Centre for Public Policy Research

EDTECH

EXAMINING EXPERIENCES, CHALLENGES, AND FUTURE DIRECTIONS

August 2023

Centre for Public Policy Research

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Acronyms

2FA	Two-factor Authentication
CAGR	Cumulative Annual Growth Rate
CPPR	Centre for Public Policy Research
DTH	Direct To Home
EdTech	Education Technology
HDI	Human Development Index
HDMI	High-Definition Multimedia Interface
HRW	Human Rights Watch
ICT	Information and Communication Technology
IT	Information Technology
KIIFB	Kerala Infrastructure Investment Fund Board
KITE	Kerala Infrastructure and Technology for Education
LMS	Learning Management Systems
NEP	National Education Policy
NETF	National Educational Technology Forum
SDG	Sustainable Development Goals
SECC	Socio-Economic and Caste Census
VPN	Virtual Private Network

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Executive Summary

Education plays a pivotal role in the development and progress of societies, serving as a cornerstone for social, economic, and cultural advancement. With the rapid developments in technology, governments worldwide are redefining education to equip students with the necessary skills to thrive in a technology-driven era. In this context, Education Technology (EdTech) has emerged as a transformative force within the Indian education system.

EdTech encompasses a range of technological tools, including software, hardware, and associated technologies, with the goal of promoting engaging, interactive, and individualised learning experiences. Though India's journey in education technology can be traced back to 1986, when the nation formulated its first education policy, the adoption and growth of EdTech were fairly slow. The onset of the COVID-19 pandemic, however, drastically expedited the transition towards technology-driven education. Additionally, the National Education Policy (NEP) 2020 places significant emphasis on integrating disruptive technologies into the transformation of the education system.

The global EdTech market size was valued at $101 billion in 2022 and is expected to grow to $300 billion in 2029, with the Indian market accounting for $6 billion, representing approximately 6% of the global market share. Given this significant growth in technology-driven education, it becomes crucial to pause and assess the effectiveness of EdTech in schools. The current study undertaken by the Centre for Public Policy Research (CPPR) seeks to explore how the school education system and teacher training programs can effectively utilise EdTech by identifying the challenges and experiences of educators, teachers, and parents. Additionally, it aims to form a basis for future discussion and deliberation on the development of technology policies for schools. The study was administered in the Ernakulam district of Kerala and comprised a sample of 407 students, 52 teachers, and 47 parents from two government and three aided schools.

The study findings revealed that a majority of students use EdTech in their learning journey. The usage of various EdTech tools, particularly digital learning applications, has proven to be useful for students in improving their academic performance and understanding of various areas of study and interest. Technology-enabled classroom lectures have contributed to students gaining a comprehensive understanding of the syllabus. The use of audio and video content for demonstrations within the classroom environment has enhanced students' attention spans and made classes more engaging and captivating. Consequently, technology has played a pivotal role in enhancing the overall teaching and learning experience.

However, the rapid pace of technological development also gives rise to new problems and challenges that require immediate attention and proactive measures to mitigate potential risks. One of the challenges associated with technology is the digital divide, which restricts access to EdTech resources such as digital learning applications. Nevertheless, the state government's efforts, particularly during the COVID-19 pandemic, have achieved considerable success, with only a small percentage of surveyed students reporting a lack of digital devices at home. However, the issue stems from inconsistent access to these devices and the absence of stable internet connections necessary to support effective digital learning. Thus, bridging this gap and ensuring equal access to EdTech for all students, regardless of their economic background, is of utmost importance.

It is worth mentioning that while there are government-funded digital learning applications, private players have gained a slight advantage due to the higher quality of teaching and study materials provided to students.

The study identified significant disparities between students and teachers in terms of the frequency of ICT equipment's usage for teaching in schools. Students reported limited usage**,** while teachers reported regular usage. While EdTech has demonstrated its potential in reducing teachers' workload, ineffective utilisation of EdTech tools by teachers hinders the expected outcomes. Therefore, it is imperative to provide better training for teachers on the effective use of EdTech for curriculum planning, student assessment, after-school support, and communication with parents. Moreover, concerns were raised by parents regarding excessive device usage, cybersecurity risks, and access to inappropriate content, emphasising the need for parental education and awareness.

In order to maximise the benefits of EdTech, it is imperative to address the challenges that have been identified. By addressing these challenges, an environment can be created that fosters the effective integration of technology in education and ensures that students can fully leverage the advantages offered by EdTech. Furthermore, it is crucial to recognise the significance of conducting similar studies at both local and national levels. Such studies provide valuable insights into the specific challenges faced by students in different regions and help identify areas for improvement in the technology-based education ecosystem.

Chapter 1

Introduction

Access to quality education is one of the United Nations' Sustainable Development Goals (SDGs), which focuses on ensuring inclusive and equitable education and promoting lifelong learning opportunities for all (SDG 4). Historically, education has been confined to the limited time and physical space of a classroom. However, the emergence of technology-driven education, commonly known as EdTech, has effectively eliminated these constraints, enabling unrestricted access to education. EdTech covers not only online learning but also the whole suite of software, hardware, and digital tools and services that can help deliver education (Education Technology, Coronavirus, and Beyond 2020). These include smart classrooms, desktop or mobile learning applications, educational channels on television, online assessment tools, learning management systems (LMS)[1], and communication and collaboration tools.

The global EdTech market was valued at $101 billion in 2022 and is expected to grow to $300 billion in 2029. Whereas the Indian market size is valued at $6 billion in 2022, which is 6% of the global market share, with the K-12 market contributing $2.7 billion (Blume Venture 2022). While the global EdTech market is growing at a CAGR of 16.4%, the Indian EdTech market is growing at 40% (Sarkar 2023). As per funding patterns, India is the most preferred country for EdTech funding by foreign investors. The EdTech market in India is highly competitive, with over 4,000 EdTech start-up players in the field (Sikandar et al., 2021). 19% of the global EdTech unicorns are based in India. These companies had a total valuation of $34.05 billion as of June 2022. This substantial valuation indicates the immense potential and investor confidence in the Indian EdTech industry.

The Indian Education System is one of the largest in the world, catering to a vast population of over 14.89 lakh schools, 95 lakh teachers, and 26.52 crore children (UDISE 2021). In recent times, the government has been actively exploring ways to reimagine educational opportunities by embracing technology and developing a technology-driven educational ecosystem. This drive gained significant momentum with the onset of the COVID-19 pandemic and subsequent lockdowns, which necessitated the reliance on technology to facilitate uninterrupted teaching and learning. The Indian government has undertaken numerous efforts to promote digital education, including initiatives such as PM e-Vidya, which unifies all digital, online, and on-air education efforts to provide coherent multi-mode access to education. With National Education Policy (NEP) 2020, the Government of India envisages establishing an autonomous body - National Educational Technology Forum (NETF), to provide a platform for the open exchange of ideas on the use of technology to enhance learning, assessment, planning, and administration. Thus, by leveraging technology, the government aims to bridge the digital divide and ensure that all students have access to quality education regardless of their socioeconomic status or geographical location.

Kerala has made remarkable strides in social development and has achieved a level of quality of life that is comparable to that of developed countries. One key area where Kerala has excelled is in education. With a literacy rate of 94%, Kerala boasts the highest literacy rate in India. The education system in Kerala is under the direct management of the Kerala Education Department, which oversees a vast network of educational institutions. This includes more than 14,000 schools, employing over 160,000 teachers, and supported by over 20,000 non-teaching staff members (“General Education Department”, n.d.).

[1]A learning management system is a software application or web-based technology used to plan, implement and assess a specific learning process.

The Kerala government has taken various steps towards digitalising the education system, with the establishment of the Kerala Infrastructure and Technology for Education (KITE), formerly the IT@School Project, launched in 2005. The first breakthrough in IT@School came when information technology was made a compulsory subject in Standard 10. This was closely followed by the launch of the VICTERS channel, a first-of-its-kind complete educational channel in the country. Under the umbrella of KITE, several ICT-based initiatives have been implemented, including the Hi-Tech School Project, Hi-Tech Lab Project, Samagra Content Portal, Sampoorna School Management Software, and SchoolWiki. Despite various initiatives by the government for digital integration, the total internet penetration in Kerala was only 56% in 2019, according to the Internet and Mobile Association of India.

Description of the Study

Given the rapid growth of EdTech, it is imperative to understand its impact on students, parents, and teachers. The current study assessed the factors driving the adoption of EdTech and the challenges faced in accessing it both in schools and at home. Based on the insights gathered, the study seeks to explore how the school education system and teacher training programs can effectively utilise EdTech, facilitate the development of relevant digital skills for student education, and strengthen support for teachers. Additionally, it aims to form a basis for discussion and deliberation on the development of technology policies for schools.

Primary Objectives of the Study

1. To assess the use and utility of ed-tech in the new age of education learning and practice
2. To identify the type of digital learning platforms preferred by the students, teachers, and parents
3. To examine the experiences and challenges of EdTech encountered by students, parents, and teachers

Chapter 2

Methodology

2.1 Study Approach and Methodology

The study adopted a mixed approach (qualitative and quantitative) to impact analysis. This evaluative process was conducted using a questionnaire-based survey method and semi-structured interviews with students, parents, and teachers.

Selection of Sample

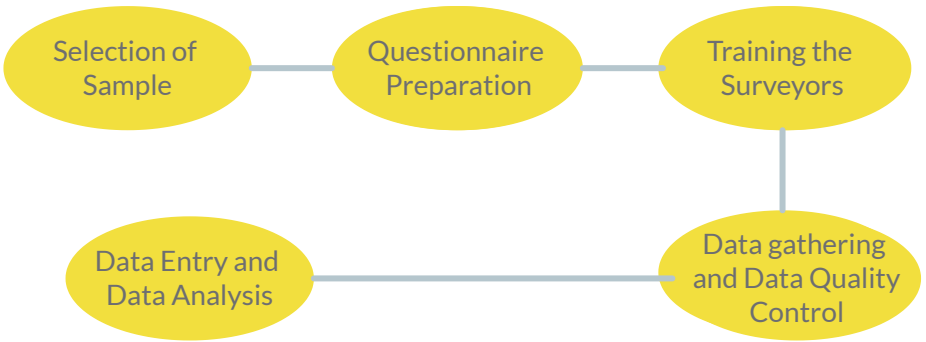
The study identified the key stakeholders as students, teachers, and parents. The selection of schools for the study was made using convenience sampling. The selection of the schools was based on their proximity to the CPPR office and their willingness to participate in the survey. Five schools were selected from the Ernakulam district of Kerala, out of which three were selected from urban areas and two from rural areas.[2] The study specifically focused on government and aided schools, as secondary research indicated that students in private schools generally have better access to EdTech resources due to the superior infrastructure and services offered by their institutions, as well as their comparatively higher socioeconomic backgrounds.

Questionnaire Preparation

In order to collect data for the survey, distinct questionnaires were developed for three key stakeholder groups: students, teachers, and parents (Appendix A1, A2, A3). Recognising the distinctive roles these groups play in education pedagogy, specific sets of questions were meticulously crafted for each group. The formulation of these questions drew upon comprehensive secondary research and consultations with experts in the field of education.

To ensure ease and convenience for the stakeholders, the questionnaires were made available in both English and Malayalam, taking into consideration the linguistic preferences of the participants. This approach aimed to facilitate a more inclusive and accessible survey experience for all respondents, allowing them to express their opinions and experiences comfortably in the language of their choice.

Figure 2.1: Data collection method



[2]*Urban and rural areas are classified as per the administrative structure.*

Table 2.1 represents the number of students, teachers, and parents covered in the survey.

Table 2.1: Sample Size

School	Respondents						
	Students				Total	Parents	Teachers
	7th (47%)		8th (53%)				
	Male (49%)	Female (51%)	Male (55%)	Female (45%)			
Government School 1	25	25	29	25	104	10	11
Government School 2	21	23	37	22	103	2	8
Aided School 1	25		25		50	10	10
Aided School 2		20		29	49	15	8
Aided School 3	23	29	28	21	101	10	15
Total = 5	94	97	119	97	407	47	52

The questions covered were categorised under the following heads:

a. General Information
b. Level of penetration of EdTech among students
c. Accessibility to EdTech at home and at school
d. Types of EdTech software/hardware used by students
e. Advantages and Challenges posed by EdTech
f. Utilisation and Effectiveness of EdTech as a teaching tool
g. Usage of technology for non-educational activities

Training of Surveyors

For the survey administration, two surveyors were carefully selected based on their understanding of the survey's objectives and their ability to facilitate the data collection process effectively. To familiarise the surveyors with the survey's purpose and methodology, they were directed to conduct pilot surveys with a small group of individuals within the organisation. This exercise was closely supervised by Senior Research Analysts, who provided valuable feedback and guidance to the surveyors.

Furthermore, the surveyors were provided with explicit instructions and guidelines not to ask any sensitive or intrusive questions of the participating students. Additionally, the surveyors were instructed to conduct the surveys under the careful observation and supervision of a designated representative from each respective school. This measure was intended to maintain transparency and accountability throughout the survey administration process.

Data Gathering and Data Quality Control

The data-gathering process was diligently carried out by the trained surveyors, who effectively collected data from a total of 407 students, 47 parents, and 52 teachers. The surveyors visited the schools where the survey was conducted, ensuring a convenient and accessible data collection process for the participants. Prior to distributing the questionnaires, the surveyors provided a comprehensive briefing to the respondents, emphasising the significance and purpose of the survey. Throughout the survey administration, the surveyors remained available to address any queries or concerns raised by the respondents, thus ensuring clarity and understanding.

To maintain data quality and systematic record-keeping, multiple methods were employed to ensure reliable and accurate data collection, while also monitoring and managing the progress of the survey.

Data Entry and Data Analysis

The collected data from the respondents were efficiently digitised using Google Forms, aiming to enhance data quality and facilitate subsequent analysis. During the data entry process, measures were taken to minimise errors and ensure accuracy. Comprehensive checks were conducted to identify and rectify any grammatical errors present in the entered data. In cases where respondents left certain questions unanswered, the entry was recorded as "Not answered". Additionally, questions that did not require a response from the respondents were intentionally left blank during the data entry process.

2.2 Relevance of the Study

Prior research endeavours have predominantly concentrated on providing a comprehensive overview of education technology at a national level. In contrast, the current study adopts a more targeted approach by focusing on a specific region within the state. Notably, the existing studies have mainly relied on secondary research to derive insights, highlighting the absence of a study based on primary data collected from various stakeholders. The limited studies that utilised primary data were either pre-COVID (before 2020) or during the COVID period (2020-2022). In contrast, the current study aimed to analyse EdTech from a post-COVID (2023) viewpoint. Furthermore, the distinctiveness of this research lies in its primary emphasis on the stakeholders identified i.e., students, teachers, and parents which further adds to its significance and contribution to the existing body of knowledge.

This study holds relevance in the contemporary educational context as it sheds light on the practical implications and challenges associated with implementing EdTech in the education ecosystem. Additionally, by evaluating the use and utility of EdTech in the new age of education, the study contributes to the ongoing discourse surrounding educational technology and its potential to enhance learning outcomes.

2.3 Limitations of the Study

During the survey process, certain limitations were encountered, which should be taken into consideration when interpreting the study results.

[1]A learning management system is a software application or web-based technology used to plan, implement and assess a specific learning process.

In two of the surveyed schools, the headmasters or headmistresses preferred to personally conduct the survey instead of allowing the designated surveyors to do so. Consequently, the questionnaires were entrusted to the respective school authorities, who undertook the task. Subsequently, the completed questionnaires were collected by the surveyors.

Additionally, due to restrictions imposed by the school heads, individual surveys were conducted with peers around. Although most answers were from the survey respondents some answers were influenced by peers. Nevertheless, diligent efforts were made to capture distinct experiences.

The study's sample size for parents and teachers is constrained to 47 and 52, respectively. This limited sample size may not accurately reflect the overall population, it is crucial to approach the interpretation of the results with prudence.

Chapter 3

Edtech: Experiences, Challenges, and Future Directions

The sample for the survey consisted of a total of 407 students, 52 teachers, and 47 parents, from two government schools and three aided schools. To ensure gender balance and representativeness, an equal number of male and female students were included from each type of school. The survey was restricted to students in the 7th and 8th grades, encompassing the upper primary and high school levels. Students in the lower primary section were excluded due to their limited familiarity with EdTech, while those in the higher secondary level were excluded due to their ongoing examinations. To evaluate the disparities between rural and urban areas, schools were chosen from both urban and rural regions.[3] The study findings indicated that there were no discernible differences in any of the aspects examined based on the location distinction. This observation could potentially be attributed to the rural areas' proximity to the city.

This chapter begins by discussing the general usage of EdTech platforms among students and the advantages and disadvantages of the same. It is followed by two sections that analyse different aspects of EdTech-based learning: EdTech-based learning at school and EdTech-based learning at home. For the purpose of this study, EdTech-based learning at school refers to the utilisation of technology within schools to enhance the learning experience. This encompasses various elements such as hi-tech classrooms, Learning Management Systems (LMS)[4], and ICT training. On the other hand, EdTech-based learning at home is defined as the use of technology to access educational resources and materials from the comfort of one's own home. This includes digital learning applications[5], YouTube, educational TV channels, and other relevant supplementary tools.

Out of the students surveyed, 98% of the students use some form of EdTech platform like YouTube, e-learning applications, educational channels on TV etc., for learning purposes. There is no significant relationship between the usage of EdTech and factors such as the locality of residence of students (Urban and Rural), the locality of the school, and gender. This could be primarily because the study was administered in Ernakulam, which is one of the most developed districts in Kerala.The rural areas in Ernakulam are relatively more developed as compared to rural areas of less-developed districts like Wayanad, Palakkad etc. This is primarily due to the proximity and efficient connectivity of the rural areas to the Kochi metropolitan area thus offering better access to digital infrastructure to facilitate education.

[3] *Urban and rural areas are classified as per the administrative structure.*

[4] *A learning management system is a software application or web-based technology used to plan, implement and assess a specific learning process*

[5] *Digital learning applications are defined as software applications that provide a wide range of educational resources, interactive activities, and tools that enhance the learning experience for students.*

Table 3.1: Number of students who uses some form of EdTech platforms

Demographic factor	Number of students	Percentage of total
Locality of school:		
Rural	197	49%
Urban	201	51%
Total	**398**	**100%**
Gender:		
Female	192	48%
Male	206	52%
Total	**398**	**100%**
Locality of residence of students:		
Rural	184	46%
Urban	203	51%
Didn't Answer	11	3%
Total	**398**	**100%**

3.1 Advantages and Disadvantages of EdTech

The initial part of the survey aims to capture the general usage of EdTech in students' coursework and teachers' outreach for course content. The survey captured the benefits and drawbacks of incorporating technology in the learning process. For this purpose, respondents were asked to list down the top three advantages and disadvantages of EdTech-based learning (Refer to Table 3.2). The factors listed by the stakeholders play a crucial role in shaping their preferences for the type of digital learning platform used, usage patterns, and their outlook on the future potential of EdTech.

Table 3.2: Advantages and Disadvantages of EdTech

Stakeholder	Advantages	Disadvantages
Students	• Ability to study at ones own pace • Better and in-depth understanding of topics • Interesting and engaging mode of teaching	• Higher chances of getting distracted • Possibility of getting addicted to digital devices. • Health issues due to increased screen time
Parents	• Better and in-depth understanding of topics • Availability of additional study material • Choice to studying at their own pace	• Possibility of getting addicted to digital devices. • Cyber safety concerns • Health issues due to increased screen time
Teachers	• Better and more in-depth understanding of topics • Personalized attention for students • Interesting and engaging teaching methods	• Possibility of getting addicted to digital devices. • Cyber safety concerns • Lack of face-to-face interaction

3.2 EdTech-based Learning at Home

With the COVID-19 pandemic, students are acquainted with using EdTech as part of their learning process at home. As mentioned earlier, a significant majority of the students (98%) use some form of EdTech platform in their educational pursuits, which include educational TV channels, digital learning applications/websites, YouTube, and other ancillary applications like WhatsApp, Gmail, Google Meet/Teams/Zoom, and Google Classroom. From the survey, it was also observed that the majority of teachers (98%) actively support and encourage digital learning at home for their students.

The three major digital learning platforms used by students are YouTube, e-learning or digital learning applications, and educational channels on television. The below graph depicts the percentage of students who use different types of digital platforms (Refer to Figure 3.1). It is evident that YouTube is the most popular digital learning platform among students.

3.2.1 YouTube

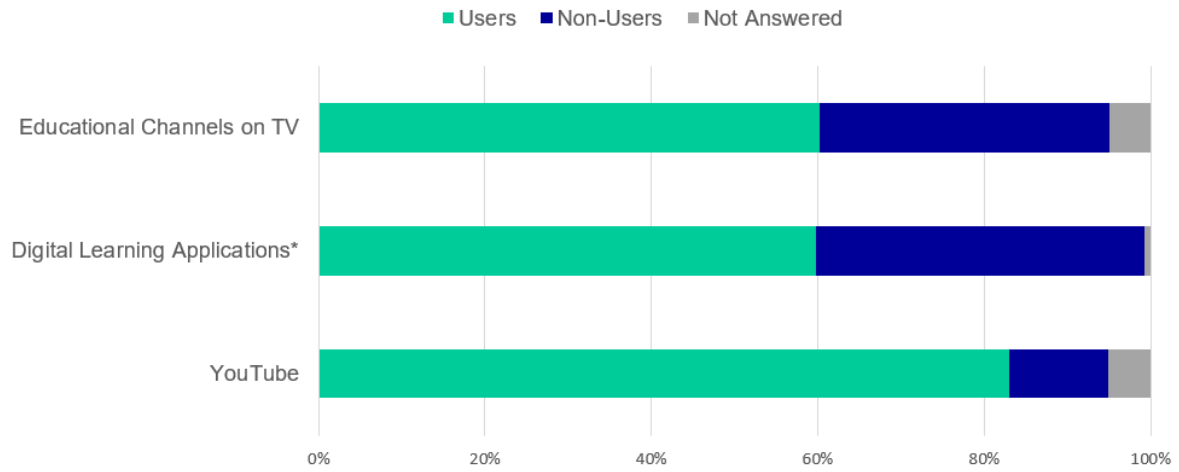
YouTube has emerged as a significant player in the field of education, providing students with access to a diverse range of educational content, both general and subject-specific. Studies have indicated that students prefer YouTube for studying purposes as it provides an informal learning environment. Informal learning environments are not only learningenvironments but also have an entertainment dimension (Burhanli and Bangir-Alpan 2021).

As per the current study, the majority (83%) of the surveyed students reported watching YouTube for educational purposes. Additionally, among the students who use digital learning applications like Byju's, Diksha, Xylem, etc., approximately 88% also utilise YouTube for educational content. This not only indicates that a large number of students use YouTube, but it also suggests that students who use other platforms also rely on YouTube for additional learning.

These findings further underscore the widespread adoption and relevance of YouTube as a valuable tool for educational purposes. YouTube is a free platform, making it accessible to students from various economic backgrounds, and additionally, it hosts a significant amount of educational content in regional languages, which enables better understanding and comprehension of complex concepts.

Additionally, the sheer variety of content available on YouTube can easily divert students' attention, leading them to spend excessive amounts of time watching videos instead of focusing on their academic responsibilities. Furthermore, students who engage in discussions within YouTube's comments section are susceptible to cyberbullying and online harassment.

Figures 3.1: Type of EdTech platform used at home



*A software application that provides a wide range of educational resources, interactictive activities, and tools that enhance the learning experience for students.

Many educators have created dedicated channels on YouTube, providing free educational resources to students across the globe. The popularity of YouTube can be attributed to its user-friendly interface and the extensive array of content available at no cost. Notably, studies have revealed a significant positive relationship between the utilisation of YouTube channels for educational videos and students' academic performance (Habes et al. 2022).

However, the widespread popularity of YouTube highlights a concerning issue regarding students' access to a vast array of non-educational content. Unlike other EdTech platforms, YouTube is not solely dedicated to educational purposes, which increases the risk of students accessing inappropriate content containing explicit language, violence, or other unsuitable material for young viewers.

Therefore, it becomes crucial to raise awareness among parents regarding the risks associated with unmonitored YouTube usage. With sufficient parental involvement and supervision, students can benefit from the platform's educational content while minimising the potential negative effects.

3.2.2 Educational Channels on Television

EdTech encompasses various forms of educational content delivery, including television broadcasts. Television plays a crucial role in disseminating educational content, such as live classes, recorded audio or video materials, and more, to a large number of students, including those in remote areas.

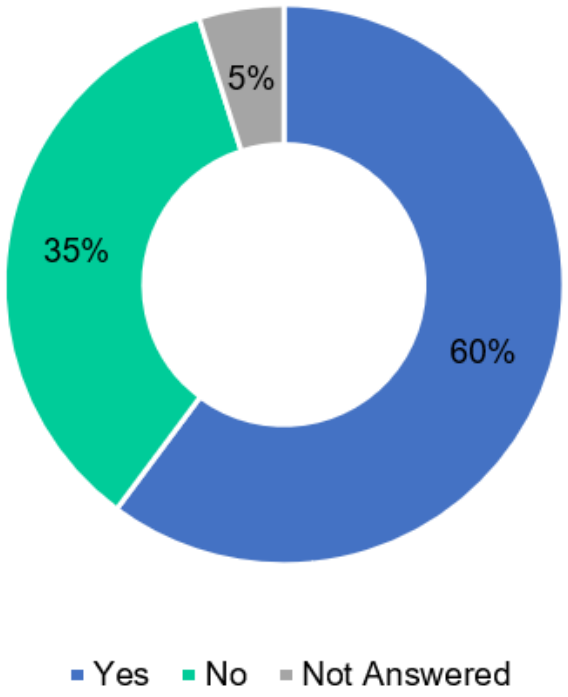
A notable study conducted in India examined the impact of watching 30 minutes of the television program "Galli Galli Sim Sim" for five days a week over twelve weeks. The findings revealed positive effects on the early numeracy and literacy skills of young children (Borzekowski et al. 2019). This highlights the potential of television as an educational tool for enhancing children's skills.

During the unprecedented circumstances of the COVID-19 pandemic, television emerged as an indispensable medium for the government to ensure the continuity of education. KITE Victers, a state-owned channel launched in 2006, was a crucial resource for students and teachers during the COVID-19 pandemic, providing digital classes to support remote learning initiatives. However, as the number of COVID cases decreased and students returned to physical classes, there has been a significant drop in the number of students watching Victers channel. According to the survey, only 56% of the total number of students continue to watch KITE Victers. One primary reason for the decline in viewership could be that KITE now primarily telecasts generic information sessions rather than programs focused on complementing the syllabus taught in class. It also conducts programs focused on providing exam revisions for students, which could be a major reason why most students watch the channel during or approaching the time of exams rather than on a daily basis.

To assess the extent to which students continue to rely on television for educational purposes, the survey posed relevant inquiries. The results revealed that approximately 60% of the surveyed students use television as a source of educational content, while the remaining students do not watch educational channels on television. . Out of the students who reported watching educational channels, only 15% of students engage with them on a daily basis. Notably, around 45% of the students stated that they only watch educational television programs during or approaching the time of examinations.

Though a large share of the students (60.2%) still continues to watch television, it has considerably declined with the reopening of schools and the resumption of physical classroom lectures. Among the various educational channels available, KITE Victers is the most popularly watched channel.

Figure 3.2: Percentage of students who watch educational channels on TV



3.2.3 Digital Learning Applications/Website

For the purpose of the study, Digital learning applications are defined as software applications that provide a wide range of educational resources, interactive activities, and tools that enhance the learning experience for students. They can offer features such as multimedia content, gamified elements, adaptive learning, assessment tools, collaborative features, and personalised learning pathways. Some examples are Byju's, Samagra's e-learning portal, Diksha, and Winners.

Interestingly, during the survey process, it was observed that a majority of the students equated digital learning applications as the only form of EdTech-based learning at home.

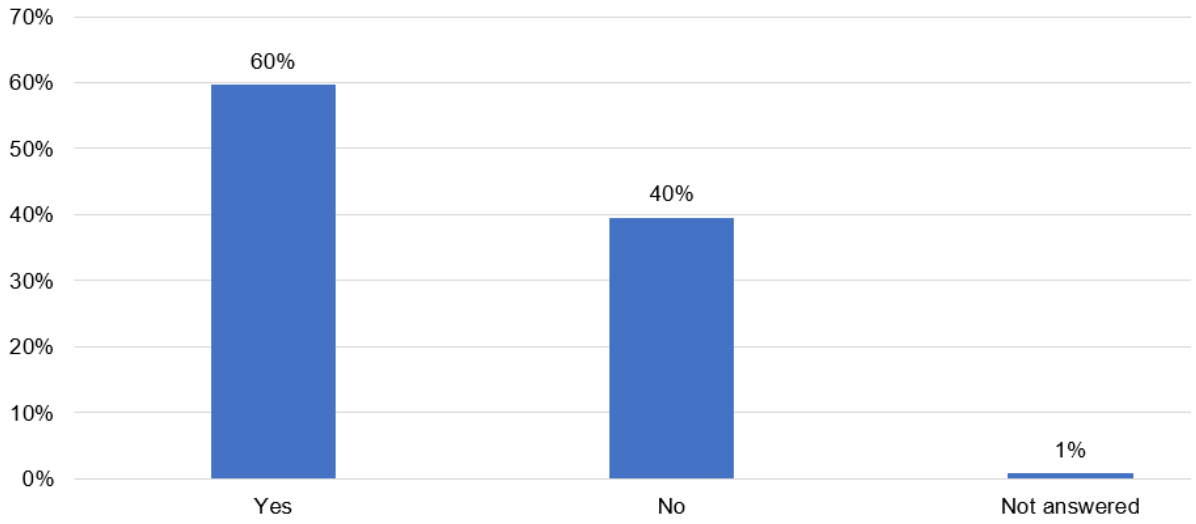
A. Usage

According to the survey 60% of the students use digital learning applications (Refer to Figure 3.3). The percentage of 8th-grade students who use digital learning applications is slightly higher than the percentage of 7th-grade students.

(Refer to Figure 3.5), out of which 74% noticed an improvement in academic performance and a better understanding of topics that were taught in class.

Among the 47 parents surveyed, 39 of them (83%) reported that their children use digital learning applications/websites. Out of this group, 14 parents (36%) indicated that their children use digital learning applications on a daily basis, while 13 parents (33%) reported that their children use them specifically during or near the time of exams.

Figure 3.3: Usage of digital learning applications/websites (Students)



This indicates that students in high school use them slightly more than those in upper primary.

Majority of the students use digital learning applications during or approaching the time of examinations (Refer to Figure 3.4). This is followed by daily usage. The daily users (60 students) were asked about the number of hours they spend on digital learning applications, and 55% of the students responded that they spend 1-2 hours daily

Furthermore, among the 14 parents whose children use digital applications daily, a majority of 8 parents (57%) specified that their children use them for less than one hour each day (Refer to Figure 3.5).

Out of the students who use digital learning applications (243 students), 66% of the children's parents monitor their usage of digital devices for digital learning.

However, the discrepancies in the responses of parents and students regarding the usage patterns indicate a lack of awareness among parents about children's usage.

Insufficient monitoring by parents has several problems and potential risks such as increased screen time, exposure to inappropriate content, cyberbullying, etc.

Figure 3.4: Frequency of usage of digital learning applications/websites (Students)

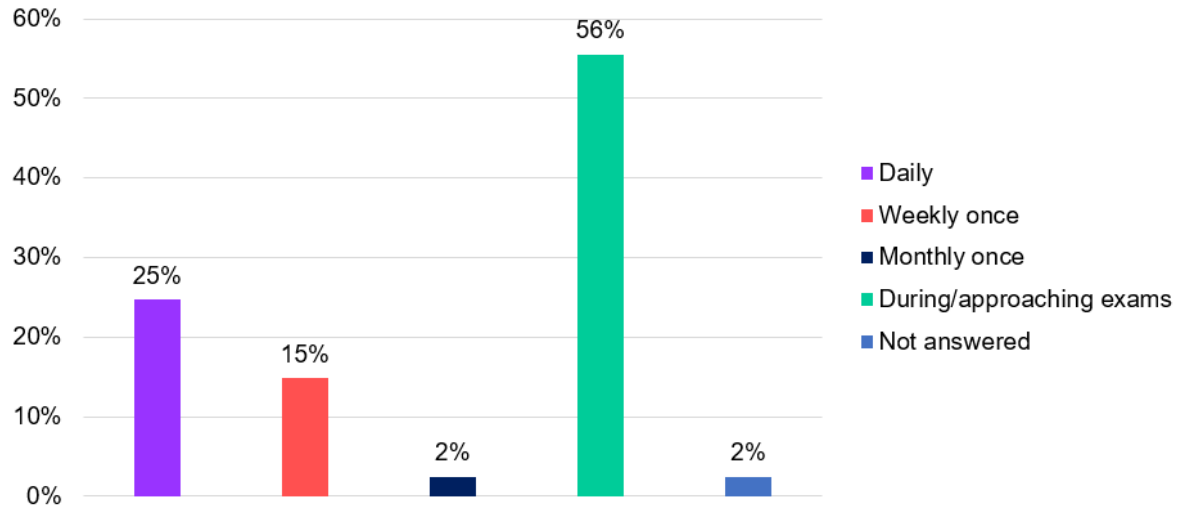
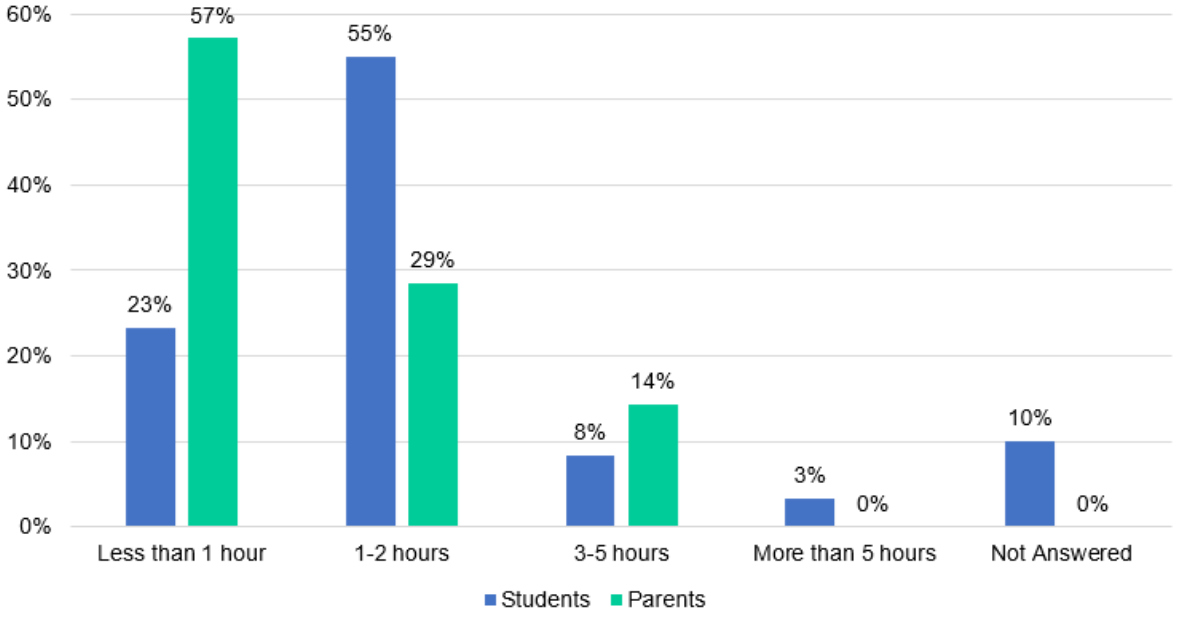


Figure 3.5: Number of hours spent per day on digital learning applications (Students and parents)



The survey of parents also indicated that those earning a monthly income of ₹30,000 and above have a higher percentage of children using digital learning applications daily compared to the percentage of daily users in other income groups earning less than ₹30,000. This demonstrates there is a direct correlation between income and the frequency of digital learning application use among children. Higher the income, the higher the daily usage.

There also exists a positive correlation between the number of digital devices available at home to facilitate students' digital learning needs and the frequency of usage of digital learning applications. The survey results indicate that 46% of students who have more than two digital devices at home[6] use digital learning applications on a daily basis. In contrast, out of the students who have less than two devices at home only 22% use digital learning applications on a daily basis. A majority of these students restrict their usage to weekly, monthly, or during the time of exams. These results emphasise the need to address accessibility and affordability barriers to ensure equal opportunities for all students in leveraging digital learning.

B. Benefits of Digital Learning Applications/Websites

Students use digital learning applications for a variety of reasons. The top three uses listed by students were:

a. Watching educational videos
b. Attending online exams/tests
c. As an alternative to tuition

Other uses that the students mentioned were accessing additional study materials and digital textbooks, submitting assignments, and learning topics beyond the prescribed syllabus. It is essential to examine whether using digital learning applications for the above-mentioned purposes helps students receive the claimed benefits.

From the survey, it was observed that out of the 243 students who use these resources, 91% reported finding them useful (Refer to Figure 3.6). A majority of the students have also noticed improvements in their academic performance and better comprehension of topics taught in class (Refer to Table 3.3).

Of the 39 parents whose children use such applications, 33 parents (85%) found them to be useful and noticed an improvement in children's academic performance, and 35 parents (90%) indicated that their children's comprehension of topics increased. These findings highlight the potential of digital learning applications to support student learning and enhance educational outcomes.

[6]*Digital devices at home here refers to the digital devices like smartphones, laptops, tabs owned by parents of the child.*

Figure 3.6: Usefulness of digital learning applications/websites (Students)

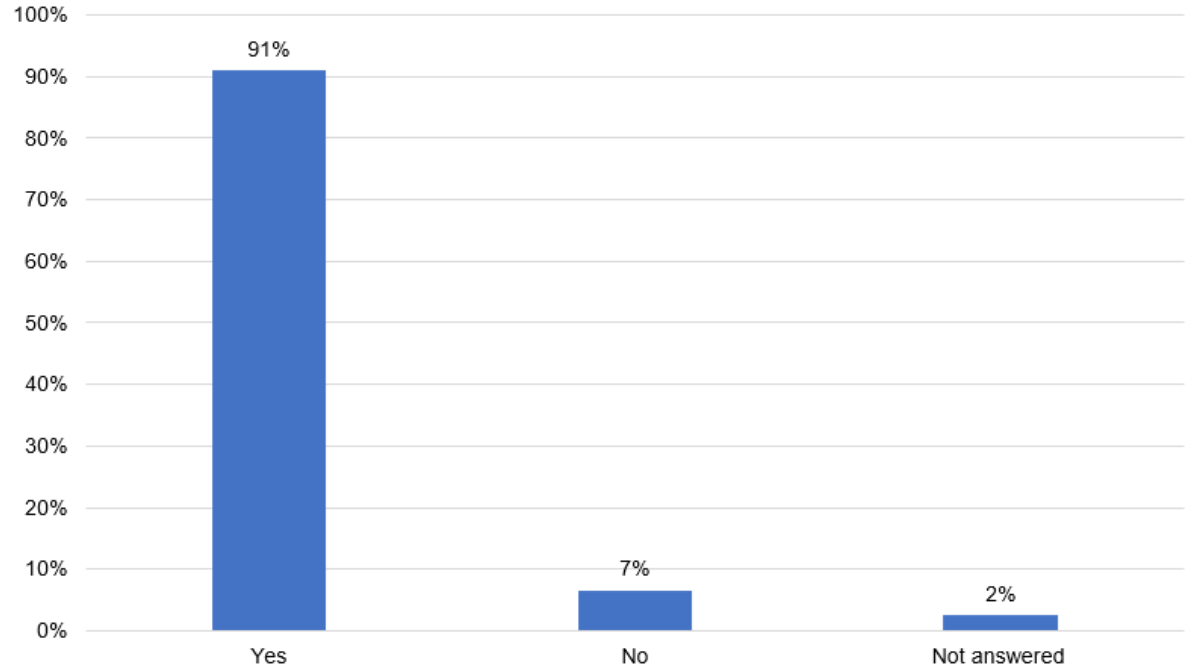


Table 3.3: Number of students who noticed an improvement in academic performance and understanding of topics

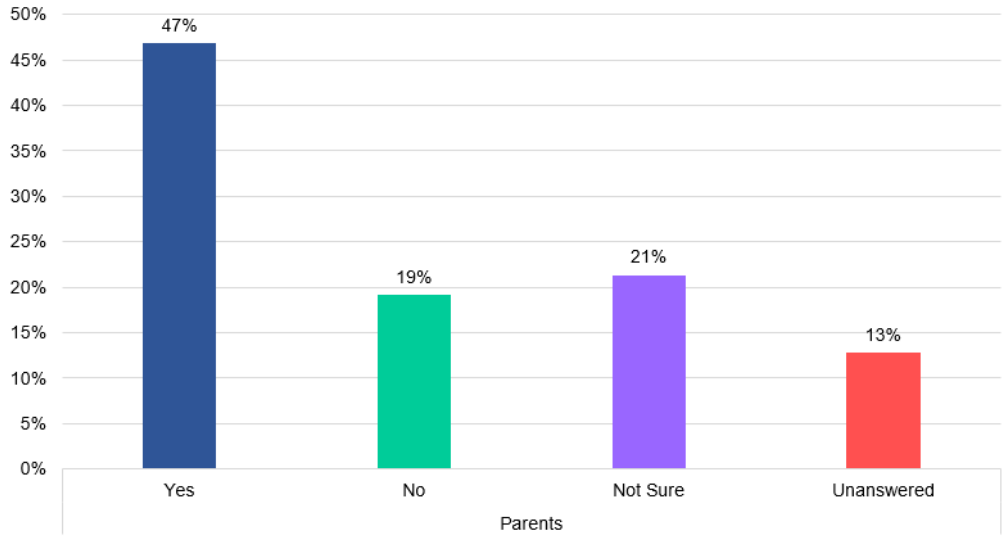
Particular	Response	Number of Students	Percentage share
Improved Academic Performance	Yes	183	75%
	No	41	17%
	Not Answered	19	8%
Total		**243**	**100%**
Better understanding of topics	Yes	209	86%
	No	20	8%
	Not Answered	14	6%
Total		**243**	**100%**

C. Type of Digital Learning Applications Used

Those students who use digital learning applications were questioned about the specific types of digital learning applications they use. For the study, the applications were classified into two main groups: Government-funded digital learning applications and Private-funded digital learning applications. According to the graph below (Refer to Figure 3.7), the maximum number of students use a combination of both government and private digital learning applications.

However, privately funded platforms have a slight edge over government-funded platforms. To further investigate the reasons for these preferences, students were asked about the factors they consider before selecting a certain type of application/website. The survey revealed that the top three factors that students take into account before opting for a digital learning application or website are: the quality of teaching, the quality of audio/video content, and the study materials provided.

Figure 3.8: Does the non-availability of digital content in Malayalam affect student usage negatively?



In terms of government-funded platforms, the Samagra e-resource portal emerges as the most popular among students. This platform provides digital content in both English and Malayalam, making it a valuable resource for students.

These findings shed light on the preferences and challenges faced by students when using digital learning applications. The inclusion of regional languages, such as Malayalam, and the availability of state-specific content play a significant role in attracting students to these platforms and enhancing their educational experience.

D. Non-Users of Digital Learning Applications

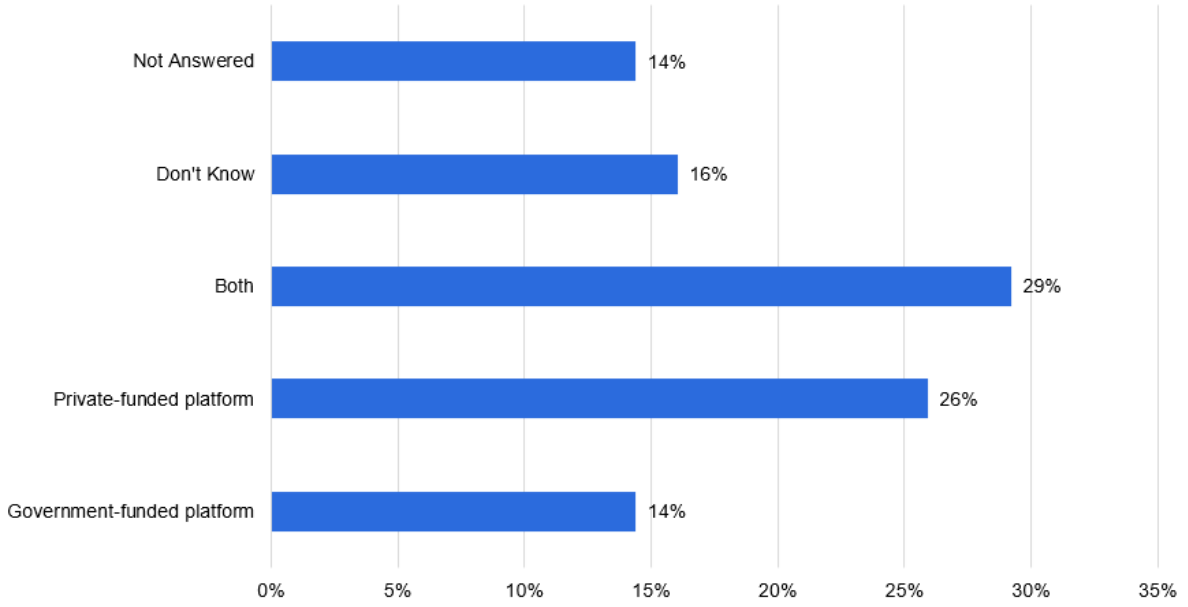
The study indicated that 40% of the students do not use digital learning applications[7] or websites. Interestingly, the percentage of non-users is slightly higher among 7th-standard students compared to 8th-standard students. One major reason for this disparity could be the lack of services provided by digital learning applications specifically catered to upper primary students.To identify the other prominent reasons for the non-usage among students, the study analyses two major aspects:

1) Awareness of Digital Learning Applications/Websites : The majority of students who are not utilising digital learning applications/websites are aware of at least one such platform (Refer to Figure 3.10). However, there is still a considerable proportion of students who lack adequate awareness, and closing this awareness gap would potentially motivate more students to benefit from these applications and websites.

Increasing awareness about digital learning applications/websites is the basic step to ensure more students use them. Given that 25% of the students who do not use digital learning applications/websites are unaware of at least one such platform, it is essential to understand how the students who use these platforms became aware of them.

[7]Digital learning applications are defined as software applications that provide a wide range of educational resources, interactive activities, and tools that enhance the learning experience for students

Figure 3.7: Type of digital learning applications/websites used (Students)



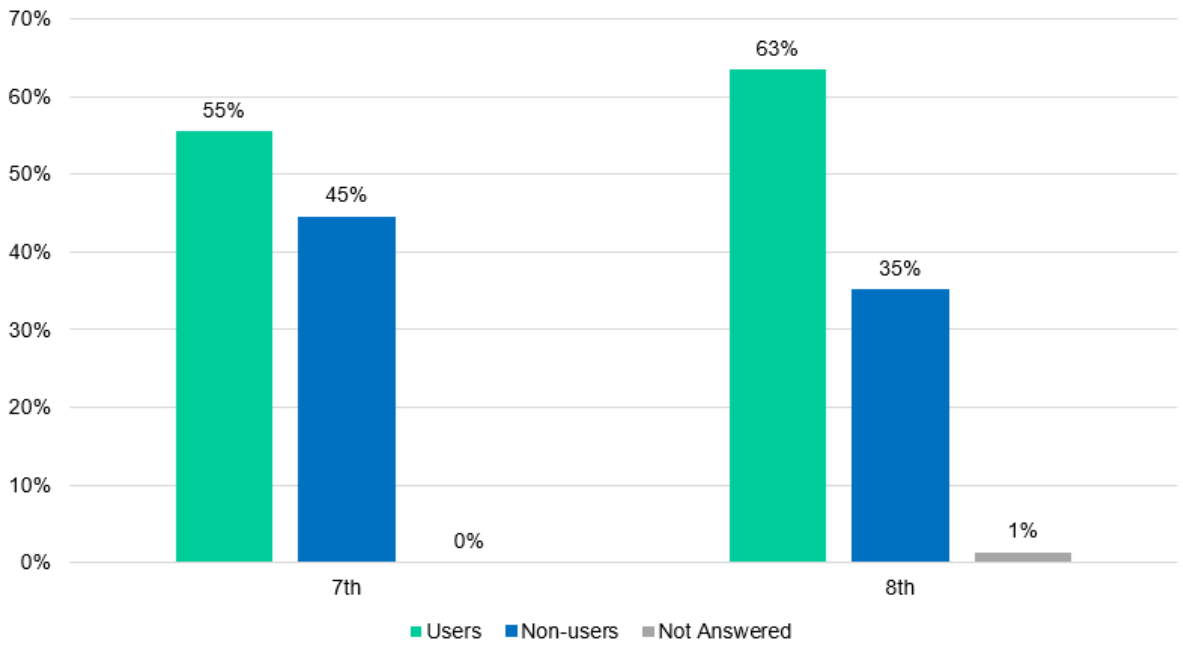
Of the 39 parents whose children use such applications, 13 of them (33%) have children who use privately funded platforms, while 9 parents (23%) have children who use both privately funded and government-funded applications. Furthermore, the parents whose children use private platforms were asked about their preference for paid or free platforms. It was found that 8 of these parents (64%) prefer free platforms, while the rest prefer paid platforms. Parents who prefer paid platforms do so because they offer more personalised support for their children, better quality study materials, and up-to-date and relevant digital content.

The survey results indicate that 31 of the surveyed teachers (60%) prefer government-funded platforms for facilitating digital learning among students. Among the surveyed teachers, the Samagra e-resource portal emerged as the most favoured government platform. Conversely, when it comes to private platforms, Byjus and Vedantu were identified as the top choices among the teachers.

According to a study conducted by EY-Parthenon, the largest EdTech players in the market are Byju's, Vedantu, and Unacademy (EY-Parthenon 2021). Interestingly, the study revealed that the majority of students prefer using Byju's, while the number of students opting for Vedantu and Unacademy is lower. Xylem, an EdTech player based in Kerala, emerges as the second most popular application among students, closely followed by the Exam Winners platform.

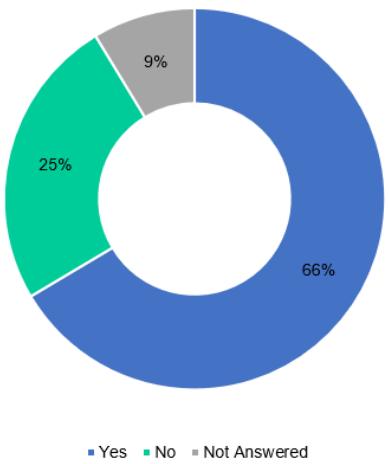
One intriguing aspect to note is that the preference for Byju's, Xylem, and Exam Winners can be attributed to their coverage of the state syllabus and their provision of classes in both Malayalam and English mediums. In contrast, Vedantu and Unacademy do not offer classes in Malayalam, and Unacademy does not cover the state syllabus. The current study also highlights that 22 out of the 47 parents surveyed (47%) believe that the lack of digital content available in Malayalam negatively affects students' usage of digital applications (Refer to Figure 3.8).

Figure 3.9: Percentage of users and non-users



According to the survey, a majority of the students from schools in rural areas came to know about digital learning applications/websites through suggestions made by friends/family. On the other hand, most students from urban areas came to know about them online or through social media platforms. Therefore, when choosing the mode of raising awareness about digital learning applications/websites among students, it is important to consider the type of locality where the schools are based.

Figure 3.10: Awareness of at least one digital learning application (students)



2) Availability and accessibility of digital devices and the internet: The survey indicates that the reason why 40% of the students are not using digital learning applications is not because they do not have digital devices at home but rather due to a lack of consistent access to digital devices at all times and fast and stable internet connectivity to facilitate the learning. (Refer to Figures 3.11, 3.12, 3.13)

Figure 3.11 Availability of digital devices at home for digital learning (Students)

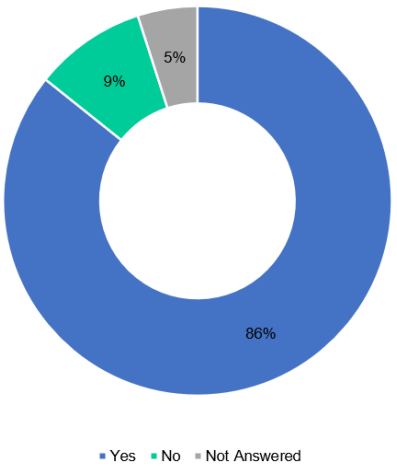


Figure 3.12 Accessibility of digital devices at all times for digital learning (Students)

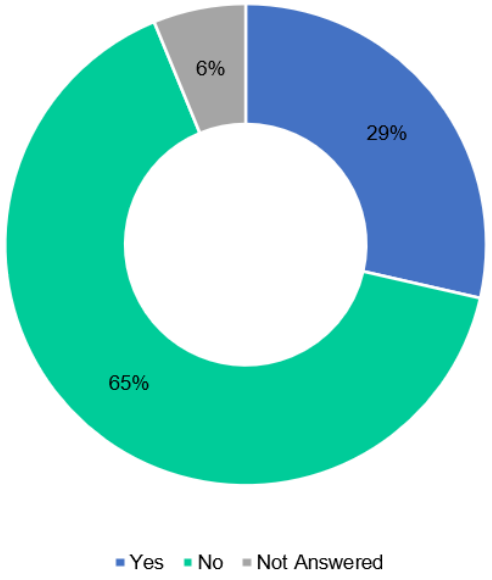
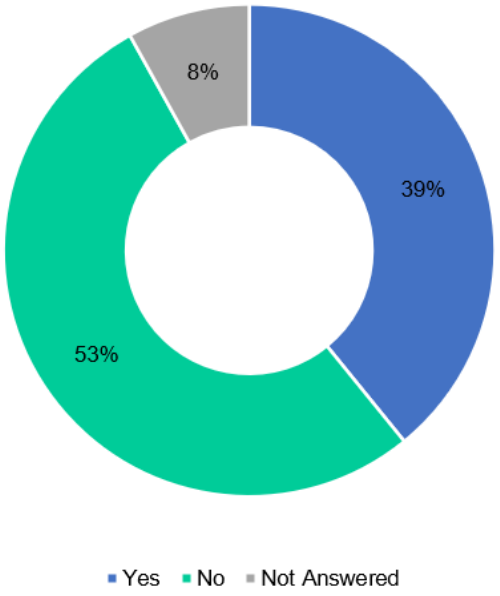
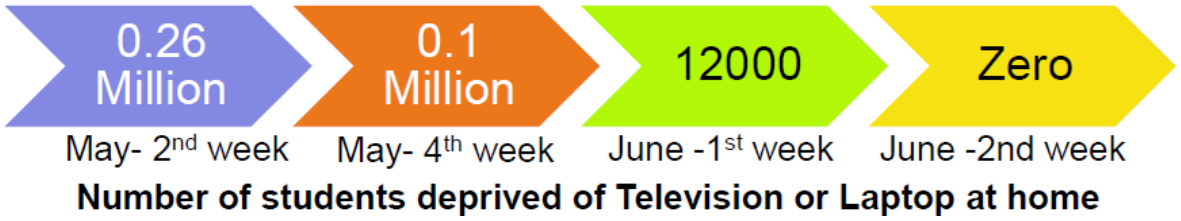


Figure 3.13 Availability of fast and stable internet at all times for digital learning (Students)



While assessing the availability of digital devices [8] for digital learning, it was noted that out of all the students surveyed, 8% did not have any digital device at home to facilitate digital learning. This finding contradicts the claims made by Kerala Infrastructure and Technology for Education (KITE) that all students had access to at least one digital device for learning purposes by June 2020. Considering the limited sample size chosen, it is likely that the percentage of students without digital devices would be much higher for the entire population.

Figure 3.14: Number of students deprived of Television or Laptop at home



[8] *Digital devices include smartphones, Television, Laptop, Tablets, and Computers.*

Table 3.4: Number of students who use ancillary applications

	Usage			
Ancillary Applications	Yes	No	Not Answered	Total
Google Meet/Teams/Zoom	46%	47%	7%	100%
Whatsapp	72%	23%	5%	100%
Mailing applications (Gmail, Yahoo)	20%	71%	9%	100%
Google classroom	36%	55%	9%	100%

3.2.4 Ancillary Applications

Apart from digital learning applications, educational channels on TV, and YouTube, there are other applications that help with the digital learning process such as WhatsApp, Google Meet, Teams, Zoom, and Google classroom. These primarily help students to ensure better communication and collaboration with their classmates/teachers for educational purposes. During COVID-19, teachers in Government and Aided Schools used these applications to communicate with students. Currently, as per the survey conducted 71% of students use WhatsApp for communication with teachers/classmates. The usage of google meet/teams/Zoom, Google Classroom, and Mailing applications is comparatively lower. (Refer to Table 3.4)

These educational tools serve as effective means to promote collaborative learning among students, encouraging them to actively engage in group activities, explore diverse subjects, and provide mutual support. Previous research studies have indicated a significant statistical correlation between the use of educational technology for collaborative purposes and students' academic performance. These findings substantiate the valuable role that EdTech plays in enhancing students' learning outcomes through collaborative engagement (Alhaddad, 2017).

3.3 EdTech in Schools

The Kerala government has undertaken numerous initiatives for the development of technology-induced education in schools under Kerala Infrastructure and Technology for Education (KITE) which is a state-owned enterprise to support ICT-enabled development in schools. The vision of KITE is to transform Kerala into a knowledge society by enhancing the quality of educational inputs through sustainable, inclusive, technology-assisted interventions. It is important to assess whether the government's efforts are resulting in the expected outcomes. This section of the study aims to assess key areas of EdTech in schools, including the usage of ICT equipment by teachers, the effectiveness of EdTech-based lectures, the provision of ICT training in schools, and the utilisation of EdTech by teachers for purposes beyond classroom lectures.

Hi-Tech School Program

The Hi-Tech School Program, launched under Kerala Infrastructure and Technology for Education (KITE), has to date made 45,000 classrooms in 4,752 schools high-tech. The project received ₹493.50 Crores as funding from the Kerala Infrastructure Investment Fund Board (KIIFB). KIIFB is the nodal agency responsible for monitoring all government projects.

Out of the total number of schools, 897 are located in the Ernakulam district, including the 5 schools selected for our survey.

As per the Hi-Tech classroom initiative under KITE, a classroom must be equipped with a Laptop, Ceiling-mounted Multimedia Projector,Whiteboard / Projection Screen, and USB Speakers. Further accessories like HDMI Cables and Faceplates, mounting kits, etc., are also to be provided. It also focuses on supporting these hardware with adequate software and skills training. This program is primarily implemented in Government and Aided High Schools, Higher Secondary Schools, and Vocational Higher Secondary Schools.
This program is primarily implemented in Government and Aided High Schools, Higher Secondary Schools, and Vocational Higher Secondary Schools.

Based on observations and semi-structured interviews with the faculty of the respective schools, it was evident that all five schools received ICT equipment, such as laptops, projectors, and whiteboards, as part of the Hi-Tech program. However, interviews with the headmasters/mistresses and teachers of the aided schools revealed that these schools typically did not receive mounting accessories and HDMI cables from the government. Consequently, these expenses had to be covered by the schools themselves. Moreover, if repairs were needed for their equipment, the schools were responsible for the associated costs. It was also noted that some ICT equipment hasn't been repaired due to insufficient funds from the management of the schools, which in turn hampers the efficient use of ICT. According to the ICT guidelines 2017[9] , these repairs are supposed to be covered by the government.

Despite the government's efforts to boost the EdTech sector, it is important to note that the budget allocation for digital development in the education sector in Kerala has undergone a shift from a focus on schools to higher education institutes. In the 2021-2022 Kerala budget, ₹73 crores were allocated to enhance the quality of education in schools, with a specific emphasis on IT training for teachers. Additionally, ₹30 crores were set aside to ensure the optimal utilisation of IT facilities in schools. However, in both the 2022-2023 and 2023-2024 budgets, there was no separate allocation specifically for IT development in schools, despite general provisions for infrastructure development.

3.3.1 Utilisation of ICT Equipment by Teachers

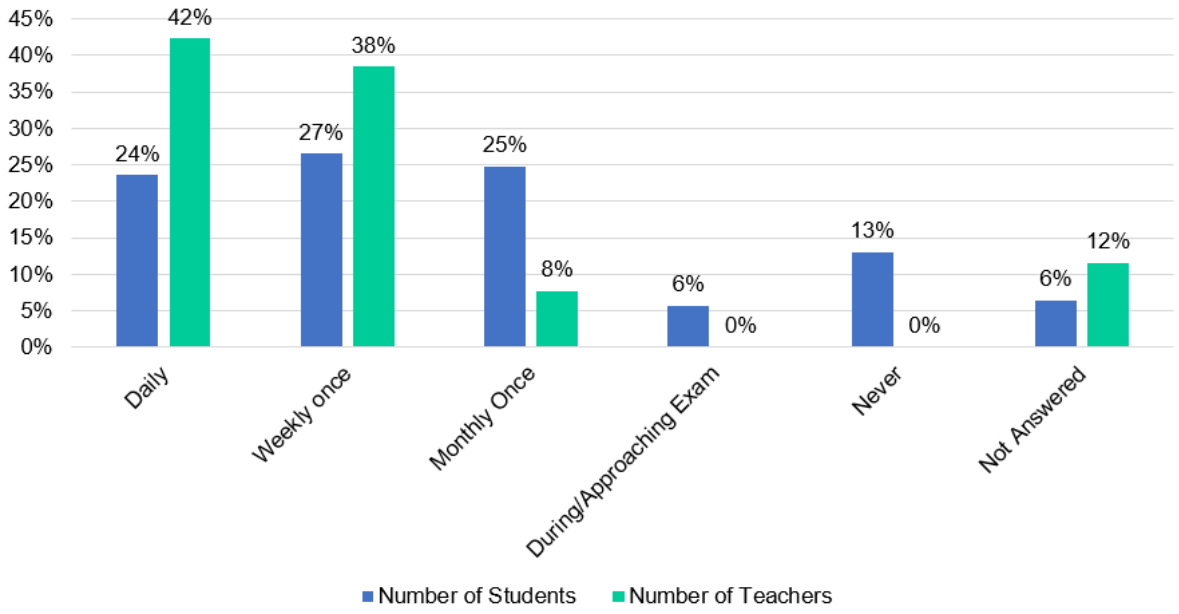
The study has indicated that 85% of the students understand topics better when taught using ICT equipment in classrooms. This finding suggests a positive relation between the use of ICT equipment for teaching and students' understanding of topics.However, the graph below reveals a discrepancy between students' and teachers' responses regarding the frequency of ICT equipment usage in classrooms.

According to the survey, a high percentage of students reported that their teachers use ICT equipment for teaching only on a weekly basis. In contrast, most teachers indicated that they use ICT equipment on a daily basis. Notably, there is a significant disparity between the percentage of students who reported daily usage and the percentage of teachers who reported the same.

The survey for students revealed that the percentage of students who are taught using ICT equipment on a daily basis (66%) tend to have a better understanding of topics taught in class than students who are taught on a weekly or monthly basis. This emphasises the importance of teachers' regular and consistent use of EdTech tools.

[9] *Set of guidelines issued by the Kerala Government for ICT implementation in schools*

Figure 3.15: Frequency of teachers using ICT equipment in the classroom



One reason for the irregularity of usage of ICT equipment is the lack of proper guidelines on how often teachers should use ICT equipment for teaching. Consequently, teachers tend to use these resources at their own discretion, resulting in reduced effectiveness. Moreover, studies conducted in India have shown a significant level of teacher absenteeism, reaching around 24% (Muralidharan et al., 2010). Additionally, even when teachers are present at school, there is a prevailing trend of limited engagement in active teaching (Rodriguez-Segura, 2020). These factors may also contribute to the underutilisation of ICT equipment in the classroom. To fully realise the benefits of EdTech-based teaching, it is crucial to address these issues. Leveraging technology, tools can be developed to monitor and track the frequency of usage by teachers, providing a mechanism for

3.3.2 Utilisation of EdTech by Teachers Outside Classrooms

I. After-School Support from Schools

EdTech allows students access to educational resources and materials at any time of the day. This enables students to study and learn at their own pace and allows teachers to give personalised attention and guidance to students on a one-to-one basis. The role of after-school support is one of the most important areas where EdTech can play a significant role. Böhmer et al. (2014) conducted a study on an after-school computer-assisted program in Cape Town, focusing on addressing individual students' weaknesses in maths. The program allowed students to choose the topics they wanted to work on, leading to significant improvements in maths knowledge.

Figure 3.16: Increase in after-school support with the help of EdTech

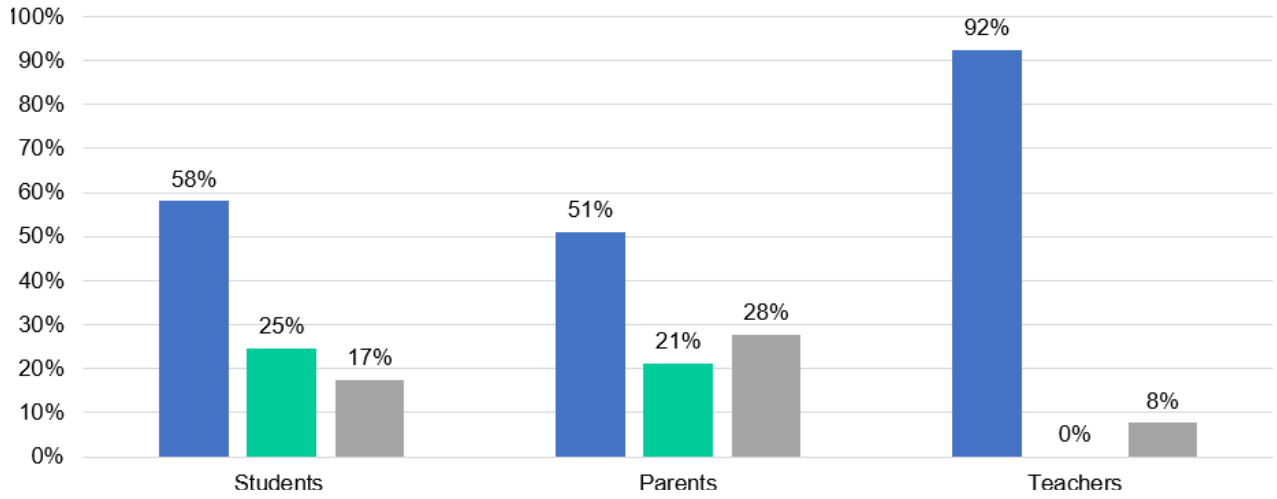
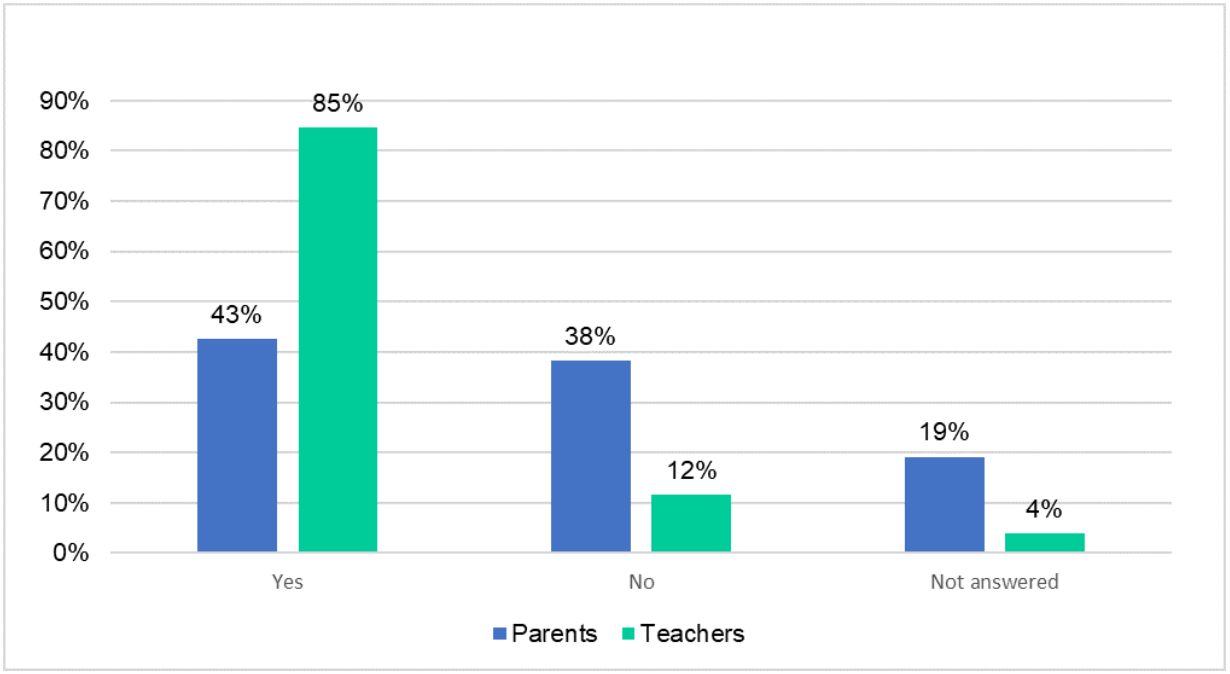


Figure 3.17: Increase in the level of communication between parents and teachers



Interestingly, the program not only enhanced grade-specific knowledge but also filled in foundational maths gaps that regular instruction might have overlooked. By customising the study program to target specific weaknesses, the program effectively remedied content gaps and improved students' overall maths skills (Rodriguez-Segura, 2020). These factors may also contribute to the underutilisation of ICT equipment in the classroom. To fully realise the benefits of EdTech-based teaching, it is crucial to address these issues. Leveraging technology, tools can be developed to monitor and track the frequency of usage by teachers, providing a mechanism for evaluation and improvement.(Refer to Figure 3.16)

II. Communication with Parents

EdTech facilitates better communication between teachers and parents, offering opportunities for increased parental involvement in their child's education. Previously, parent-teacher meetings were the primary avenue for parental engagement. However, technology allows parents to play a more active role in their child's education and stay updated on their progress. This involvement helps parents understand their child's strengths, weaknesses, and learning needs, thereby creating a nurturing and supportive learning environment at home. However, the study indicates a mismatch between teachers' and parents' responses regarding the effectiveness of EdTech tools in facilitating communication. It shows that while 44 out of the 52 teachers (85%) claim improved communication with parents, only 20 parents (43%) agree (Refer to Figure 3.17).

The disparities in the above two key areas highlight the need to address the mismatch between teachers' perceptions and the actual experiences of students and parents regarding enhanced after-school support through digital learning.

To resolve these issues, it is crucial to foster better communication and collaboration between teachers, parents, and students. This can be achieved through regular feedback sessions, where students and parents can openly share their experiences and concerns. Additionally, conducting training sessions for teachers to effectively utilise EdTech tools and incorporate them into after-school support can further enhance their effectiveness. Furthermore, as mentioned earlier, communication and collaboration tools such as WhatsApp, Teams, and Zoom can be effectively utilised for this purpose. During the COVID-19 pandemic, schools utilised WhatsApp groups to clarify students' doubts. These practices can be continued and extended to involve parents as well. By bridging the gap between perception and reality, it will be possible to ensure that the benefits of EdTech are experienced consistently by all stakeholders involved in the educational process.

3.3.3 ICT Training in Schools

Information and communication technology training is important for shifting to EdTech-based learning and teaching. ICT training is crucial for students to maximise the benefits of educational technology (EdTech) in the classroom and at home. Both students and teachers should be given basic ICT training. The below graph (Refer to Figure 3.18) shows that 58% of the students surveyed stated that they received ICT training from their respective schools, whereas a considerable portion of students didn't receive it. Parents' responses are also in line with that of the students, with around 27 parents (58%) indicating that their children received training.

However, there is a discrepancy between the responses given by the above two stakeholders and that of teachers. 51 teachers (98%) indicated that the students had received ICT training from their respective schools. The discrepancy in ICT training may be attributed to the limited student-to-computer ratio, leading to reduced hands-on experience for students. Consequently, despite the training being offered, students may not fully experience the expected benefits. The ICT guidelines 2017 indicate that the student-to-computer ratio in computer labs should be 3:1. Whereas, according to a study conducted on private schools by the Department of School Education and Literacy, 75% of the selected private schools maintained a student-to-computer ratio of 1:1 (Department of School Education and Literacy, n.d.).

ICT training is crucial for teachers, it enables them to effectively utilise the EdTech tools like online resources, Learning Management Systems (LMS)[10] , and various digital hardware like Laptops, projectors, etc. Under KITE, teachers are given ICT training with a special emphasis on empowering them to effectively utilise the possibilities of ICT in classroom transactions. The survey conducted for the teachers indicated that 94% of the teachers received ICT training.

3.3.4 Usage of EdTech for Curriculum Planning and Assessment

EdTech provides numerous benefits to teachers, including improved content delivery, enhanced student engagement, and increased teacher productivity. During a discussion with a 7th-grade teacher from one of the two surveyed aided schools, it was found that integrating EdTech in teaching has several benefits. These include increased student attention span, improved comprehension through real-life examples, and enhanced academic performance.

In this study, we considered three primary uses of EdTech for teachers, namely as a teaching tool, an assessment tool, and for curriculum planning. The graphs below depict the percentage of teachers using EdTech for these three purposes. As shown, the majority of teachers (82.69%) use EdTech as a teaching tool, while 54% and 73% of teachers use it as an assessment tool and for curriculum planning, respectively.

EdTech has proven beneficial for teachers by alleviating their workload, as indicated by the survey. Approximately 77% of teachers reported experiencing a reduction in burden with the aid of EdTech tools. Past studies have found that a majority of teachers indicate that an increased workload negatively affects their ability to ensure effective academic performance in school (Mukundan and Bray, 2004).

[10] A learning management system is a software application or web-based technology used to plan, implement and assess a specific learning process

Figure 3.18: ICT training for students

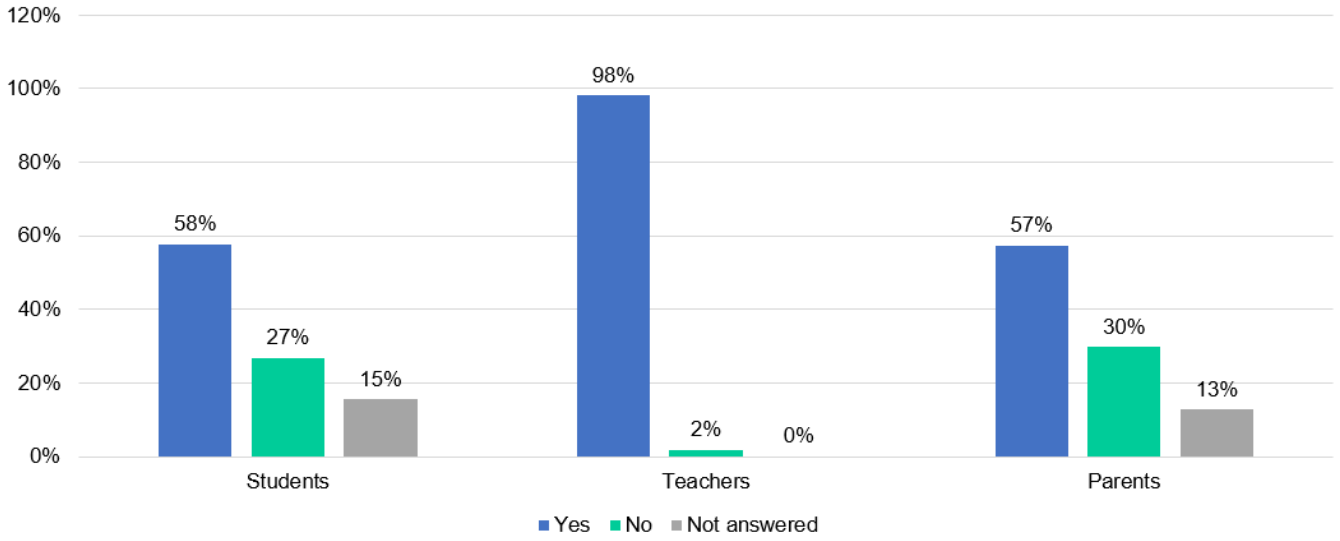


Figure 3.19: Percentage of teachers who use EdTech for different purposes

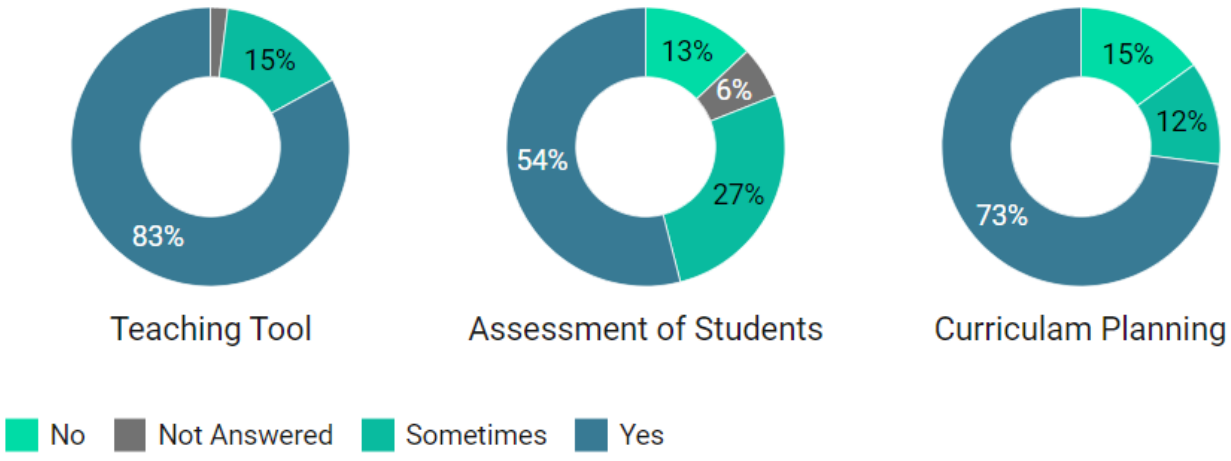
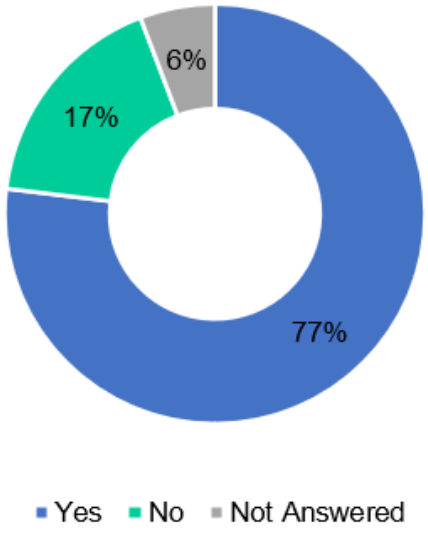


Figure 3.20: Percentage of teachers who experienced a reduction in burden due to EdTech



Among the teachers who did not experience a reduction in burden (17.31%), only 33% use EdTech for curriculum planning, and only 44% use EdTech for student assessment. In contrast, among the teachers who experienced a reduced burden, a higher percentage of 80% use EdTech for curriculum planning, and 58% use it for student assessment.

In conclusion, the findings suggest a positive relationship between the reduction in burden experienced by teachers and their usage of EdTech tools for curriculum planning and student assessment. Teachers who experienced a decrease in workload used EdTech tools more frequently, while those who did not exhibit lower usage rates.

This highlights the potential benefits of the efficient use of EdTech in alleviating the workload of teachers. Thus, teachers who have successfully incorporated EdTech tools and experienced a reduction in workload can play a vital role by conducting knowledge-sharing sessions to inspire and encourage other teachers to adopt these tools.

3.4 Future of EdTech

The use of EdTech has gained significant momentum in recent years, with the potential to revolutionise the education system. However, the question of whether it will completely replace traditional classroom learning or complement and enhance classroom lectures remains unanswered. Linden (2008) examines the use of EdTech as a substitute or complement to in-class maths instruction in Gujarat, India. The study reveals that the computer-led intervention had negative effects when used as a substitute for in-class instruction but had positive effects when employed as a complement to reinforce instruction (Linden, L., 2008).

The survey conducted as part of this research substantiates the above findings, while many stakeholders believe EdTech is the future of education, they do not think it will entirely replace traditional classroom lectures. Therefore, it is likely that EdTech will continue to evolve and become an integral part of the education system, alongside traditional teaching methods.

However, the survey results indicate that the percentage of parents who perceive EdTech as the future of education is lower compared to that of teachers. This discrepancy can be attributed to certain disadvantages associated with EdTech, as reported by parents. The top three factors mentioned by parents include concerns about potential addiction to digital devices, increased health issues due to excessive screen time, and cyber security concerns.

According to a report by Human Rights Watch (HRW), educational apps operated by both government and private entities have engaged in practices that compromise children's privacy. Applications like Diksha, e-pathshala, and Khan Academy, among others, have been involved in the collection of student information for marketing purposes (Human Rights Watch, 2022). Thus cyber safety is a major concern in EdTech that requires immediate attention.

KITE has initiated programs like Smart Mothers and Amma Ariyan to provide parents, particularly mothers, with digital training and cyber security awareness. However, it is concerning that only 12 out of the 47 parents (26%) have received any form of cyber security or digital training from their child's respective schools or KITE. Further, among the 18 mothers surveyed, only 5 (28%) have received any form of training. In addition, discussions with the headmistress of one of the surveyed schools have highlighted a significant concern expressed by a considerable number of parents regarding digital learning at home. These parents have observed that their children tend to allocate more time to non-educational activities on digital devices rather than engaging in learning. It is worth noting that 98% of the participating parents acknowledged their children's daily involvement in non-educational activities on digital devices, such as consuming entertainment media, gaming, listening to music, and accessing social media platforms. Consequently, parents exhibit a certain degree of reluctance to fully embrace a complete transition to digital learning, instead expressing a preference for EdTech-based lectures within the traditional classroom environment.

Technological tools such as web filtering software, virtual private networks (VPNs), data encryption, and two-factor authentication (2FA) can be utilised to ensure better protection of students' privacy. Both Android and iOS operating systems provide mechanisms for parental control, allowing parents to set screen-time limits and restrict access to certain apps or app categories. Features like device reminders and app restrictions can help reduce excessive screen time and non-educational device usage. Additionally, promoting parental involvement and raising awareness through informative sessions about these technological tools can help address concerns and foster a positive perspective on EdTech.

Figure 3.21 Is EdTech the future of education?

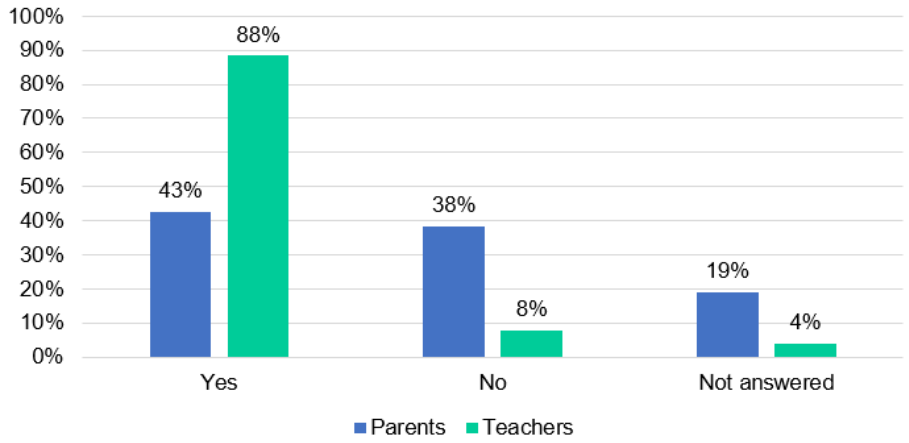
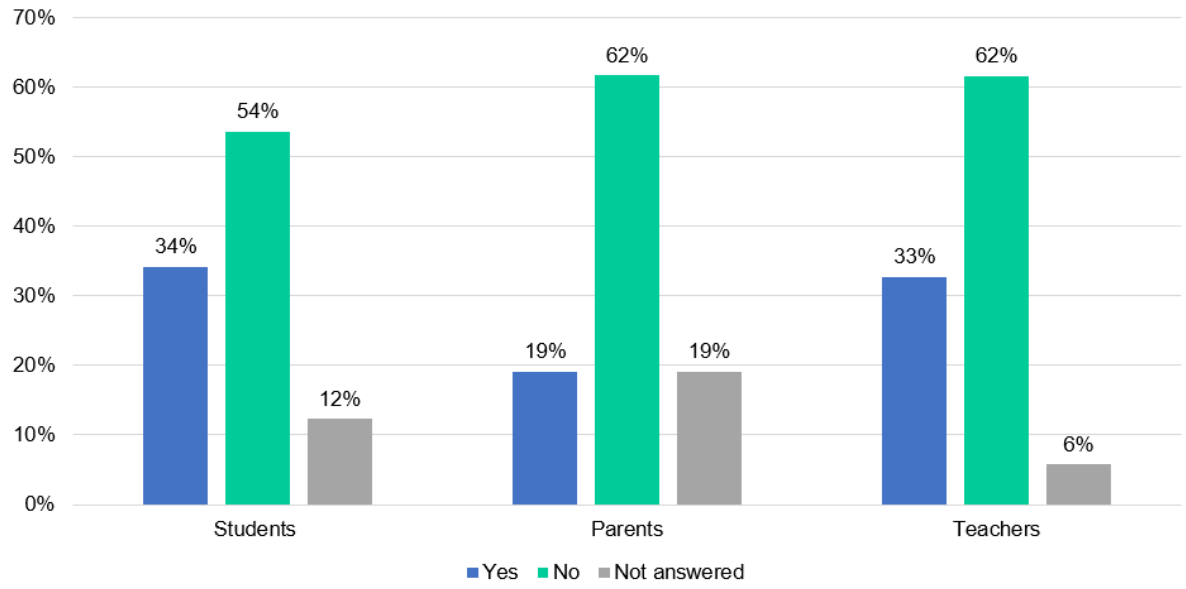


Figure 3.22: Will digital learning replace traditional classroom lectures?



Chapter 4

Conclusion

The advent of the COVID-19 pandemic has played a pivotal role in catalysing the transformation of the Indian education system from traditional teaching methods to a technology-driven approach. With an expected CAGR of 40%, the Indian EdTech market is bound to reach $10 billion by 2025. This substantial growth can be attributed to the increased reliance on EdTech by students in schools and higher education institutes in recent times.

It is important to recognise that the EdTech market is characterised by continuous evolution and innovation. Therefore, it is imperative to ensure that students' evolving needs are effectively met and that any challenges arising from this dynamic environment are promptly addressed. The present study focused on identifying the practical implications of EdTech based on data collected from the grassroots level. Conducting such studies is important as it helps identify the actual experiences and challenges of EdTech in practice. Through direct interactions with students, educators, and parents, valuable insights are gained into their concerns and challenges. The present study can form the basis for dialogue, discussion, and awareness around Edtech and its usage.

EdTech is playing a significant role in shaping future needs, and collectively finding solutions will not only foster a collaborative approach but also create opportunities for further advancement in EdTech. As highlighted by the study, it has the potential to enhance learning outcomes. One of the key benefits of EdTech lies in its ability to provide personalised learning experiences for students. Each child is unique, with different strengths, weaknesses, and learning styles.

In the past, the education system has often failed to recognise these individual differences, treating every student as the same and assessing their worth solely based on academic performance. EdTech has the potential to overcome these challenges by utilising adaptive learning.[11] By assessing each student individually, Edtech allows to dynamically adjust the content, pace, and level of difficulty to match each student's individual needs and abilities. This personalised approach empowers students to learn at their own pace, focus on areas where they need improvement, and explore topics of interest in greater depth. It fosters a supportive and inclusive learning environment that caters to the unique needs of every student.

EdTech has proven to be beneficial for students, with a majority of the students surveyed noticing improvements in academic performance, understanding of topics, and overall outlook on learning. However, despite the widespread acceptance and usage of EdTech platforms and tools, there are still many challenges that are yet to be addressed.

It is crucial to ensure equitable access to EdTech for all students, irrespective of their economic backgrounds. The study revealed that the limited usage of digital learning applications can be attributed to insufficient access to digital devices and a stable internet connection. While a majority of students have a digital device at home to facilitate learning, their effective utilisation for educational purposes is hindered by the lack of consistent access to these devices and poor or no internet connectivity. Thus, bridging this digital gap is a focal point that needs immediate action.

[11]Adaptive learning is an educational method which uses computer algorithms as well as artificial intelligence to orchestrate the interaction with the learner and deliver customised resources and learning activities to address the unique needs of each learner.

The study brings to light a slightly higher inclination among students and parents towards private-funded digital learning applications as opposed to government-funded applications. It is also important to note that currently, only a limited number of digital learning applications provide content aligned with the state syllabus and in regional languages such as Malayalam. Furthermore, the majority of these applications do not offer support for students at the upper primary level. As a result, a considerable number of students are unable to reap the benefits of digital learning applications.

There also exists a lack of comprehensive awareness regarding the diverse applications and capabilities of technology in education. The majority of students have a limited understanding of EdTech, often associating it solely with digital learning applications. While many students watch YouTube, use ICT equipment in class, or access educational TV channels, they fail to recognise the interconnected nature of these tools and their potential as an integrated ecosystem within EdTech. It is crucial for students, teachers, and parents to understand that these tools are not independent entities, but rather interconnected components that can complement and enhance one another, thus exploiting the full potential of EdTech. For instance, YouTube videos can be used in conjunction with digital learning applications to reinforce concepts, while educational TV channels can serve as supplementary resources to support classroom learning. Recognising these connections and utilising them synergistically can lead to a more comprehensive and effective educational experience. Teachers play a significant role in creating awareness among students and parents, by emphasising the interrelatedness of these tools and demonstrating how they can be integrated into a cohesive learning environment to make the most of EdTech's capabilities.

Another area of concern is the ineffective use of EdTech by teachers, which leads to a reduced realisation of the expected benefits. The study also highlights differences in responses between students and parents compared to teachers regarding after-school support and communication. Therefore, there is a need to establish efficient feedback mechanisms to reduce the gaps in teachers' perceptions and actual experiences of students and parents.

Lastly, the importance of addressing the potential negative consequences of utilising EdTech cannot be overlooked. It is crucial to establish a robust ecosystem that not only facilitates the use of EdTech but also promotes safe and responsible usage. While platforms like YouTube have gained popularity as a form of digital learning among students, it is essential to acknowledge the potential risks associated with its informal learning environment. Unrestricted access to inappropriate content poses a significant concern. Moreover, considering the high percentage of students engaging in non-educational activities on digital devices, it becomes imperative to provide cybersecurity and digital training to parents and students. Parents should be duly informed about the significance of monitoring and controlling their child's usage of digital devices. The internet exposes students to a wide array of cyber safety risks, necessitating the utilisation of tools such as VPN, two-factor authentication, and data encryption to ensure their online safety. Additionally, parents can employ software applications to monitor their child's usage, limit screen time, and restrict access to specific apps or websites. It is also essential to address health issues that may arise from increased screen time and potential distractions caused by excessive use of digital devices. Parents and teachers play a crucial role in fostering a healthy balance between digital engagement and other activities.

In the current era of rapid technological advancement, EdTech has gained widespread acceptance and holds immense potential for further development. However, it is imperative to address the aforementioned challenges by actively involving stakeholders at all levels. As technology, including AI, reshapes the world, the education system must adapt to equip students with all the relevant technical and practical skills.

Merely relying on textbooks is insufficient; students need holistic knowledge, practical application of concepts, and transferable skills. Regardless of their economic background, students deserve a supportive environment that enables them to fully benefit from technological advancements. This study can form a basis to initiate policy conversations on the efficient use of EdTech, upskilling, and reskilling of teachers, parents and students.

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