

CSD Working Paper Series: Towards a New Indian Model of Information and Communications Technology-Led Growth and Development

Maharashtra Digital Schools Survey Findings Report

ICT India Working Paper #24

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March 2020

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EARTH INSTITUTE | COLUMBIA UNIVERSITY

Executive Summary

Since 2018, the Center for Sustainable Development has been engaged with the Maharashtra State Council of Educational Research and (MSCERT) and education-focused NGO Leadership for Equity (LFE) in Maharashtra, conducting action research to support the state's efforts to strengthen strategies for increasing quality of education through integration of ICT in schools. This research is part of the "Towards a New Indian Model of ICT-Led Growth and Development" project led by Professor Jeffrey Sachs and Dr. Nirupam Bajpai looking at the role of ICT in various sectors in India, including education, health and agriculture, to better understand the role of ICT in India's future economic growth and to make recommendations for India's continued global leadership in ICT-based development.

Maharashtra State has prioritized the integration of technology in teaching practice as a key area for helping to raise learning outcomes for students across the state. In order to guide their investments, the state is interested in identifying the most effective tools and approaches for various types of learning environments within the state that can be scaled up.

This paper presents the findings and proposed next steps from the Digital Schools Survey which was conducted in Maharashtra, India with 1,000 government schools representing the state's urban/rural/tribal make-up. The Digital Schools Survey was identified as an important step in understanding the current levels of digital infrastructure, support, resources and skills that schools across Maharashtra are equipped with. Findings are intended to help inform how the state can best direct resources to support schools in filling gaps and optimizing use of digital technology and resources.

The data findings reveal common scenarios faced by schools across the state, including the reality that most schools are only able to access the Internet due to teachers' willingness to use their own mobile data for educational purposes of their students, and the great reliance on corporate social responsibility for provision of devices in schools. The data also reveal differences along urban and rural lines. For example, rural schools are more likely to have problems accessing reliable electricity and connectivity, while urban schools are more likely to have reliable electricity and connectivity provided by the school, as well as more tech savvy teachers. The overwhelming preference among teachers for video resources from YouTube and the Digital Infrastructure for Knowledge Sharing (DIKSHA) platform was apparent from the data, and demonstrates the need for more guidance on how to discern quality content from the rest.

Based on the common school scenarios emerging from the data, a set of recommendations is presented for consideration by the Maharashtra State Council for Education, Research and Training (MSCERT). Further, a plan for development of an action research protocol is outlined as a next step for the research team, which is being designed to look at a sampling of approaches to pedagogical training for integration of ICT that are intended to meet the specific needs of various school contexts as identified in the Digital Schools Survey.

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Introduction

India is using Information and Communication Technologies (ICT) to leapfrog economic development in key sectors: health, education, infrastructure, finance, agriculture, manufacturing, and governance. ICT is being used to deliver critical goods and services to hundreds of millions of Indian citizens. While many sectors have already seen huge improvements through innovative use of ICT, such as infrastructure and communications, the education sector has struggled to optimize the potential of ICT for improving teaching and learning. ICT holds an important promise for education especially in rural areas, if it is optimized and tailored to local needs.

The “Towards a New Indian Model of ICT-Led Growth and Development” project led by Professor Jeffrey Sachs and Dr. Nirupam Bajpai is looking at the role of ICT in various sectors in India, including education, health and agriculture to better understand the role of ICT in India’s future economic growth and to make recommendations for India’s continued global leadership in ICT-based development. One of the research strands in the education sector is to better understand what components need to be in place to support effective uptake of ICT among teachers in various educational contexts in Maharashtra.

ICT in Education Research in Maharashtra

Since 2018, the Center for Sustainable Development has been engaged with the Maharashtra State Council of Educational Research and Training (MSCERT) and education-focused NGO Leadership for Equity (LFE) in Maharashtra, conducting action research to support the state’s efforts to strengthen strategies for increasing quality of education through integration of ICT in schools.

Maharashtra State has prioritized the integration of technology in teaching practice as a key area for helping to raise learning outcomes for students across the state. In order to guide their investments, the state is interested in identifying the most effective tools and approaches for various types of learning environments within the state that can be scaled up. The research focus initially looked specifically at the rollout of DIKSHA (Digital Infrastructure for Knowledge Sharing platform), and upon finding that some of the barriers to effective uptake of the platform were similar to those hindering teachers from adopting ICT more broadly, the research team expanded the scope to look more holistically at how support and training for teachers and content creators can help facilitate development and use of more locally relevant content both on the DIKSHA platform and beyond for teachers across Maharashtra.

This education research requires looking at different models of conducting teacher training in integration of ICT for more interactive, learner-centered classroom practice to understand what approaches work best for the various diverse contexts within Maharashtra, in alignment with the state's strong commitment to identifying effective, scalable solutions for equipping Maharashtra's massive population of teachers with these skills. A major focus going forward in the project will be conducting action research to identify what methods and models of pedagogical training and support for integrating ICT effectively in classrooms lead to sustained uptake among teachers in different settings.

Digital Schools Survey

As a first step in informing design of training approaches for various contexts and school needs in Maharashtra, the research team carried out a Digital Schools Survey at the start of the 2019-20 academic year with the goal of understanding the current levels of digital infrastructure, support, resources and skills that schools across Maharashtra are equipped with to help inform how the state can best direct resources to support schools in filling gaps and optimizing use of digital technology and resources. The survey looks at six components:

1. General School Characteristics
2. School Support
3. Digital Infrastructure
4. Teacher ICT Integration
5. Digital Content Availability
6. Digital Community Engagement

Data from the survey was analyzed to create a holistic picture of schools' capacity to fully leverage digital technology to improve teaching and learning. Questions that guided the data analysis include:

- What are common school scenarios in terms of school capacity for effectively integrating ICT into teaching and learning, considering the components listed above?
- Are there common trends in terms of school capacity for integrating ICT for effective teaching and learning across urban, rural, and tribal schools? If so, what are they, and how do they differ from each other?
- What do teachers see to be the greatest needs to support their improved teaching practice with regard to ICT?
- How are current ICT investments being made in schools?

Data Collection Protocol & Preparation

The survey was carried out with 1,000 schools in Maharashtra through a mix of online and in-person means. The online survey, which was in both Marathi and English, was distributed using Survey Monkey. The research team assumed that many of the most hard-to-reach and less digitally equipped schools that this survey was designed to support would be the same ones who may struggle to complete an online survey. Therefore, for the data collected through this survey to have the intended impact, Block Resource Persons (BRPs) played a critical role in collecting in-person survey data at schools identified as being hard to reach or which lack the ability to easily complete an online survey.

Sampling

Maharashtra has a total of 66,750 government schools, with about 91.3% classified as rural and 8.7% classified as urban. Less than 1% of these schools is sub-classified as tribal. The 1,000 government schools that participated in the survey were selected to represent the state's urban/rural/tribal make-up, spread across regions. Amongst the 1,000 sampled schools, 912 were classified as rural, 77 as urban, and 11 as tribal.

Method

To prepare for data collection, members of the research team coordinated with MSCERT Head of Research to design and carry out webinar-based training sessions for all the heads of Maharashtra's District Institute of Education and Continuous Professional Development (DIECPD) offices, as well as with the selected BRPs from each district who would be tasked with carrying out the survey. It was notable that these webinars were the first time that the Research Department of MSCERT conducted any ICT-enabled, distance training program. During these webinars, the DIECPD heads and BRPs were informed of the larger "Towards a New Indian Model of ICT-Led Growth and Development" research agenda that the Digital Schools Survey is a part of, the objectives of the survey, and the plans for how findings would be used to inform action research to support teachers from various school environments to improve their skills through training in integration of ICT in teaching practice.

BRPs were expected to visit all of their selected schools within the allotted time frame. During each visit, the first step was to introduce the purpose of the survey to the School Heads before proceeding with the survey. BRPs were trained to emphasize the following points:

- The purpose of the survey is to better understand the needs of the schools based on their specific circumstances, so their truthful answers are critical.

- The survey is for all *schools*, not just those that already have devices or are using ICT in classrooms. The idea is to help design ICT solutions for schools based on their needs and constraints.
- The person to complete the survey should be the person with the best knowledge of the school's ICT resources, use of ICT in lesson preparation and/or classroom, and/or readiness factors for future use of ICT in the school. This person might be the School Head, ICT teacher, or another tech savvy or otherwise interested teacher. Ask the School Head to identify who the best person to complete the survey would be.
- Ask the School Head if he/she has any questions and do your best to answer them. If there are any questions, ask them to direct their questions to the Research Department.
- Inform the schools to not to fill the online version of the same form in future.

Timeline

- August 5th -17th 2019: BRPs visit target schools to introduce the purpose of the survey, answer any questions and complete the survey.
- August 17th – September 30th 2019: Remaining schools complete the survey online.
- October 1st - December 31st 2019: Data analysis
- January 2020: Report writing

Limitations

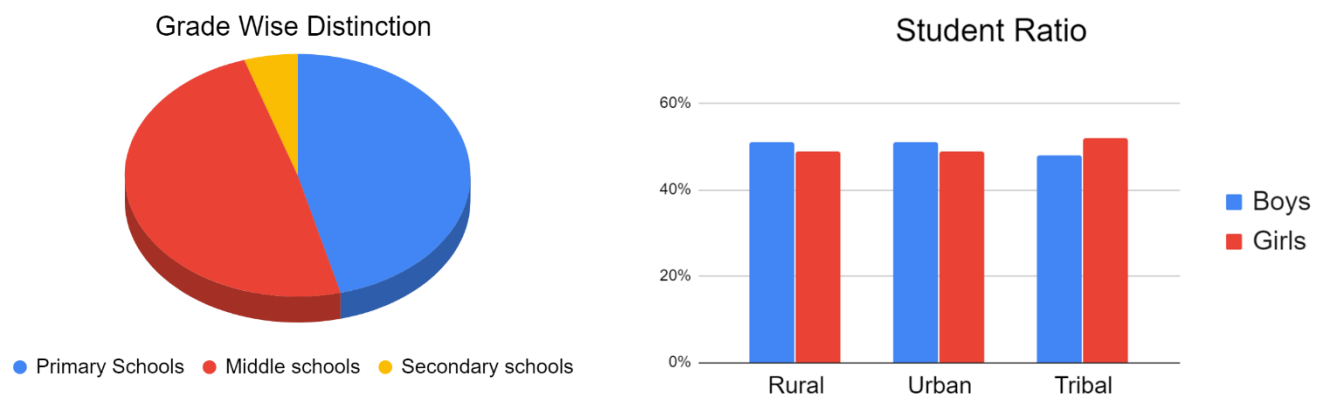
The survey was planned for all 36 districts of Maharashtra but due to unfortunate heavy rains during the data collection period of August – September, Block Resource Persons (BRPs) were not able to make enough school visits in two districts, Mumbai and Mumbai Suburb District to collect adequate data. The final data collection was done from 34 districts covering the original sample size. It is possible that urban schools are underrepresented in the total number of schools since Mumbai, the state's most urban district, was not included in the sample.

Among the 1,000 schools from which data was collected, 912 are classified as rural schools, 77 as urban schools, and 11 as tribal schools. Therefore, the sample for urban and especially tribal schools is quite low. In some cases, tribal schools were not included in disaggregated analysis because the sample was considered to be too small to yield meaningful interpretation. In other cases where there was some anomalous factor, it was included in the disaggregated analysis.

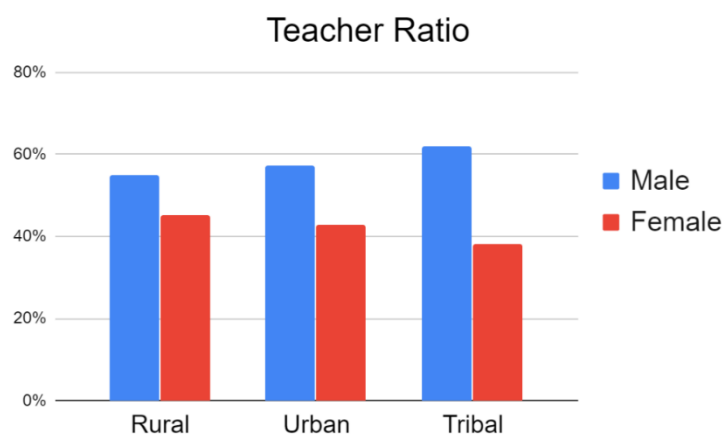
Findings

General School Characteristics

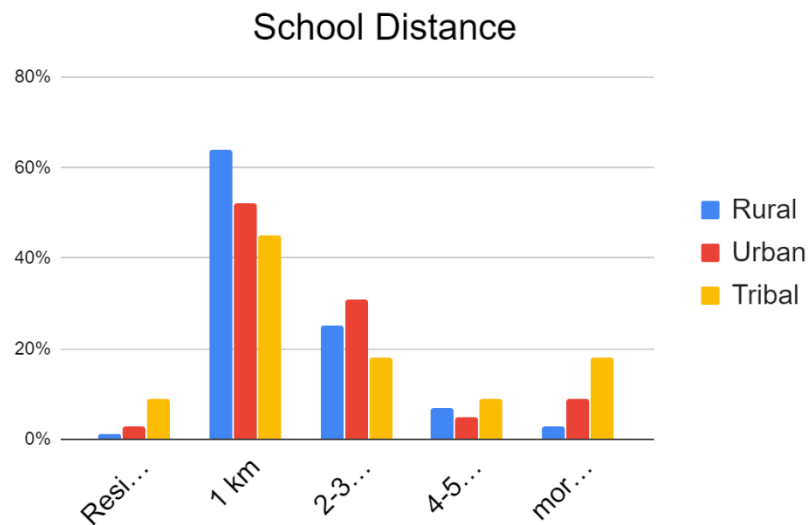
With regard to general school characteristics, among the schools from which data was collected, 46% were primary schools, 49% were middle schools, and 5% were secondary schools. In both rural and urban schools, the female to male ratio was about 49 to 51, with slightly more boys enrolled than girls. In tribal schools however, girls were significantly more likely to be enrolled than boys, with a female to male ratio of about 52 to 48. While further research would need to be done to better understand the reasons, one hypothesis might be that in tribal areas, young boys are more likely to be expected to perform agricultural or other labor.



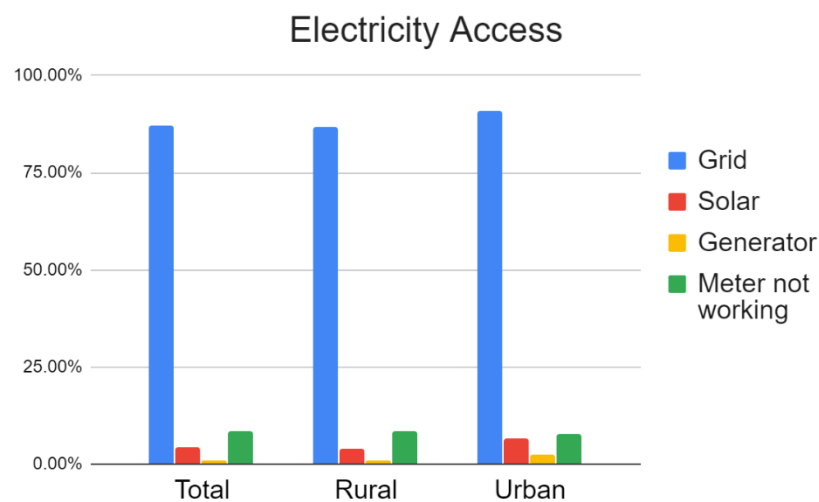
The survey also found that teachers are more likely to be male than female across settings, with the gender gap least significant in rural areas (55% male, 45% female) and most significant in tribal areas (62% male, 38% female).



A majority of both urban and rural schools reported that most children travel 1km or less to reach the school, while 18% of tribal schools reported that some children travel over 5km to reach their school.

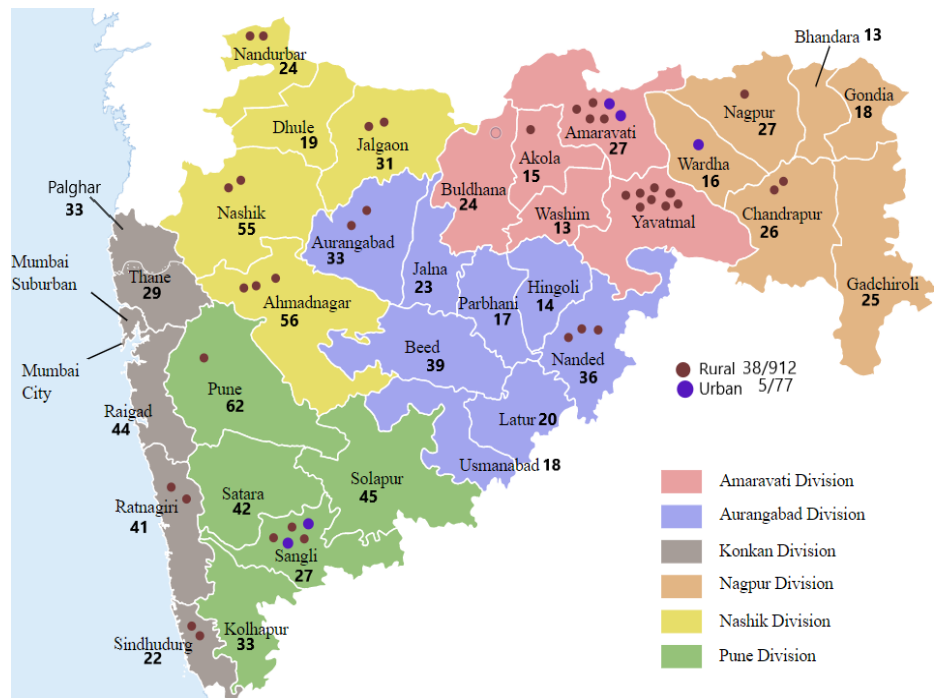


Among surveyed schools, 93.5% have access to electricity, with the majority of them getting their electricity from the grid. There were not significant differences between urban and rural schools in terms of their sources of electricity. About 9% of schools reported having meters that aren't working.



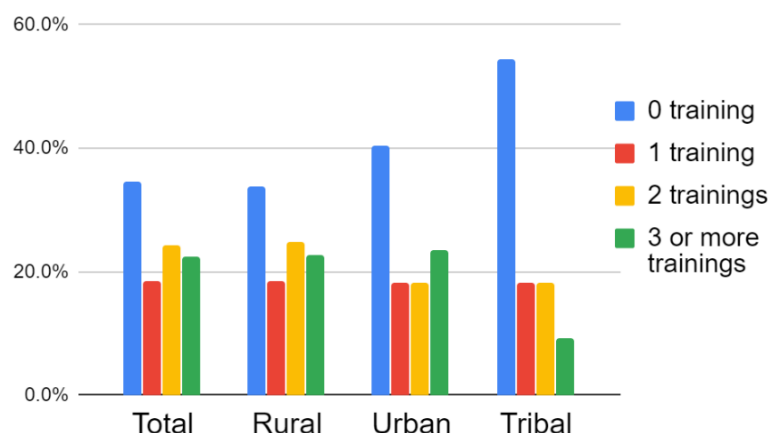
School Support & Training

When asked whether their schools receive regular support from DIECPD, 4.3% of respondents said that they did not. However, when asked about frequency of visits, 20.3% reported that they receive visits from DIECPD rarely or never. When mapping the schools who reported receiving no visits from DIECPD, it is clear that the schools are clustered in particular areas, notably in Amaravati Division.



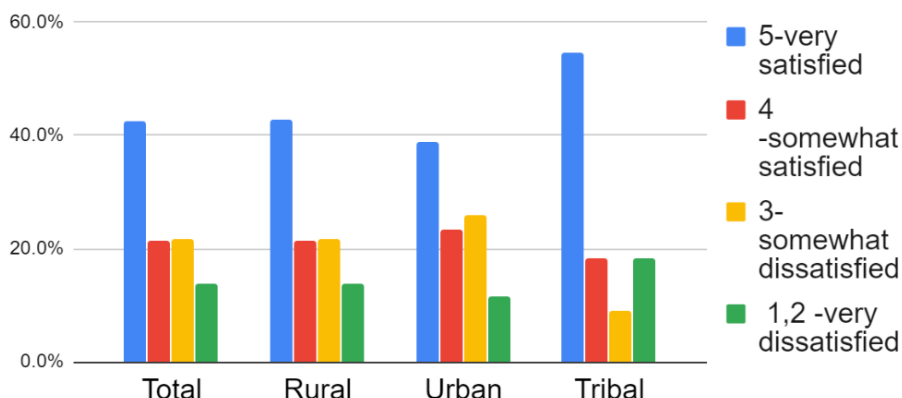
Among all schools, 65.4% reported having received training on the integration of ICT from their DIECPD in the past year, while 34.6% reported not having any DIECPD trainings. Within this average, tribal schools had the least access to DIECPD trainings, with 54.5% reporting not having any DIECPD trainings, followed by 40.3% of urban schools, and 33.9% of rural schools. Among the 65.4% who reported having received DIECPD trainings, 18.5% reported receiving 1 training in the past year, 24.2% received 2 trainings, and 22.5% received 3 or more trainings. This trend shows that, where investments are made in providing training on integration of ICT, DIECPD trainings are more likely to be provided on an ongoing basis rather than as a one-off event.

Frequency of DIECPD teacher's training



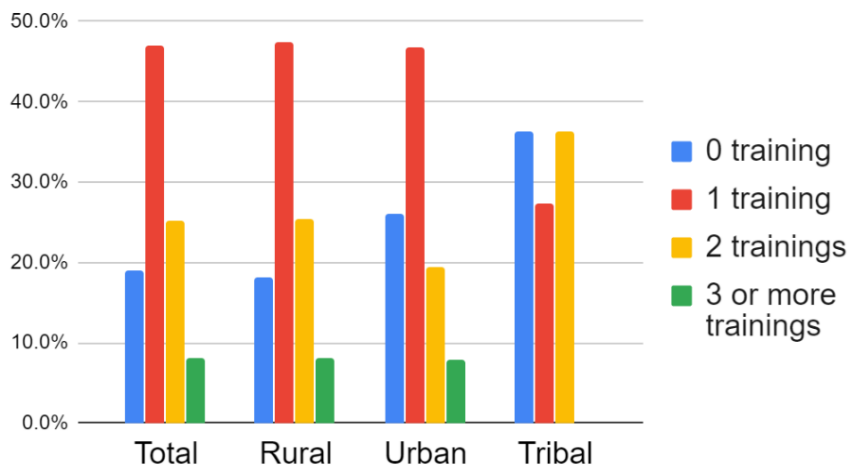
Out of total schools 42.6% reported being very satisfied with the DIECPD support, 21.5% were somewhat satisfied, 21.8% were somewhat dissatisfied, and 13.7% were very dissatisfied.

Satisfaction with DIECPD Support



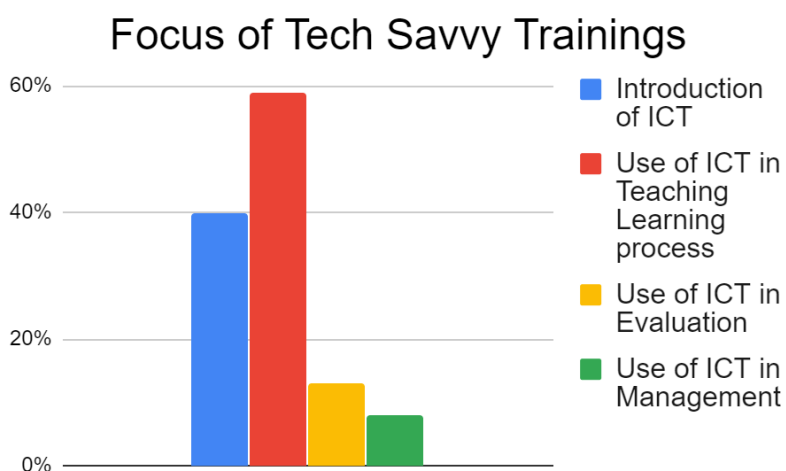
A greater percentage of schools reported having teachers who have participated in “tech savvy” teacher training, which may include the DIECPD trainings already reported, and/or provided by non-governmental or other private partners, with a total of 80.3% of schools reporting to have received at least one tech savvy teacher training. However, while a greater percentage of schools have received at least one tech savvy training regardless of provider than those who have received training from DIECPD, tech savvy trainings appear to more frequently be conducted as one-off events, as there is a sharp drop between schools reporting having received 1 training and those who received 2 (47.1% to 25.2%). The drop is again significant from those reporting having received 2 trainings and those receiving 3 (25.2% to 8%).

Frequency of Tech Savvy Training



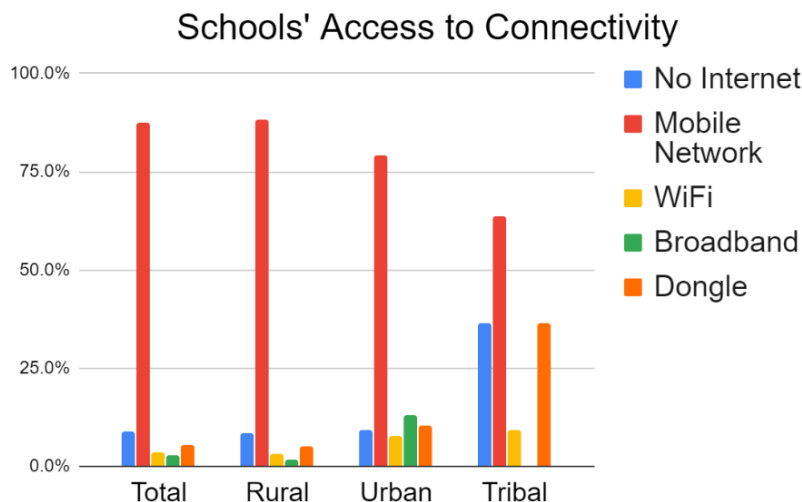
The exception to this trend is the tribal schools, which are the only subset to have a greater number of schools reporting having received 2 trainings than having received only one. When comparing against the data on DIECPD trainings, and based on the assumption that this broader question likely includes some of the DIECPD trainings it may be inferred that tech savvy trainings provided by partners other than DIECPD are significantly more likely to be conducted as one-off events.

In regard to the focus of tech savvy trainings received, the largest proportion of schools reported receiving training focused on using ICT in the teaching and learning process (59%), with another 40% receiving basic introductory training on using ICT. Trends for the above data across primary, middle, and high school levels were similar.

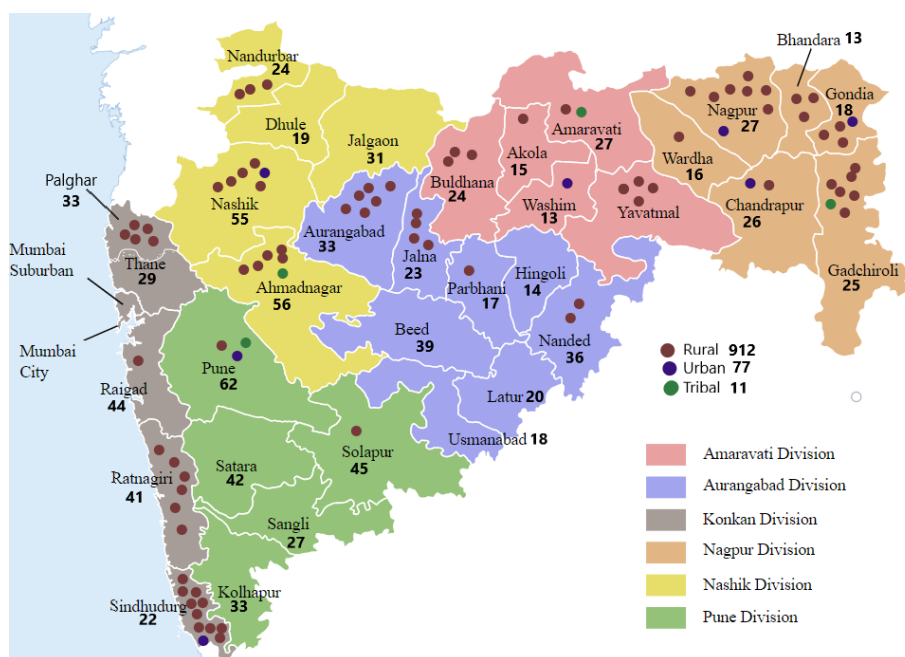


School ICT Infrastructure

A vast majority of schools at 91.2% reported having Internet facility, but dig a little deeper, and the data reveal that among this group of schools, 5.4% reported connecting to Internet with a dongle, 3.6% use Wi-Fi, and 2.7% use broadband, while 87.4% reported connecting using mobile data.



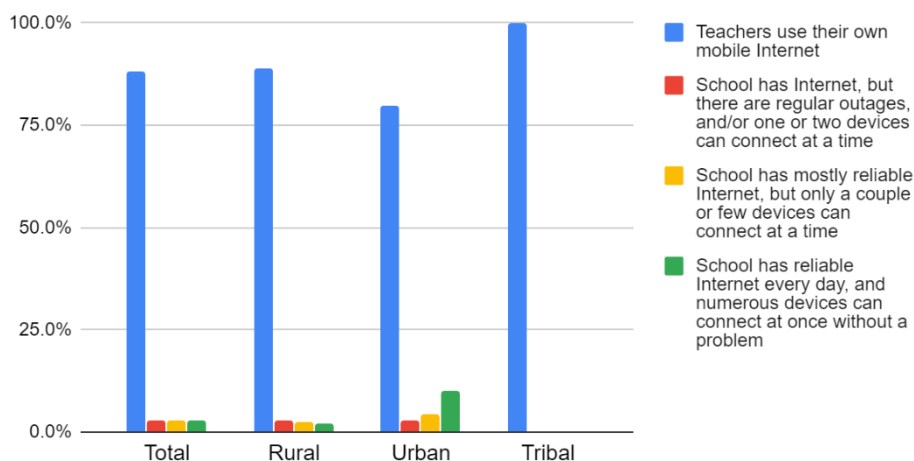
Nearly 9% schools don't have access to any kind of internet connectivity. Mapping of these schools shows that these schools are clustered in few districts which are notably clustered in Konkan, Ahmadnagar and Aurangabad divisions.



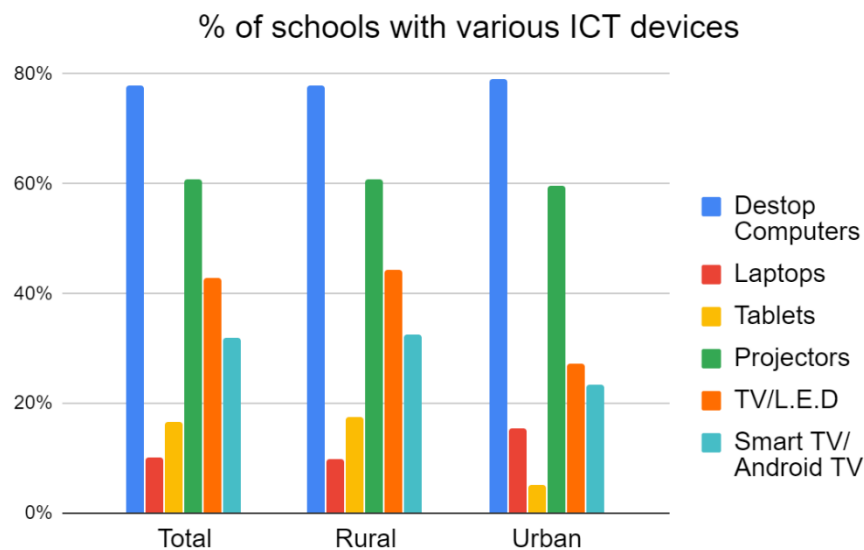
When asked about common connectivity access scenarios in their schools with the internet connectivity, a majority (88.2%) of schools reported that their teachers connect using their own mobile data via their phones. However it is notable that urban schools reported stronger, more stable connectivity than rural schools, with 4.3% of urban schools reporting connectivity that is “mostly reliable” and able to connect to only a few devices at a time, as compared to only 2.6% of rural schools and 10% of rural schools and 10%

urban schools having reliable connectivity to connect numerous devices simultaneously as compared to 2% of rural schools. Tribal schools are most likely to have teachers’ mobile data as their only connectivity option.

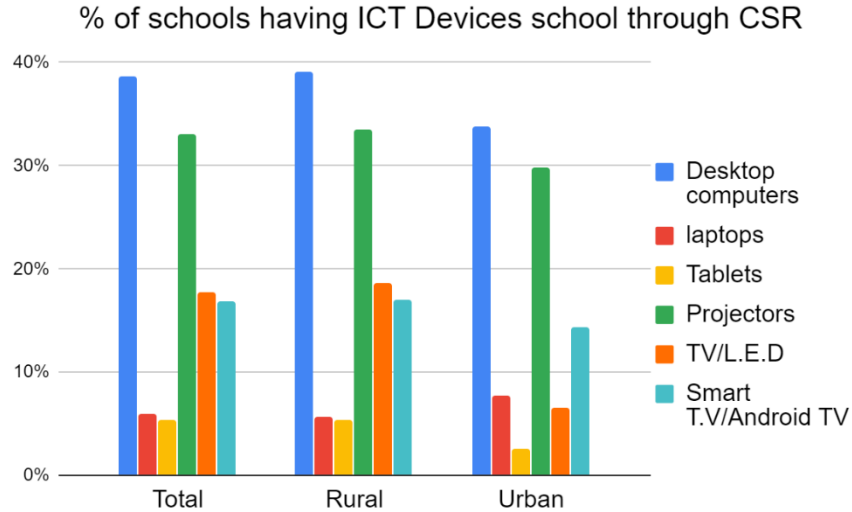
School Internet Connectivity Scenarios



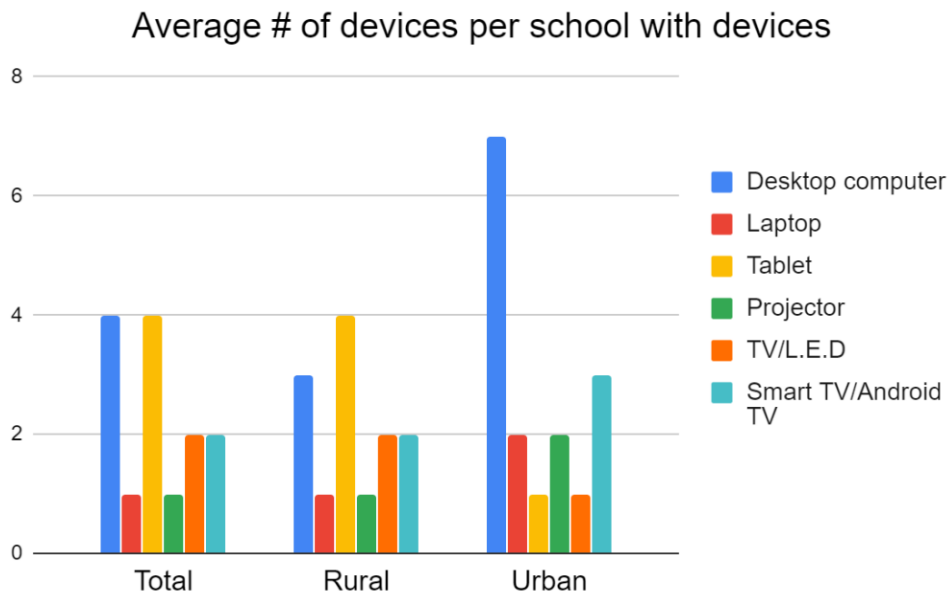
When it comes to devices, desktop computers are the most significantly available type of device, with 78% of schools reporting having at least one desktop computer. Projectors are also common, with 61% of schools reporting having at least one. Across all schools, 17% reported using tablets, while 10% reported using laptops, however the data show that laptops are more prevalent in urban schools, with 16% of urban schools having at least one laptop as compared to 10% of rural schools, while tablets are three times more common in rural schools than urban, with 17% of rural schools having at least one tablet as compared to just 5% of urban schools. Rural schools are also more likely to have LED or Smart TVs. Reasons for these differences warrant further research, but seem on their face to align to the different needs and capacities of typical urban and rural schools. Urban schools have more consistent access to electricity and so can support more powerful devices like laptops, while rural schools need less energy-demanding devices, such as tablets, and devices that can serve a greater number of students, such as LED and Smart TVs. It is important to note that, while prevalence of desktop computers is significant, it was also reported that over 27% of desktop computers in schools are *not* in working condition.



Looking at the schools having ICT devices, it is clear that a significant portion of devices are made available to schools through corporate social responsibility (CSR) contributions. In case of most of the devices, near around 50% of the schools having ICT devices received them through CSR interventions.



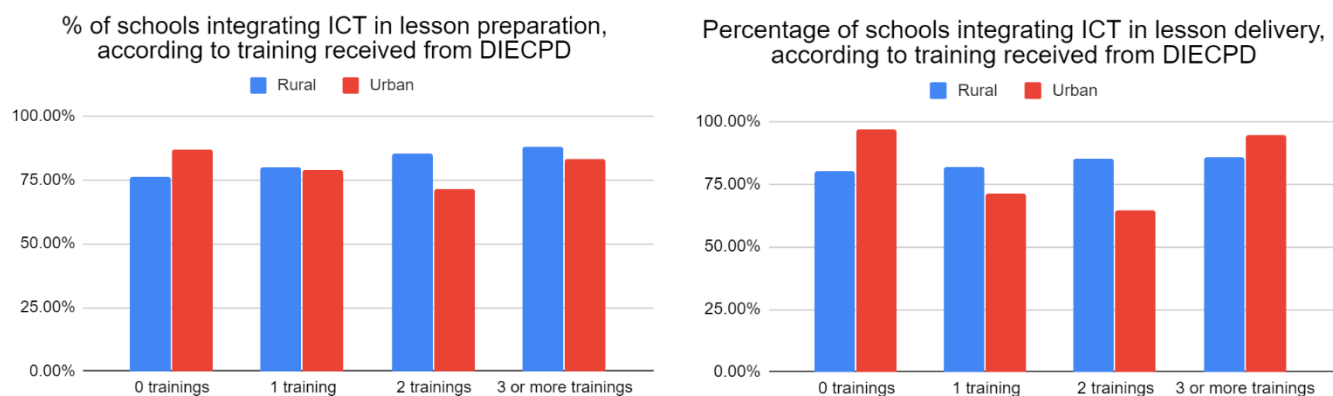
Digging a little deeper, among those schools reporting to have various types of devices, the average number of each device type is shown below, and is quite low across the board. Urban schools with desktop computers have an average of 7 per school, as compared to just 3 per rural school. Rural schools are again better equipped with tablets, with an average of 4 per school, as compared to just 1 per rural school.



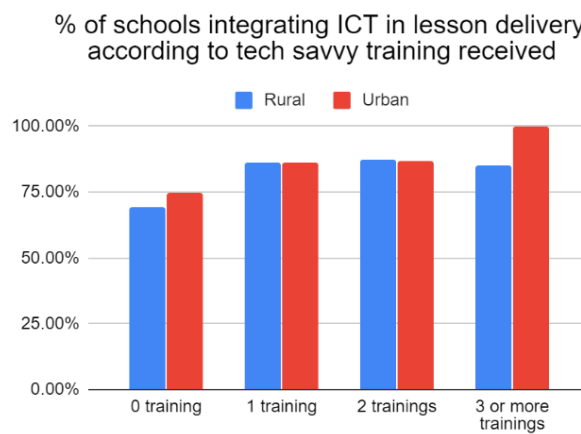
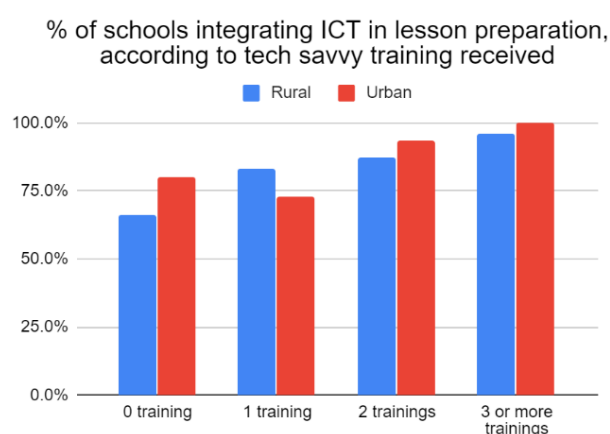
Teacher Practice & Integration of ICT

Overall, 81.5% of schools reported having teachers who use ICT to prepare lessons, with 83.3% of schools having teachers using ICT to deliver lessons. 74.8% reported teachers using ICT at least once per week. Trends were similar across urban, rural and tribal schools.

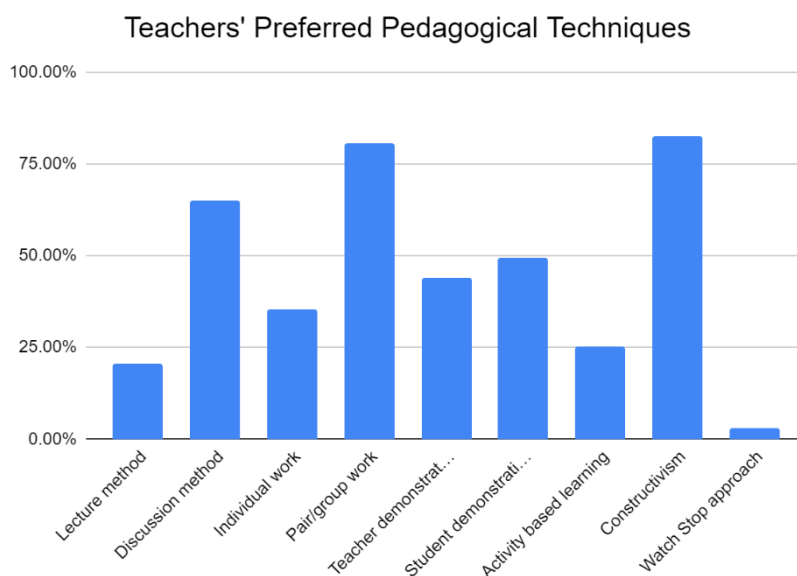
With regard to teachers' exposure to ICT integration training opportunities, and their apparent impact on teacher use of ICT in preparation and delivery of lessons, the data show notable differences in impacts of different types of training, and in rural versus urban school settings. For teacher trainings provided by DIECPD, while findings among urban schools were mixed, findings from rural schools show a clear upward trend in teacher integration of ICT for both preparation and delivery of lessons the more training opportunities teachers received from DIECPD. Seventy-six percent (76.1%) of teachers receiving zero trainings reported using ICT to prepare lessons, while 87.9% of teachers receiving 3 or more trainings reported the same.



For the broader question asking about schools' access to "tech savvy" teacher trainings, including those provided by DIECPD as well as by non-governmental or other private partners, the impact on teacher use of ICT in preparation and delivery lessons is more significant, and, for the most part, applies to urban and rural schools. Among schools receiving 0 tech savvy trainings, 66.1% of rural schools and 80% of urban schools reported having teachers using ICT to prepare lessons. These figures climb significantly to 95.9% and 100%, respectively, for teachers who have received 3 or more tech savvy trainings. These findings suggest that tech savvy trainings provided by non-governmental or other private partners may be more impactful on teacher practice than DIECPD trainings, particularly for urban schools, but that DIECPD trainings are also effective, especially for rural schools.

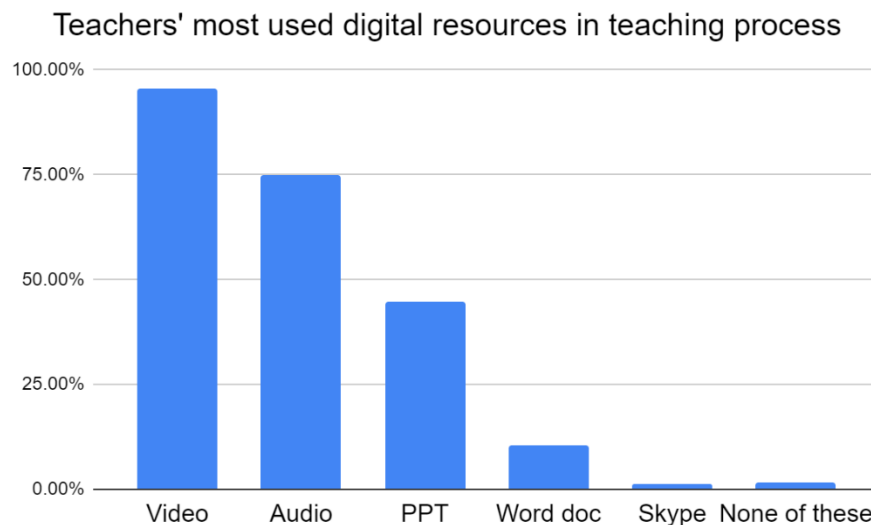


When asked about the most common pedagogical techniques used in their schools, 82.6% of schools reported teachers using "Constructivism", 80.8% reported using "Pair/Group work", and 65.2% reported using "Discussion method". No other method was chosen by more than 50% of schools, though "Student demonstration method" came close with 49.6% of schools selecting it. Follow-up research to further investigate how teachers define constructivism may be helpful in guiding how training on ICT integration can highlight how ICT can enhance facilitation of learning using teachers' preferred methods.

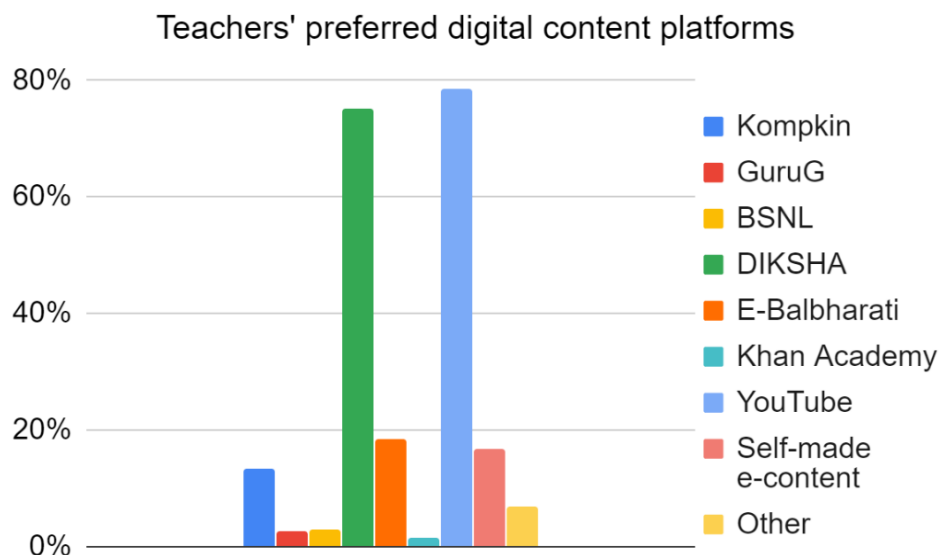


School Preferences for Digital Content

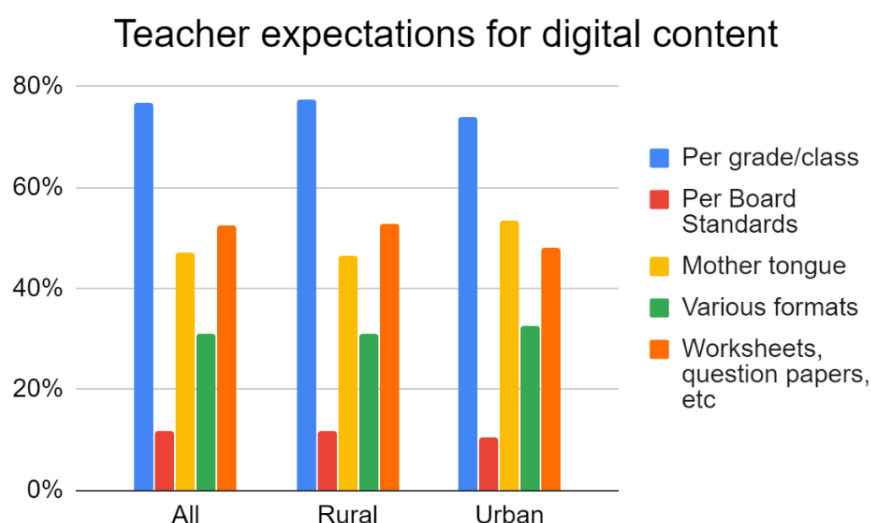
When asked about types of digital resources most frequently used by teachers, 95.5% of schools reported videos as the most frequently used resource. Audio resources were also popular, reported by 74.9% of schools, as were PowerPoint presentations, reported by 44.6% of schools.



Teacher preference for teaching with videos is further demonstrated by the finding that YouTube is the favorite digital platform among teachers from 78.6% of schools, followed closely by DIKSHA at 75.2%. No other platforms came close, though E-Balbharati (18.5%), teachers own self-made e-content (16.8%), and Kompkin (13.3%) were all selected by significant numbers of schools. 2.8% of schools reported that they do not use any digital content.

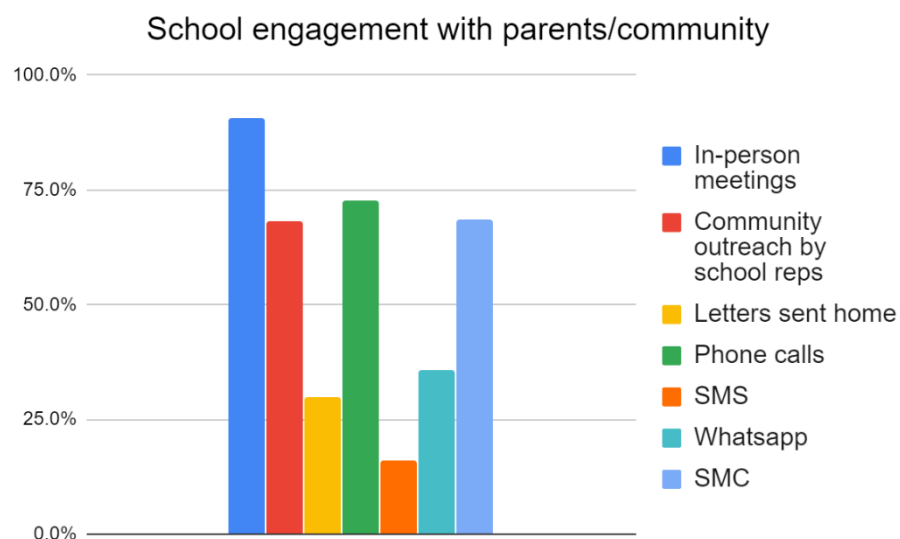


Schools were also asked about teachers' expectations for digital content availability. By far the most commonly captured expectation, selected by 77% of schools, was that digital content be available by grade/class. Practical resources like exam papers and worksheets were also selected by 53% of schools. Interestingly, urban schools (53%) were more likely than rural schools (46%) to expect digital content to be available in mother tongue, while rural schools (39%) were more likely than urban schools (32%) to expect digital content in English.

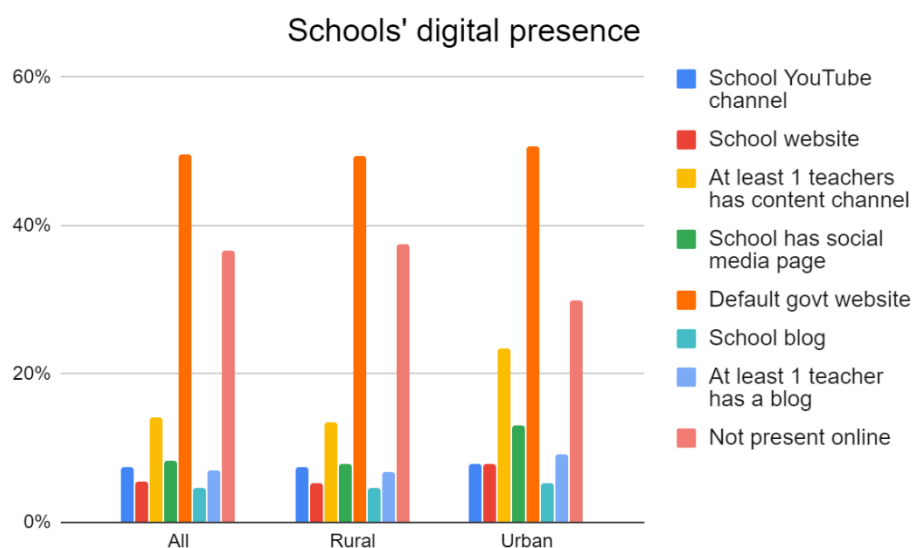


Digital engagement with parents & community

It is clear that the most common methods for engaging with parents and community about school-related matters involve face-to-face interactions, with in-person meetings being selected as a primary method in 90.7% of schools. While digital communications were less commonly cited, it is clear that WhatsApp is the preferred medium for digital communication between schools and parents, with 35.8% of schools using WhatsApp to communicate with parents and community members.



While many schools reported regular use of ICT by teachers in preparing and delivering their lessons, schools as a whole appear to take a less proactive role in building their own web presence. About half of schools reported taking advantage of the free default website provided to each school by the government, while more than a third of schools reported having no online presence at all, with rural schools less likely to be online than urban schools. Urban schools are 61% more likely than rural schools to have a social media account and 58% more likely to have at least 1 teacher with their own content channel.



Discussion

This data analysis is intended to offer a bird's eye view of the current state of school capacity for and practice of integrating ICT in schools in Maharashtra. One overarching trend is that progress made by schools to increase their use of ICT in teaching practice seems to largely be a result of teachers' own efforts in using their own mobile devices to access the Internet. It is also clear that at least half of devices in schools are there as a result of corporate social responsibility efforts, and therefore there is little consistency across schools in terms of types and number of devices they have. This poses significant challenges to government agencies and other organizations seeking to provide training to teachers in integration of ICT that is relevant to the types of devices and connectivity they have access to.

There is evidence that training in integration of ICT, whether provided by DIECPD, non-governmental or private partners, is likely to have an impact on increasing teachers' use of ICT in preparation and delivery of lessons. Trainings provided by non-governmental partners appear to have a greater and more consistent impact on teacher uptake of ICT across rural and urban schools than DIECPD trainings. This may be due to the fact that many trainings provided by non-governmental or private partners are focused on specific software platforms or other specific ICT solutions new to the schools, and therefore will be more likely to impact uptake of that particular platform or solution, whereas DIECPD trainings are more often focused on how teachers can take greater advantage of resources they already have.

There also appear to be clear trends among urban versus rural schools in regards to the types of resources they have access to. For example, a common scenario found in 9% of rural schools is the problem of a broken meter, which may make access to electricity unreliable and/or weak in its strength to power ICT devices. Rural schools are also less likely to have access to connectivity provided by their school, with most relying on their own mobile devices to access the Internet. Even across schools reporting access to connectivity, urban schools reported being more likely to have reliable, stable connectivity, while rural schools are more likely to struggle with less reliable connectivity that is only strong enough to power few devices as a time.

Common scenarios in urban schools include greater access to connectivity provided via WiFi or broadband by the school. Urban teachers are also more likely to be tech savvy, with greater proportions of schools reporting having teachers with their own YouTube channel, or schools with their own social media accounts.

Recommendations

Public/private coordination to ensure basic package of resources tailored for specific school settings

The data reveal unique challenges of urban versus rural schools, as well as challenges shared across school settings. At the same time, the data show a great dependence on CSR efforts for device provision in schools, and a great breadth of types of devices being provided. The government can play more of a role in recommending ideal ICT packages for schools in various common school scenarios. For example, rural schools with unreliable electricity and weak connectivity may be best suited to using a Smart TV with a dongle and a set of student tablets that can be charged using solar power, all pre-populated with curriculum-aligned multimedia content. Urban schools, being more likely to have reliable electricity and tech savvy teachers

with their own smart phones, could benefit from investment in WiFi or Broadband connectivity to enable greater leverage of teachers' own devices without expecting them to pay for their own data costs when using their phones for teaching.

Incentivize equitable investment by IT industry to enable stronger, more stable access to connectivity in rural and tribal schools.

The findings show that rural and tribal schools are less likely to have connectivity provided by their schools, and are also less likely, even when using their own mobile data, to have strong enough service to connect more than a very small number of devices as a time. One reason for this inequity in quality of connectivity may be that IT companies are not incentivized to invest in the necessary infrastructure in rural and tribal areas where populations are smaller and sparser. The government may be able to play a greater role in incentivizing the private sector to maintain the necessary infrastructure to ensure that all schools have equitable access to strong, reliable connectivity.

Increase teacher access to ongoing professional development through blended delivery models

The findings demonstrate the positive impact that sustained access to professional development opportunities can have on teachers' uptake of ICT for their lesson preparation and delivery. For "tech savvy" trainings, there is a clear correlation between increased number of teacher trainings and increased integration of ICT by teachers across both urban and rural schools. DIECPD trainings alone also showed a similar but less significant correlation among rural schools, with mixed results for urban schools. Further research into the different approaches taken by these various types of teacher training programs may help contribute greater understanding into the key training inputs and approaches that lead to most significant and sustained teacher uptake of ICT, and the ways in which teachers use ICT after receiving training. Government can then use findings to inform selection of non-governmental and/or private partners to work with in delivering training to teachers in various common school scenarios, and/or adopt more impactful inputs and approaches for trainings provided by DIECPD.

Improved guidance from government on Content Quality Guidelines

It is clear from the data that the vast majority of teachers turn to YouTube for their content. While YouTube has a wealth of quality resources for teachers, there is also a lot of low-quality content, and it may be difficult at times for teachers to know how to parse out the best from the lackluster. Clearer content quality standards and dissemination of those standards to teachers can help them in selecting content. The government might also consider creating and continually updating a set of recommended YouTube channels. This could also create an opportunity to promote and incentivize the great work of Maharashtrian and other Indian teachers with their own high-quality YouTube channels.

Next Steps

Based on the survey findings, an action research protocol is being designed to look at a sampling of approaches to pedagogical training for integration of ICT that are intended to meet the specific needs of various school contexts as identified in the Digital Schools Survey. The models for teacher training will be selected among existing innovative approaches being led by NGOs and/or DIECPDs, as well as at least one model to be designed by the research team in collaboration with Leadership for Equity and DIECPDs. Selected schools will receive at least 2-3 in person/blended trainings over the course of the academic year, and have access to staff for regular support using WhatsApp and other video conferencing technology. The research questions that this action research seeks to answer include:

- What are the different kinds of teacher training initiatives focused on pedagogy for ICT integration that are being conducted by DIECPDs and other education stakeholders (e.g. NGOs), and how do their approaches align/differ?
- Which training approaches (in terms of format, frequency, follow-up, etc) lead to most effective/sustained teacher uptake and changes in student participation?

Different models of teacher training will be studied, and will be identified for study during the next academic year through outreach to various DIECPDs and NGO partners doing innovative work in the area of teacher training. For example, the Aurangabad DIECPD has been conducting teacher support calls using Zoom in order to reach remote schools. The company Jnana Promodhini has been developing e-content for 11 years, and over the past year has been developing content for the DIKSHA platform. Part of their offering includes providing content and skill-based trainings for teachers, and tailor their training to the needs of the schools they work with. They are currently developing an app to further support teachers with content and training tips, and planning to conduct their own internal research to develop a blended learning model for teacher trainings. These different approaches are likely to be among those selected for this action research and comparative analysis.

For the model to be developed by the research team, the team is looking at developing an adapted version of the Center for Sustainable Development's Virtual Reality Teacher Training Platform. The Virtual Reality (VR) platform was developed in 2017 by CSD's Connect To Learn initiative – a partnership with global telecommunications company Ericsson. Platform development was supported by Qualcomm Wireless Reach, and was designed as a follow-up to a 2-year engagement with 31 schools in Myanmar supported by UK Aid's Girls' Education Challenge. During the two-year program, 31 schools in Myanmar received installations of

teacher computer kits and student tablets, and were equipped with connectivity. Teacher trainers from the Myanmar Ministry of Education received training in integration of ICT into classroom practice, which they then implemented with teachers from participating schools. The project saw significant uptake in use of technology by teachers and students. To sustain that progress, the initiative needed to identify a low-cost approach to ensure teachers would have ongoing access to training and support.

CSD and Ericsson, together with a UK-based VR firm, developed a series of four modules to help 1000 plus teachers understand the goals of student-centered, ICT-integrated pedagogy and explore various approaches to integrating it in the classroom. The approaches and sample activities that are covered in the modules are based on a global literature review of recommended pedagogical practices from country curricula in order to ensure that the activities covered are applicable in different country contexts.

Based on expressed interest in this solution by the Maharashtra Education Commissioner as a possible area for further exploration in Maharashtra, the research team is looking into possibilities for adapting their solution for the Maharashtrian context in partnership with SCERT and LFE, and piloting it as part of this research strand looking at different approaches to teacher training focused on integration of ICT.

Alongside implementation of these various training approaches, the research team will conduct teacher and student surveys and interviews and regular classroom observations to monitor the degree to which involvement in teacher training correlates with increased use of technology in lesson preparation and/or delivery and modes of student participation. Classroom observations will measure the types of student engagement taking place in the classrooms, how much time is spent on various types of activities, and different ways ICT is used by teachers and students.

After the close of this research looking at different models of teacher professional development, a comparative analysis will be conducted to help understand which aspects of teacher training lead to the most significant changes in teacher practice and classroom engagement, considering cost effectiveness of the various approaches as well. Based on this analysis, a set of recommendations will be made for how effective teacher training in integration of ICT can be scaled up.

APPENDIX – DIGITAL SCHOOLS SURVEY QUESTIONS

Background Questions

1. District (drop-down)
2. Block
3. Name of School
4. UDISE Code
5. School Management Type
 - a. Zila Parishad
 - b. MNC
 - c. NP
 - d. Tribal Welfare Department
 - e. Social Welfare Department
6. What is the medium of instruction of your school?
 - a. Marathi
 - b. Hindi
 - c. Urdu
 - d. English
 - e. Other: _____

General School Characteristics

7. What grades does your school serve?
8. How many students are enrolled in your school?
 - a. Boys_____
 - b. Girls_____
9. How many teachers work in your school?
 - a. Men_____
 - b. Women_____
10. How many classrooms does your school have?
11. Does your school have electricity?
 - a. Yes
 - b. No
 - i. If Yes, how is it supplied?
 1. Grid
 2. Solar

- 3. Generator
 - 4. Meter is not working
12. How would you describe your school setting?
- a. Urban
 - b. Rural
 - c. Tribal
13. What is the furthest that students travel to reach your school?
- a. 1km
 - b. 2-3km
 - c. 4-5k
 - d. More than 5 km
 - e. Residential School
14. Which type of Headmaster does your school have?
- a. Headmaster
 - b. In charge Headmaster
 - c. School is not designated for Headmaster/Principal

School Support

15. Does your school receive regular support from resource persons from DIECPD?
- a. Yes
 - b. No
16. What is the distance of your school from DIECPD/DIET?
17. How often does your school receive visits from DIECPD/SCERT staff?
- a. 1x/week
 - b. At least 1x/month
 - c. At least 1x/term
 - d. Rarely
 - e. None
18. How many times per year do teachers from your school receive professional development trainings?

- a. 0
- b. 1
- c. 2
- d. 3 or more

19. How would you rate your satisfaction with the support received by DIECPD/SCERT?

- a. Very satisfied
- b. Somewhat satisfied
- c. Somewhat dissatisfied
- d. Very dissatisfied

Digital Infrastructure

20. What kind of Internet facility is available in your school?

- a. Mobile network
- b. Wifi
- c. Broadband
- d. Dongle
- e. No Internet

21. Which of the following Internet connectivity scenarios best describes your school's situation?

- a. Our school has reliable Internet everyday, and numerous devices can connect at once without a problem.
- b. Our school has mostly reliable Internet. Only a couple or few devices can connect at a time.
- c. Our school has Internet, but there are regular outages, and/or only or two devices can connect at a time.
- d. Our school does NOT have Internet

22. How many of the below types of devices, in working condition, does your school have?

- a. Total number of Computers: _____
- b. Number of working Computers: _____
- c. Total number of Laptop computers: _____

- d. Number of working Laptop computers: ____
- e. Total number of tablets: ____
- f. Number of working tablets: ____
- g. Total number of projectors: ____
- h. Number of working projectors: ____
- i. Total number of TV/LED: ____
- j. Number of working TV/LED: ____
- k. Total number of Smart TV/Android TV: ____
- l. Number of working Smart TV/Android TV: ____

Teacher ICT Integration

23. Are there teachers at your school who use technology to **prepare** their lessons (i.e. research the topic online, finding resources to share in class, etc)?

- a. Yes
 - i. If so, how many? ____
 - ii. If so, how often?
 - 1. Everyday or almost everyday
 - 2. At least once per week
 - 3. Less than once per week
 - 4. Once per month or less
- b. No

24. Are there teachers at your school who use technology to **deliver** their lessons (i.e. using a projector to present slides, showing a video, etc)?

- a. Yes
 - i. If so, how many? ____
 - ii. If so, how often?
 - 1. Everyday or almost everyday
 - 2. At least once per week
 - 3. Less than once per week
 - 4. Once per month or less
 - iii. Please describe one example of how technology is used by teachers in your school.
- b. No

25. Out of following digital technology, which is mostly used for teaching learning process?

- a. Video
- b. Audio
- c. PPT
- d. Word Document
- e. Skype
- f. None of these
- g. Other (please specify)

26. Out of the working digital equipment in the school, which is ***easiest*** to use?

- a. Computer
- b. Laptop
- c. Smart phone
- d. Tablet
- e. LCD Projector
- f. Interactive Whiteboard
- g. TV/LED
- h. Smart TV
- i. TV with Android Stick
- j. None of these
- k. Other: _____

27. Out of the working digital equipment in the school, which is ***most used***?

- a. Computer
- b. Laptop
- c. Smart phone
- d. Tablet
- e. LCD Projector
- f. Interactive Whiteboard
- g. TV/LED
- h. Smart TV
- i. TV with Android Stick
- j. None of these
- k. Other: _____

28. How many tech savvy teachers are in your school?

29. How many teach savvy teacher trainings have been held for teachers at your school?

30. What was the focus of the training?

- a. Introduction of ICT
- b. Use of ICT in teaching learning process
- c. Use of ICT in evaluation
- d. Use of ICT in management
- e. Other

31. What teaching methods, in general (with or without ICT) are most commonly used in your school? Select the top 3 most used methods:

- a. Lecture method
- b. Discussion method
- c. Individual work
- d. Pair/group work
- e. Teacher demonstration method
- f. Student demonstration method
- g. Activity-based learning
- h. Constructivism
- i. Watch and Stop approach
- j. Other _____

Digital Content Availability

32. Check any of the below software/digital resources that your school uses on any of its devices. If you don't use digital content at your school, leave blank.

- a. Kompkin _____
- b. GuruG _____
- c. BSNL _____
- d. Nalanda _____
- e. DIKSHA _____
- f. e-Balbharati
- g. Khan Academy
- h. YouTube
- i. Microsoft teacher platform
- j. Self-made e-content
- k. DO NOT USE digital content
- l. Other _____

33. How satisfied are you with the availability of content for your subject?

- a. Very satisfied
- b. Somewhat satisfied
- c. Don't know/Not interested
- d. Somewhat dissatisfied
- e. Very dissatisfied

34. Do you have any expectations regarding e-content?

- a. Yes
 - i. If yes, what expectations do you have?
 - 1. E-content should be available as per grade/class
 - 2. E-content should be available as Board
 - 3. E-content should be available in various options
 - 4. E-content should be available in mother tongue
 - 5. E-content should be available as Board
 - 6. E-content should be available in English language
 - 7. E-content should be available in the form of worksheets, practice question paper, etc
 - 8. Other: _____
- b. No

35. What kind of additional content would be useful for your school (e.g. considering language, local relevance, etc)? (optional)

Digital Community Engagement

36. How would you describe your school's web presence? Check all that apply.

- a. We have our own website
- b. We have our own YouTube channel
- c. At least one of our teachers has a content/YouTube channel
- d. We have social media pages (Facebook, Twitter, etc)
- e. We access/use the default government provided website
- f. Our school has its own blog
- g. At least one of our teachers has their own blog(s)
- h. Other _____
- i. We are not present online

37. How does your school engage with parents in the community? Please rank those that apply, starting with 1 for most commonly used method.

- a. In-person meetings at the school ____
- b. Outreach to communities by school representatives ____
- c. Announcements/letters sent home ____
- d. Phone calls ____
- e. SMS
- f. WhatsApp messages/groups ____
- g. SMC
- h. Other: _____

38. Which of the following digital equipment did your school get from social contribution/CSR?

- a. Computer
- b. Laptop
- c. Smart phone
- d. Tablet
- e. LCD Projector
- f. Interactive Whiteboard
- g. TV/LED
- h. Smart TV
- i. TV with Android Stick
- j. None of these
- k. Other: _____

39. Please upload a photo of your school's ICT facilities/equipment