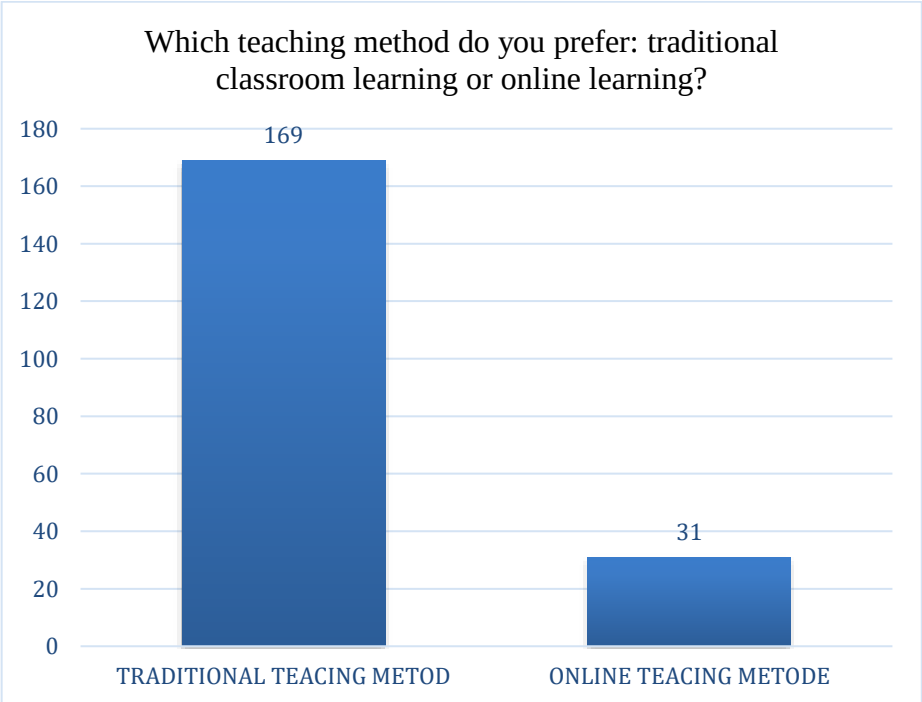


Fig.4: Graphical representation of Method of learning prefers by students

Out of 200 respondents, 169 preferred traditional classroom learning, while only 31 favoured online learning. This highlights that students place significant value on the interactive and immersive experience offered by traditional classrooms, making it their favoured mode of education.

Findings: -

The survey results provide insight into students' academic performance, perceptions of online science education, and preferences for teaching methods before and during the COVID-19 pandemic.
A significant majority reported good academic performance before the pandemic, while some students reported poor performance. This suggests that most students were performing well academically before the pandemic.

However, the quality of online science education during the pandemic was rated poorly by most students. Only 9 students rated it as good, while 48 students rated it as average, and 143 students rated it as bad. This suggests that online science education during the pandemic was inadequate and ineffective. An overwhelming majority reported difficulty in staying engaged with their science studies during the pandemic. This highlights the challenges students faced in maintaining their interest and motivation in science subjects during the pandemic. A significant majority believed that their learning during the pandemic will have a long-term impact on their future academic performance. This suggests that students are concerned about the potential consequences of inadequate online education on their future academic success. Finally, a majority preferred traditional classroom learning over online learning. This suggests that students value the interactive and immersive nature of traditional classroom learning and prefer it over online learning. Overall, the survey results suggest that the COVID-19 pandemic had a significant impact on students' academic performance, engagement, and motivation in science subjects. The results also highlight the limitations of online education and the need for more effective and engaging teaching methods.

The survey results reveal a mixed impact of online learning on students' understanding and motivation to learn science subjects during the pandemic.

A majority (147 out of 200) reported a negative impact on their understanding of science subjects mainly physics, while 53 students reported a positive impact. This suggests that online learning may not have been as effective for many students in grasping complex scientific concepts. Similarly, a slight majority (145 out of 200) reported a negative impact on their motivation to learn science, while 55 students reported a positive impact. This indicates that online learning may have demotivated some students from pursuing science subjects. An overwhelming majority (167 out of 200) reported facing challenges in conducting or attending science experiments online. This highlights the limitations of online learning in providing hands-on experience and practical skills in science subjects. Interestingly, a majority (117 out of 200) believed that the teaching methods used during the pandemic will influence their future science teaching methods. This suggests that students value the flexibility and adaptability of online and hybrid learning models.

A majority (109 out of 200) reported experiencing a lack of interaction or support from teachers during online learning. This suggests that students felt isolated and unsupported during the pandemic, which may have contributed to their difficulties in staying engaged with their science studies.

A significant majority (154 out of 200) believed that their learning during the pandemic will have a long-term impact on their future academic performance. This suggests that students are concerned about the potential consequences of inadequate online education on their future academic success.

Finally, a majority (149 out of 200) preferred traditional classroom learning over online learning. This suggests that students value the interactive and immersive nature of traditional classroom learning and prefer it over online learning.

Overall, the survey results suggest that the COVID-19 pandemic had a significant impact on students' academic performance, engagement, and motivation in science subjects. The results also highlight the limitations of online education and the need for more effective and engaging teaching methods.

Recommendations

1. Infrastructure Development: Provide schools with the resources needed to deliver hybrid education, including digital devices and internet access.
2. Virtual Labs and Simulations: Develop and disseminate virtual tools to enable practical Science experiments remotely.
3. Teacher Training: Conduct regular workshops to enhance teachers' skills in digital pedagogy and online content creation.
4. Community Support: Engage local communities to create support systems for students, such as study groups and mentorship programs.
5. Government Initiatives: Formulate policies to bridge the digital divide and ensure equitable access to education in rural areas.
6. Flexible Curriculum: Adapt the curriculum to allow for more flexible and modular learning during emergencies.

Conclusion

A significant number of students reported inadequate access to proper internet facilities, which hindered their participation in online classes. Since reliable network and internet connectivity are essential for online education, these findings highlight the critical issue of the digital divide in Assam.

Furthermore, many students indicated that their educational institutions were not conducting regular online classes, which could negatively impact their academic progress. While most institutions transitioned to online education due to disruptions in the traditional system, the data suggests that a large number of students remain excluded from online learning opportunities.

The majority of students have expressed a preference for traditional classroom education over online education. In terms of academic focus, holistic development, and overall grooming, traditional education is favoured significantly over its online counterpart. The COVID-19 pandemic, however, caused a substantial disruption to students' academic progress, as many lacked access to necessary study materials due to lockdowns and the closure of institutional libraries. Additionally, students' mental health suffered during this period of crisis, with many finding it challenging to concentrate on their studies.

In Karbi Anglong, Assam, the challenges related to science learning have been particularly pronounced during the COVID-19 pandemic. Many students, especially in rural and remote areas, faced significant barriers in accessing essential resources for science education, including laboratory materials and practical learning opportunities, due to the closure of schools and lockdown restrictions. The absence of hands-on science experiments and the inability to engage with physical learning tools hampered the development of scientific knowledge and skills. Additionally, the digital divide, with inadequate access to the internet and technology, further limited students' ability to benefit from online science classes. As a result, students in Karbi Anglong experienced disruptions in their science education, which may have long-term implications for their academic and career prospects in science-related fields.

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ANNEXURE I

A questionnaire to elicit the information on **"The Impact of COVID-19 Pandemic on Science Subjects with reference to Physics in Howraghat Development Block of Karbi Anglong District"**

SOCIO-ECONOMIC PROFILE: (Personal data)

1. Age
a. 18-25
b. 26-35
c. 36-45
d. 45-above
2. Gender
a. Male
b. Female
3. Marital status
a. Married
b. Unmarried-Divorced
c. Prefer not to answer

4. Occupation
a. Student
b. Employee
c. Businessman/women

Access to Resources:

5. Is there a reliable network connection in your area?
6. Did you have access the necessary technology at home/ institution for online learning during the pandemic?
7. Were online science resources (Eg. Digital lab, simulations, videos) are available to you?
8. Are you able to conducting/ attending regular online classes?

Challenges in Teaching and Learning:

9. What impact did the transition to online learning have on your understanding of science subjects?"
10. How did the online learning experience influence your motivation to learn science subjects?
11. Did you face challenges in conducting/ attending science experiments in online method?
12. Do you think the teaching methods used during the pandemic (online, hybrid, etc.) will influence your future science teaching methods?

Impact on Academic Performance:

13. How would you describe your academic performance before the Covid-19 pandemic?
14. How would you rate the quality of online science education to receive during the Covid-19pandemic?
15. Did you find it difficult to stay engaged with your science studies during the pandemic?
16. Did you experience a lack of interaction or support from teachers during online Learning?
17. Do you think you're learning during pandemic will have a long-term impact on your Future academic performance?
18. Which teaching method do you prefer: traditional classroom learning or online learning?