

# **Information and Communications Technology in the Education Sector in India**

ICT India Working Paper #3

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## EXECUTIVE SUMMARY

India has successfully achieved quantity benchmarks for education by making schooling accessible to all and making rapid strides in improving attendance. Next, India must improve the quality of its educational system, which is limited by large class sizes, limited teacher expertise, poor access to resources, and teacher absenteeism. ICT provides tools to address all these challenges. Historically, ICT has been used to improve educational coverage. Educational radio programs have been produced since 1972, and corporate initiatives have introduced computers to classrooms since the 1990s. Most radically, India even launched a satellite to broadcast educational content to remote schools off the grid. Yet the digital revolution provides the greatest opportunity for ICT to contribute to improved education and equality of opportunity across India.

ICT has been applied to improve education in several ways. Teachers can gain access to improved lesson plans and teaching resources that incorporate multimedia and best pedagogical practices. Similarly, these platforms are used to deliver interactive teacher training that uses data to analyze teachers' strengths and weaknesses. Data can also be used to break down and isolate challenges for students or entire classrooms. Finally, communication tools embedded in these platforms provide teachers, students and parents with a more collaborative classroom experience.

The MHRD's *DIKSHA* platform, powered by EkStep, is currently the most comprehensive and widespread societal platform in use. Integrating ICT into all aspects of education, *DIKSHA* incorporates quality user-developed content, student assessment tools, data collection and analysis, teacher professional development, and parent-teacher-student communication into a multilingual package now being implemented in several states. Additional general-purpose platforms include Karnataka's *Meghshala*, Gujarat's *Learning Delight*, and the Central Board for Secondary Education's *Saransh*. More specialized platforms also exist to fulfill specific needs, such as *StoryWeaver*, an initiative to develop mother tongue literacy material. EkStep and DIKSHA provide functionality to incorporate other platforms as specialized modules within their own system, a powerful integrative feature with the potential to consolidate the many different platforms in existence under one roof without sacrificing local adaptability or flexibility.

Education policymakers should continue encouraging the consolidation of redundant platforms. While teachers often use ICT resources such as Youtube in the classroom, these freelance solutions do not provide the opportunities for beneficial synergies inherent in a platform. Additionally, implementers and end-users of education platforms should be more fully trained in the capabilities of these tools, with continuing support provided to increase familiarity and comfort level. Significant infrastructure investment is required to provide electricity to many schools, let alone digital connectivity, and opportunities exist for involving India's major industries in content production. Finally, the definition of a digital school must be clarified to incentivize and prioritize investments in ICT integration.

## ICT IN THE EDUCATION SECTOR

### *Incorporating ICT Into Education*

#### *In India*

In building enough schools to educate its vast population, and building trust in these schools, India has won the first battle in improving the education level of the general population by ensuring adequate educational coverage. “The trust in the education system is high in the sense that everyone sends their children to school,” says Deepika Mogilishetty, chief of Policy and Partnerships at the EkStep Foundation. The next frontier, and the one where ICT has most directly been involved recently, is improving the quality of education. India has used ICT in the broadest definition of the term to enhance education quality since 1972, when educational radio broadcasts were produced as part of the central government’s five-year plan. Since 2000, these efforts have ranged from direct promotions of computer usage in rural classrooms to launching a satellite to broadcast quality content to marginalized schools.

#### COMPUTER AIDED EDUCATION

Sporadic initiatives aimed at promoting usage of digital technology in classrooms, both government-led and nonprofit, have existed since personal computers began appearing in Indian schools, and are the latest iteration of a series of educational technology promotion schemes dating back to 1972. MHRD’s flagship initiative for improving education quality at the secondary level, Rashtriya Madhyamik Shiksha Abhiyan (RMSA), itself features an ICT component centered around creating computer labs within schools and introducing computers directly to classrooms. In the research and nonprofit space, prominent Computer-Assisted Learning (CAL) projects in India include Pratham’s CAL program in Mumbai and Vadodara, a randomized trial from 2000 which found measurable improvements in math and language skills at primary schools which received computers and trainings on integrating them into education.<sup>1</sup> Another prominent initiative was Media Lab-Asia (ML-A), a 2002 partnership between MIT’s Poverty Action Lab and the central government which introduced a software platform to ten rural and ten urban locations in India. This CAL intervention found a significant impact on learning outcomes and computer literacy from Grade VII onwards.<sup>2</sup> Bearing the results of this research in mind, RMSA has increasingly encouraged the direct incorporation of ICT-based education in the classroom by placing computers in classrooms, rather than standalone labs where they can easily be ignored.<sup>3</sup>

#### CORPORATE SOCIAL RESPONSIBILITY

The Azim Premji Foundation, whose eponymous founder serves as the billionaire chairman of the Indian tech giant Wipro, is a philanthropic effort dating back to 2000 with the goal of delivering quality universal education to the country’s rural government-run elementary schools. In the Foundation’s early days, education initiatives were implemented in direct collaboration with state governments in the areas of assessment, curriculum reform, textbook development, teacher training and education administration. These programs included a substantial commitment to multilingual digital learning resources including books, electronic

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<sup>1</sup> <https://www.centreforpublicimpact.org/case-study/computer-assisted-learning-project-in-india/>

<sup>2</sup> <http://gyanshala.org/computers-aided-learning-cal-program/>

<sup>3</sup> <http://blogs.worldbank.org/edutech/computers-in-secondary-schools-whither-india>

databases, and software targeted to students in grades I-VIII.<sup>4</sup> Since 2010, the Azim Premji Foundation's focus has shifted to direct engagement with institutions in order to work with the state in a more systematic and sustainable fashion.

The HCL Foundation, Hindustan Computers Ltd.'s Corporate Social Responsibility arm, also leads philanthropic initiatives to deliver technology-powered education solutions to children and women in urban and rural areas. Under the broader HCL Samuday program, an initiative promoting sustainable development in rural India, HCL's three education initiatives, Gurukul, My School and My Scholar, reached 133,665 adults, youth and children in 2016-2017. Of these programs, Gurukul offers digital literacy courses for women and children through a community center outreach model and My School works directly on strengthening the quality of school programs, while My Scholar is a direct scholarship initiative for the children of HCL support staff under a certain income threshold.

In 1994, Shiv Nadar, the founder of HCL, launched his own foundation to promote transformational education across the socioeconomic divide. The Shiv Nadar Foundation (SNF) started by founding educational institutions focused on tech and other STEM applications, but followed this up in 2009 by introducing VidyaGyan, a leadership academy in Uttar Pradesh targeting underprivileged students from rural backgrounds. By 2012, SNF further extended its research through Shiksha, an initiative to deliver ICT-powered content to over 25,000 students at over 300 schools in rural Uttar Pradesh along with ICT trainings for over 600 teachers. Shiksha is designed with intent to scale up, incorporating interactive content, integrated student assessment, and comprehensive review of material. Shiksha introduced an adult literacy project in 2015 in 20 villages, and the whole project aims to cover 100,000 schools by 2023.

Another one of India's tech giants, Infosys, is associated with yet another philanthropic through Rohini Nilekani, the wife of the founder Nandan Nilekani who is himself the chairman of EkStep. Mrs. Nilekani is the former chair of the Akshara Foundation, a primary-level education initiative in Karnataka and Odisha which has reached 900,000 children since 2000. Akshara's Library Program incorporates ICT through educational software packages linking students to titles in the library. In addition, Akshara serves as the anchor of the Karnataka Learning Partnership, which allows communities, schools and nonprofits to share data, network, and discuss concrete means to improve the quality of education.

#### EDUSAT

EDUSAT represents an unorthodox, yet innovative way to distribute quality educational content to remote classrooms. Launched by ISRO in 2004, the "educational satellite" sits in geosynchronous orbit above India, serving as a hub for schools and content providers to exchange video education materials. EDUSAT is not merely a source of teaching material for instructors at remote schools off the grid. It is also capable of facilitating two-way interactivity between teachers and students, offering a real opportunity for distance learning for schools with the capacity to receive these transmissions and consistent enough electricity to use them in the classroom.

#### *Theoretical Benefits of ICT in Education*

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<sup>4</sup> <http://azimpremjifoundation.org/library/books#block-menu-menu-library-menu>

ICTs yield improved development outcomes in any sector, not just education, through two main pathways. First, ICTs reduce the financial costs associated with procuring and delivering information and materials. These technologies exponentially expand the markets producers and consumers of any type of content have access to at a cost of virtually zero. In doing so, ICT-enabled markets become far more competitive and less vulnerable to monopolistic capture. Increased competition leads to lower prices, while both consumers and producers of services gain additional benefits by accessing specialized services in markets that may not otherwise exist.

Second, ICTs vastly reduce the time costs associated with identifying and accessing quality resources and services. Communications technologies, particularly the internet, have made search processes far more efficient than prior means of exchanging information such as paper directories, physical advertisements or word of mouth. Additionally, not all ICTs are created equal when it comes to simplifying access to information. Calling a business may take less time than walking there and asking a question in person, but search engines make answering questions about services for multiple businesses an order of magnitude faster. Automated processes facilitated through AI can deliver information even more quickly and efficiently.

In summary, ICTs have a catalyzing effect on the markets that utilize them, lowering barriers to mutually beneficial transactions and exchanges. Within the education sector, the benefits of these reduced constraints are covered in the points below.

#### *Improved Teaching Resources*

Through ICT, teachers gain access to a broad network of teaching materials which cater to various types of learners, utilize multiple forms of media, and are often explicitly aligned with existing curricula. In contrast with non-digital resources, which teachers often find difficult to teach in a way that benefits all levels of students, ICT resources aid interactive and self-paced learning in a way that helps teachers move from instructors to active guides and facilitators. As digital resources have often either been explicitly vetted by a content review committee or implicitly by their popularity among other teachers, these materials often teach more effectively than those that non-digital classrooms have access to.<sup>5</sup>

#### *Scaffolded Training for Developing Educators*

In a similar fashion to how teachers use ICTs to improve the quality of classroom content, teacher training has come to rely on similar systems to provide teachers with the best pedagogical instruction. With pedagogy developing into an increasingly specialized art informed by fields as diverse as data science and psychology, new platforms help deliver the insights of theorists and teaching professionals to teachers, offering them a heretofore unprecedented opportunity to learn the best practices in their field from the start.<sup>6</sup> The particular strength of ICT in data collection supports straightforward tracking of and targeted feedback to teachers, while communication between student teachers and mentors is streamlined as well.

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[https://www.researchgate.net/publication/279640233\\_Role\\_of\\_ICT\\_in\\_the\\_Process\\_of\\_Teaching\\_and\\_Learning](https://www.researchgate.net/publication/279640233_Role_of_ICT_in_the_Process_of_Teaching_and_Learning)

<sup>6</sup> <https://pdfs.semanticscholar.org/54bb/3e86694e88abf91cb1486b7f67ee76b12d08.pdf>

### *Overcoming Geographical and Resource Constraints*

Distance learning is the most prominent example of how ICT can close the gap between students studying a specific field and the trained specialists and experts in that field with the knowledge to teach it. In the absence of these technologies, delivering specialized education to students in remote and poor areas would be expensive, difficult and time-consuming. This would become especially pronounced in secondary and tertiary settings, as subjects became more specialized and would outstrip the expertise of the local teachers that students would have access to.<sup>7</sup> Numerous successful distance learning initiatives have already emerged in India, particularly in secondary education, and other major platforms have partnered with large international distance education providers to deliver refined and tested educational content to students at minimal cost.

### *Data-Driven Improvement*

Prior to the advent of ICT resources for education, teachers had few metrics for systematically measuring the performance of students beyond examinations. Any more detailed examinations of student performance, especially at an individual level, rapidly scaled up in difficulty, and robust statistical analyses and comparisons of schools and methods was nearly impossible. Introducing ICT into classroom and school analytics has drastically simplified these tasks for two main reasons. First, the analysis of existing data has been made far less time-consuming through database and statistical software packages. Second, integrating ICT into classrooms allows far more data to be generated on student performance, providing deeper insights into the triumphs, challenges and key areas of improvement for students, teachers, schools and entire regions.<sup>8</sup>

### *Robust Learner Support*

Whether used for distance learning or within a classroom setting, ICT platforms can enhance the quantity and quality of communication between learner, teachers, parents, and the rest of the educational ecosystem. Where opportunities for discussion and clarification were formerly limited to in-person meetings, technology now facilitates interaction through a variety of different channels. Tools such as forums allow learners to ask targeted questions to a broader audience, prompting multipolar discussions of classroom topics rather than the binary interactions between teacher and student prevalent without such tools.<sup>9</sup> Communities around students can also use such tools to more easily understand the constraints and opportunities of the educational environment, allowing more actors to increase their involvement.

## **CAPABILITIES OF EXISTING PLATFORMS**

### *Comprehensive Platforms for Classroom Use*

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<sup>7</sup> [https://www.researchgate.net/publication/273898911\\_The\\_Role\\_Of\\_Ict\\_In\\_Open\\_And\\_Distance\\_Education](https://www.researchgate.net/publication/273898911_The_Role_Of_Ict_In_Open_And_Distance_Education)

<sup>8</sup> <https://www.brookings.edu/wp-content/uploads/2018/02/toward-data-driven-education-systems.pdf>

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[https://www.researchgate.net/publication/232607668\\_Does\\_ICT\\_Improve\\_Learning\\_and\\_Teaching\\_in\\_Schools](https://www.researchgate.net/publication/232607668_Does_ICT_Improve_Learning_and_Teaching_in_Schools)

The EkStep Foundation was only founded in 2015, but has quickly achieved a leading position in the space of ICT for education. EkStep supports ICT-enabled education at two levels. It directly functions as the foundation for numerous comprehensive platforms operated by state governments that provides crowd-sourced educational content to end users. For students, EkStep's app, Genie, provides gamified content that integrates guided practice and assessments into an engaging digital environment, while for teachers, the platform offers analytics for content creation, tutoring, assessment and reporting. Content creators are incentivized to apply innovative teaching methods such as concept maps, language models, games and stories in order to share their pedagogical knowledge and experience with other users. The decentralized nature of the system also allows EkStep to support content in multiple languages and adapted to the requirements of local curricula.<sup>10</sup>

EkStep also provides high levels of technological support to states working to develop their own ICT systems for education. EkStep's platform functions as the technological backbone for DIKSHA, and EkStep has provided technical support to Andhra Pradesh's e-knowledge exchange platform, APEKX. EkStep has also incubated Sunbird, an open-source repository for teaching and education management solutions.<sup>11</sup> Between the direct impact of its own platform and its collaboration in the development of other platforms, EkStep seeks to impact 200 million children in India by 2020 while engaging with and improving the agency of schools, governmental and non-governmental agencies, extracurricular programs, and parents at home.<sup>12 13</sup>

### DIKSHA (DIGITAL INFRASTRUCTURE FOR KNOWLEDGE SHARING)

DIKSHA is one of the most established ICT platforms for education in India. It was launched in September 2015 as a collaboration between the Ministry of Human Resource Development (MHRD), the National Council for Teacher Education (NCTE), and the EkStep Foundation as a state-level open and customizable digital education platform intended to host a comprehensive set of educational resources. Through consultations with state governments, NGOs, and more than 30 public and private organizations, DIKSHA has compiled a set of features intended to help teachers develop into more interactive and engaging educators. These are offered on a flexible platform currently supporting ten Indian languages that can cater to the varied educational needs of India's diverse population.<sup>14</sup>

DIKSHA's core objective is to host Open Educational Resources (OERs) for schoolteachers, teacher educators and student teachers. Resources such as lesson plans, concept videos, and worksheets mapped to local curricula are offered in conjunction with personalized professional development training and assessments to aid teachers in identifying their

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<sup>10</sup> <https://economictimes.indiatimes.com/small-biz/startups/nandan-rohini-nilekanis-world-of-good-how-they-are-working-on-community-minded-projects-like-ekstep/articleshow/48034515.cms>

<sup>11</sup> <https://economictimes.indiatimes.com/industry/services/education/is-india-on-its-way-to-fix-the-abysmal-state-of-its-schools-far-from-it/articleshow/61140853.cms>

<sup>12</sup> <http://www.heart-resources.org/wp-content/uploads/2016/04/Edtech-Case-Study-Ek-Step-FOR-WEB.pdf>

<sup>13</sup> <https://www.goodworklabs.com/bill-gates-appreciates-nandan-nilekanis-digital-project-ekstep/>

<sup>14</sup> <http://www.newindianexpress.com/cities/vijayawada/2017/oct/15/ap-e-knowledge-exchange-programme-integrated-with-diksha-1674456.html>

strengths and areas of improvement.<sup>15</sup> It also gives teachers the opportunity to contribute their own training content, classroom resources, and advice to a community that aims to reach five million teachers in India.<sup>16</sup>

In order to reach such a large community, DIKSHA is designed to accommodate existing constraints to ICT platform integration in education and highlight the advantages of bringing ICT into the classroom. Platform materials are made available both online and offline for smartphones, tablets and other devices, and are mapped both to local languages and local curricula. Teachers can conduct digital assessments of students on the platform, and are likewise encouraged to share best practices for explaining difficult concepts, enhance their professional development through a gamification approach, and compare their past and present teaching performance. DIKSHA's reach additionally makes it an excellent means of communication between teachers and institutions.<sup>1718</sup>

#### MEGHSHALA

Meghshala (“school on the cloud”) is a Bangalore-based private effort in partnership with Teach for India, Tata Trusts, and the Government of Karnataka working to transform the state’s education system. Designed around an offline mobile Android app, the platform targets learners and educators to support more interactive, engaging classrooms. For teachers, the app provides quality resources and designs lessons infused with relevant content and targeted to diverse skill levels. The app also engages students who are motivated to learn, with the end goal of building active learning spaces that prioritize critical thinking over memorization.

The Meghshala app includes over 2500 “teachkits,” multimedia modules aligned to the Karnataka state curriculum and prepared by master teachers. These lessons incorporate tested techniques that strive not just to teach a subject well, but to provide inexperienced teachers with in-context training in applying best pedagogic practices to everyday teaching. Since teachers and schools may lack the familiarity or infrastructure to implement ICT-based education in their own classrooms, teachers are provided trainings in the technology and then given computers and solar powered projectors to use the platform in their classrooms as intended. Meghshala ultimately aims to reach 100,000 teachers by 2020 through the cloud-based lessons on its app and additional support structures, and primarily targets government schools and low-income private schools in both urban and rural areas.<sup>19</sup>

#### SARANSH

Saransh is a web portal introduced in November 2015 by the Central Board for Secondary Education (CBSE) to promote ICT usage in schools. The platform incorporates six loosely connected tools, including self-review tools, a data-driven decision support system for parents, hosting for e-books and other educational materials, a framework for interaction between teachers and parents, data uploading and real-time generation of performance

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<sup>15</sup> <https://digitalequality.in/ictscool-the-missing->

<sup>16</sup> <https://digitalequality.in/increasing-teacher-agency-in-the-use-of-digital-technology-are-societal-platforms-a>

<sup>17</sup> <https://www.leadershipforequity.org/>

<sup>18</sup> <https://diksha.gov.in/rj/>

<sup>19</sup> <http://www.meghshala.com/>



statistics going back three years, and data visualizations to clearly present and explain these statistics. For CBSE affiliated schools, Saransh can help teachers and parents analyze student performance, monitor progress and identify any necessary remedial measures.<sup>20</sup>

#### LEARNING DELIGHT

Learning Delight is a digital tool that prioritizes student engagement in learning. Founded in 2016 and currently used in government schools in rural Gujarat, the platform uses nontraditional tools like animation, riddles and puzzles, the software seeks to stimulate students to become active participants in the learning process. Learning Delight is integrated with e-books that incorporate audio and video aligned to the state curriculum and in the regional language, making core subjects more engaging and accessible for students. LCD screens are installed in participating classrooms, and Learning Delight provides logistical and technical support to these schools so that these installations are maintained and the program is properly implemented. Teachers are also explicitly trained in Computer Aided Learning (CAL) to learn how to make the best use of ICT in education.

Learning Delight software is divided into separate sections for e-textbooks for standard 1-8, activities, games, language, value education, health, and student assessments. Each section incorporates interactive animations, simulations, and videos to encourage more experiential learning for students. While other comprehensive platforms are open source and incorporate user-created content, Learning Delight content is produced by the organization's own team. The organization provides additional teacher trainings on using the software, and conducts regular follow-ups for impact measurement and user feedback.<sup>21</sup>

#### CONNECTED LEARNING INITIATIVES (CLIX)

CLIX offers students chances for experiential learning in the high school classroom. Subject-specific modules for science, mathematics and communicative English are developed for the CLIX software by experts in each field in order to help students to connect their learning in the classroom to outside experiences. Having identified low levels of higher-order cognitive development and educational inequality within the country as significant barriers to India's future growth, the program seeks to improve knowledge and skills acquisition by involving students directly in the learning process. Founded in 2015 and piloted so far in Chhattisgarh, Mizoram, Rajasthan and Telangana, CLIX prioritizes high quality curricular resources, student learning outcomes, improved teacher knowledge and classroom practices, expanded ICT usage and hands-on activities in secondary schools, and sustainable growth of the initiative.<sup>22</sup>

#### *Distance Education Platforms*

##### SWAYAM (STUDY WEBS OF ACTIVE-LEARNING FOR YOUNG ASPIRING MINDS)

SWAYAM is an indigenous provider of Massive Online Open Courses (MOOCs) for Indian learners. Introduced by MHRD in July 2017 and developed in collaboration with Microsoft and the All India Council for Technical Education (AICTE), SWAYAM focuses on the

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<sup>20</sup> <https://saransh.digitallocker.gov.in/>

<sup>21</sup> <https://businesswireindia.com/news/fulldetails/learning-delight-takes-big-leap-forward-digitizing-rural-education-gujarat/53581>

<sup>22</sup> <https://clix.tiss.edu/>

secondary and higher education market to affordably provide students with skill sector courses and training in advanced subjects. Hosted courses are made available for classroom usage from 9<sup>th</sup> grade onward, and are available to access by any user at any time. The cloud-based platform currently supports enough bandwidth for one million simultaneous viewers, while the government plans to enroll a minimum of 10 million students within the first 2-3 years. 323 courses are currently offered, with certificates offered in collaboration with numerous major Indian universities.<sup>23 24</sup>

#### A-VIEW (AMRITA VIRTUAL INTERACTIVE E-LEARNING WORLD)

Amrita Virtual Interactive E-learning World is one of India's oldest education platforms, introduced in 2004 by the research institution Amrita Vishwa Vidhyapeetham with funding from MHRD as a distance education platform designed to provide members with a near-classroom experience under faculty from prestigious academic institutions. The platform uses ICT to work around the general lack of experienced and qualified teachers in higher educational institutions, and offers full free tuition programs to improve job prospects for college-aged students with limited resources. Beyond academia, A-VIEW also provides business development education for young startups.<sup>25</sup>

A-VIEW's online functionality currently includes Audio/Video communication modules, whiteboard collaboration, document sharing and group chat. Additional AI-enabled features such as face recognition and handwriting recognition are under active development. Also incorporating recorded classes and a voting-based question interface, the platform provides an effective solution for recreating a realistic classroom experience in the context of distance education.<sup>26</sup>

#### JUGNUU

Jugnuu is a private and proprietary mobile-based platform still in the pilot stages that seeks to provide English language learning resources to students in difficult to reach areas. The platform delivers English speaking, reading and listening content to students via phone calls and text messages in an effort to provide a personalized learning environment outside the classroom. Following a pretest during the summer holidays, students receive scheduled calls three times a week according to their availability featuring stories, grammar, critical thinking, comprehension and vocabulary questions calibrated to their skill level. Jugnuu's simple design allows it to be used by smartphone and feature phone users alike. By introducing a platform targeted to students' needs which minimizes technological barriers to ICT-enabled education, Jugnuu hopes to close learning gaps for students who could otherwise be left behind.<sup>27</sup>

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[https://www.researchgate.net/publication/323734079\\_A\\_SURVEY\\_REPORT\\_ON\\_AWARENESS\\_AMONG\\_LIS\\_PROFESSIONALSSTUDENTS\\_ABOUT\\_SWAYAM\\_A\\_GOVERNMENT\\_OF\\_INDIA\\_INITIATIVE\\_ON\\_E-LEARNING](https://www.researchgate.net/publication/323734079_A_SURVEY_REPORT_ON_AWARENESS_AMONG_LIS_PROFESSIONALSSTUDENTS_ABOUT_SWAYAM_A_GOVERNMENT_OF_INDIA_INITIATIVE_ON_E-LEARNING)

<sup>24</sup> <https://www.aicte-india.org/bureaus/swayam>

<sup>25</sup> <http://aview.in/htmldashboard/dashboard>

<sup>26</sup> <https://www.amrita.edu/research/project/amrita-virtual-interactive-e-learning-world-view>

<sup>27</sup> <https://morning-wave-86869.herokuapp.com/>

## MINDSPARK

Mindspark is a private, for-profit platform whose goal is to develop students' math and English skills through its proprietary adaptive learning program. Developed in 2009, Mindspark improves student competency in these two core subjects by identifying misunderstandings about basic concepts and common. The application uses more than two million data points from ten years of benchmarking tests to grade questions according to type, difficulty, and student need. Exercises are gamified through a time-based reward system which encourages engagement and computational fluency, and responses are evaluated by step to refine identification of student mistakes and areas for improvement. Most students use the software online, but it can also be used offline in case of internet connectivity issues. Mindspark is primarily for individual use, but has also been adopted by schools as an affordable and scalable method for instruction and review where teachers are either unavailable or inadequate.<sup>28</sup>

### *Specialized Platforms*

#### FIRKI

Firki is an open-source online teacher training platform developed by Teach for India and dating back to 2013. The platform focuses on basic teacher competencies and pedagogical tools in close alignment with the formal B.Ed. curriculum. Rather than a purely online approach, Firki relies on a blend between online resources, such as readings, videos and assessments, and in-person facilitation and peer learning. Firki therefore attempts to combine the best traits of remote and brick and mortar teacher training programs, concentrating quality standardized resources in one location while maintaining the flexibility of personal interaction with experienced instructors. Firki also encourages flexibility in training by dividing its content into modules for classroom instruction, leadership, school and community interaction, and the educational landscape, allowing teachers to access the content most closely aligned to their needs. Firki aims to train 50,000 teachers in India using the portal, directly impacting 196,500 children.<sup>29</sup>

#### E-PATHSHALA

Introduced by the MHRD in November 2015, ePathshala offers free and easy access to digital textbooks and learning resources in Hindi, English and Urdu. Teachers have access to instructional and curricular resources through the platform, including resources for teaching diverse groups of students. Parents can also access curricular documents and student resources to support learning outcomes and participate in their children's education. Resources are available both through a platform website and a mobile app. Eventually, MHRD plans to offer the platform in 22 Indian languages, involving 31 states and Union Territories in textbook and resources digitization.<sup>30</sup>

#### SHAALA SIDDHI

Shaala Siddhi, also known as the National Program on School Standards and Evaluation (NPSSE), is a comprehensive school evaluation web portal enabling schools to strategically

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<sup>28</sup> <https://mindspark.in/>

<sup>29</sup> <https://teachforall.org/news/scaling-high-quality-teacher-education>

<sup>30</sup> <http://www.ncert.nic.in/detailedepathshala.pdf>

examine and improve their performance. Developed and introduced in November 2015 by the National University of Educational Planning and Administration (NUEPA) under MHRD, the program targets 1.6 million schools across India for evaluation on a set of comprehensive metrics including enabling resources, teacher training, learning outcomes, teacher performance and professional development, school leadership and management, productive community participation, and inclusion, health and safety. Results are available to be seen by all participants for the purposes of creating a culture of collaborative feedback, and school evaluations can be consolidated at any level to provide input for policies and actions from the local to the national level. The platform therefore aids both the identification of school-specific needs and systematic gaps where policy intervention could improve school performance.<sup>31 32</sup>

#### STORYWEAVER

StoryWeaver has applied collaborative crowdsourcing to solve the problem of limited mother tongue literacy material since 2015. Recognizing that issues of affordability and access limit children's ability to benefit from reading resources in their native language, the platform connects readers, authors, illustrators and translators to create free stories for children around the world. StoryWeaver's digital library now has some 7800 stories in 111 languages categorized by reading ability and made easily available online and offline on multiple devices or in hard copy.<sup>33</sup>

#### CHALKLIT

ChalkLit works to build the capacity of teachers in low-cost private schools. Founded in 2016, the platform hosts educational resources aligned with public curriculum standards that are mainly designed to increase teachers' understanding of topics to the point that they can teach a subject successfully. Lessons on the platform are scaffolded using Open Educational Resources in order to both build student understanding of topics and train inexperienced teachers in how to develop their students as creative and comprehensive thinkers. Teachers are provided resources on lesson planning, conceptual and pedagogical techniques, and the latest innovative practices both by individual teachers and at the global scale. ChalkLit is available both on a website and its native mobile app, and has been made available to teachers across India.<sup>34 35</sup>

#### KARNATAKA LEARNING PARTNERSHIP

Since 2006, the Akshara Foundation's Karnataka Learning Partnership (KLP) has served as an open web platform for data-driven improvement of public primary education in the state. KLP generates, compiles, visualizes and shares data on government school infrastructure and learning outcomes, allowing nonprofits, corporations, academia, and advocates to become

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<sup>31</sup> <http://mhrd.gov.in/ICT-Initiatives-shaala-sidhdhi>

<sup>32</sup> <https://www.hindustantimes.com/mumbai-news/school-accreditation-18-225-schools-complete-process-maharashtra-tops-the-list/story-Lj2p7ZdB6izL2yp623VloL.html>

<sup>33</sup> [https://storyweaver.org.in/our\\_partners](https://storyweaver.org.in/our_partners)

<sup>34</sup> <http://www.heart-resources.org/wp-content/uploads/2018/04/A-scoping-study-transforming-education-through-technology.pdf>

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[http://delhi.gov.in/wps/wcm/connect/doiit\\_scert/Scert+Delhi/Home/In+Service+Education+and+Training/Online+Training/](http://delhi.gov.in/wps/wcm/connect/doiit_scert/Scert+Delhi/Home/In+Service+Education+and+Training/Online+Training/)

involved in the cause of improving public education. KLP not only uses technology to generate data to drive discussions, it uses its influence to create a common language by setting common agendas, creating shared measurement systems, and enhancing coordination between its partner institutions. By increasing accountability and transparency within public education, KLP sets the table for more informed policy research and analysis.<sup>36</sup>

#### EVIDYALOKA

The eVidyaloka platform offers a unique solution to improving lower secondary education in rural schools by crowdsourcing volunteer teachers and bringing them to remote classrooms via digital infrastructure. Participating schools set up a digital classroom including an LCD screen, a camera and a conference microphone, which are set up by community partners. Volunteer teachers use the local curriculum and language of instruction with a primary focus on mathematics, science and English.<sup>37</sup>

#### *International Platforms*

##### KHAN ACADEMY

Khan Academy has largely led the way in the global distance education movement with its mission to provide a free, world-class education to anyone, anywhere. The platform offers practice exercises and instructional videos on a broad range of topics, enabling performance monitoring by teachers and parents and personalized learning at a student's own pace. Since its founding in 2007, Khan Academy has made its platform available in more than 36 languages across the world, covering content from pre-primary to the university level.

##### COURSERA

Coursera has grown into one of the largest online distance learning companies since its founding in 2012, partnering with participating universities in a for-profit arrangement to bring top courses to a wider audience. Online students benefit from the same video lectures and reading materials as enrolled students, with additional interactive quizzes, peer support networks, and systems for communication between instructors and students. Available subjects are wide-ranging, from engineering and data science to humanities and social sciences.

##### EDX

EdX is a nonprofit alternative to Coursera dating back to 2012 and founded as a joint partnership between Harvard and MIT. MOOCs offered through edX are composed of short videos, interactive learning exercises, tutorials, online textbooks, and discussion forums for peer support and homework help. EdX uses experiential learning practices to teach concepts that would otherwise be difficult to teach on an online platform: for example, an edX circuits and electronics course incorporated an online laboratory to allow students to build virtual circuits.

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<sup>36</sup> <https://klp.org.in/>

<sup>37</sup> <https://www.evidyaloka.org/>

## SCALE AND EXTERNAL SUPPORT FOR EXISTING PLATFORMS

### *Comprehensive Platforms*

EkStep has taken the lead in cultivating a support ecosystem for its platforms within the realm of ICT-enabled education in India. As standard practice, the foundation invites collaboration from ground-level nonprofit partners with extensive local experience in education services. These partners are empowered to adapt the platform to their needs by introducing their own content, recording what data they find necessary, and implementing pedagogical lessons from their own knowledge and experience in their lesson design in alignment with state and national curricula. EkStep's 30 active partners currently operate in 18 states, and the platform is currently operational in English, Kannada, Hindi, Marathi and Telugu with more languages planned in the future.

EkStep and the many associated platforms running on its technological foundations have an even broader reach. The foundation has partnered with over 100 organizations domestically and internationally, from Premji Foundation and NGO Pratham to Google and Microsoft, for implementation and improvement of its platforms. DIKSHA, EkStep's flagship collaboration, demonstrates the benefits of this collaborative approach. DIKSHA partners with the government, public institutions like curriculum boards and state education bodies, and private organizations as part of its process to develop open-source content and resources for actors throughout the education system. This stakeholder driven approach has encouraged states to adopt DIKSHA at a deeper operational level. Tamil Nadu develops and uploads assessments on DIKSHA, and Andhra Pradesh has integrated its own e-knowledge exchange portal, APEKX, with DIKSHA. Rajasthan has adopted DIKSHA statewide as the Rajasthan Interface for School Educators (RISE). And the Maharashtra Academic Authority (MAA) is in the process of piloting an upgraded version of its Maharashtra In Service Teachers Resources (MITRA) App, powered by DIKSHA.

EkStep and DIKSHA appear set to maintain their momentum. Uttar Pradesh has expressed interest in adopting the system, and the Central Square Foundation (CSF) has collaborated with MHRD to implement DIKSHA as a major platform for teacher training and education. Outside its productive arrangements with content partners and implementation partners, DIKSHA is also positioned well with other partners such as CSR foundations, curriculum boards like the Central Board of Secondary Education (CBSE) and Indian Certificate of Secondary Education (ICSE), and major teacher training institutions.

Outside of the EkStep ecosystem, other comprehensive, classroom-targeted platforms have also gained footholds in the broader education ecosystem. Learning Delight, the Gujarat-based experiential learning software platform, has worked in close tandem with the state government, particularly the "Sarva Shiksha Abhiyaan" initiative to promote adoption of easily accessible and understandable technology in rural schools across Gujarat. Under the wing of this government partnership, the platform has expanded from five schools in 2011 to 10,000 rural government schools spread across 13 districts in the state, while transforming education delivery in these traditionally underserved areas. Meanwhile, CLIX, a similar software platform at the high school level, has built partnerships with the state governments of Chhattisgarh, Mizoram, Rajasthan, and Telangana, along with various universities, education research institutes, and content providers.

### *Specialized Platforms*

Unsurprisingly, the specialized platforms with the most established partnerships have been those focused on content and resource provision. E-Pathshala, the MHRD initiative providing free access to digital textbooks and teaching resources, has taken the pole position in this domain so far. The e-Pathshala app already has core teams in 31 states and Union Territories, and the interface is available in 22 Indian languages. The State Council of Educational Research and Training (SCERT), along with school boards and other institutions below the national level, now work directly with e-Pathshala to digitize existing textbooks and develop new e-resources for the app. Haryana has developed its own app, Meri ePustak, powered by ePathshala to distribute these textbooks, while other states have submitted and converted 150 textbooks so far. E-Pathshala is now in the process of working with other government organizations to train the stakeholders required to scale the platform up to the national level. Another initiative featuring successful partnerships has been StoryWeaver, whose partnerships with Cisco and Oracle have expanded STEM-related content while a separate partnership with Google has provided funds necessary for expansion. These collaborations helped StoryWeaver earn the Nasscom Social Innovation Forum's award for most innovative solution in education in 2017. Finally, ChalkLit's collaboration with SCERT in Haryana, Goa and Uttar Pradesh, and its technical collaboration with Million Spark Foundation, have boosted its efforts to create classroom content that doubles as instructional material for inexperienced teachers.

Outside of the realm of content creation, other specialized platforms have found success in building partnerships around data-driven school improvement and education policy research. Shaala Siddhi, the comprehensive school evaluation platform by MHRD, had undergone state and language-specific trials in hundreds of schools in Andaman and Nicobar Islands, Delhi, and Tamil Nadu, while Maharashtra and Madhya Pradesh and completed their adaptations of the platform. Shaala Siddhi has additionally been implemented in the Kendriya Vidyalaya and Navodaya Vidyalaya school systems, covering nearly 2000 schools. The Karnataka Learning Partnership has served as a successful analog of Shaala Siddhi in that state, driving collaborative partnerships and data-driven examination of learning outcomes and school success.

### *Distance Learning and International Platforms*

The most successful distance learning initiatives in terms of adoption, scale and partnerships have been major international players, namely Khan Academy. Having already developed new modules specifically targeted to Indian curriculum standards, Khan Academy has partnered with the government of Karnataka to recreate its content in the Kannada language for use in government schools across the state as part of the government's Technology Assisted Learning Program. Khan Academy has also partnered with the Kerala government, which has already distributed laptops, projectors and other ICT equipment to newly broadband-connected schools as part of the Kerala Infrastructure and Technology for Education (KITE) program, to develop e-learning content for the state.<sup>38</sup> To improve Khan

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<sup>38</sup> <https://www.thehindubusinessline.com/news/national/khan-academy-kerala-govt-ink-mou-for-e-learning/article25319405.ece>

Academy's content development for low-income urban secondary students, Tata Trusts has financed a five year partnership with Khan Academy, seeking to adapt its existing resources to the specific needs of these learners.<sup>39</sup> Khan Academy will develop new resources in Marathi, Tamil and Bengali as part of the partnership. Khan Academy India has received major financial backing from the venture philanthropy firm ChrysCapital.<sup>40</sup>

Domestic distance learning initiatives have experienced moderate success as well in their own specific niches, despite the dominance of Khan Academy. SWAYAM, the domestic MOOC provider, was developed in collaboration with the All India Council for Technical Education (AICTE) and Microsoft. The national-level initiative now partners with national and state-level universities and organizations as content providers. Meanwhile, one of the country's oldest platforms, A-VIEW, has partnered with the Maharashtra government to provide training to 35,000 teachers, including 10,000 at IIT Bombay. The platform is currently in use at over 3500 colleges and 450 universities across the country.

## **WHAT HAS WORKED: REPLICABILITY AND SCALABILITY**

### *Consolidation of Redundant Platforms*

India has experienced an upsurge both in the number of ICT tools and platforms available for education and in the number of tech-savvy teachers able and willing to use them. However, this rapid increase in resource availability has also resulted in resources being divided amongst many different platforms. The high number of platforms focused on narrow and specialized functionalities further discourages consolidation in the space. As the number of platforms dedicated to education increases, teachers are faced with a bewildering array of choices which have so far largely failed to reach the critical mass necessary to sustain organic usage and growth.

In response, these teachers increasingly turn to websites and platforms that do have synergies with their own daily lives and those of their students. For example, YouTube has become a major source of classroom content, and teachers often use WhatsApp to communicate directly with students' parents. This approach has the benefit of convenience, and can serve as an accessibly gateway for less savvy teachers to begin using ICT productively in the classroom. However, it inhibits deeper and more integrated use of ICT in education in the future by discouraging the synergies between different elements of ICT in education that would make a societal platform effective. A successful platform, for example, would serve as a one-stop shop for teachers to adapt and produce classroom content in the target language, receive pedagogical instruction designed around said content, and differentiate instruction based on data-driven analysis of student assessments, mutually dependent functionalities which third party platforms would not support.

At the same time, the wide range of available platforms serves as a cautionary tale. Many of these were conceived as an ultimate solution to the fragmentation evident in the education space, only to fall short during adoption and implementation. In this way, attempts to consolidate ICT usage around certain platforms has only added to the fragmentation discouraging scaling up. For this reason, the best approach to encouraging consolidation is

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<sup>39</sup> <https://www.livemint.com/Companies/mfqq1bHDBY2aIF8BFkCOyM/Tata-Trusts-enter-into-strategic-partnership-with-Khan-Acade.html>

<sup>40</sup> <https://www.deccanherald.com/content/634782/tie-up-education-ngos-welcome.html>



not introducing a new platform addressing all the shortcomings of existing platforms. Rather, the best existing societal platform should be aggressively promoted in combination with efforts to expand and improve the content available. Teachers will only adopt platforms hosting resources they find useful, and will only contribute content to platforms they are sufficiently comfortable with, but once this process starts, it should continue organically.

### *Training of Human Resources*

While teachers are increasingly tech-savvy users of ICT-based classroom content, they lack formal pedagogical training on integrating ICT into education, creating two major barriers to scaling up the delivery of quality education. First, teachers are not adequately versed in the benefits and opportunities of the technology to use it optimally. Formal training, ideally through the platforms hosting lesson content, would increase confidence and fluency in using ICT in a classroom setting for the ultimate benefit of students. Second, teachers lack the familiarity and comfort level with technology necessary to produce content for other teachers on an ICT platform. Since most platforms rely on user-generated content for scalability, this hampers their ability to reach a wider audience. Training teachers in producing content, coupled with successful examples of teacher-generated content for use on platforms, would support the goal of crowdsourcing quality educational resources from the most effective teachers.

### *Distribution of Physical Assets*

State governments may have the ambition to improve ICT integration in education, particularly at government schools, but school often lack the physical infrastructure to host digital technology in their classrooms. A 2015-16 report by the National University of Educational Planning and Administration found that only 62.81% of all schools in India had an electricity connection, the primary-only and upper primary-only schools trailing the pack at 52.40% and 49.86% respectively. A mere 19.45% of schools in the state of Jharkhand were electrified, followed by 25.55% in Assam, 28.54% in Meghalaya, and 28.80% in Madhya Pradesh.

Schools are even less likely to have access to technology to use – the same report found that a mere 27.31% of schools in India had a computer, including only 10.36% of primary-only and 19.78% of upper primary-only schools. Only 9.37% of schools in Bihar, 10.28% of schools in Jharkhand, 10.76% of schools in Assam, 12.67% of schools in West Bengal, and 12.70% of schools in Chhattisgarh had a computer. In Uttar Pradesh, India's biggest state, less than a quarter of secondary students studied at schools with a computer, the lowest reported rate nationwide.<sup>41</sup>

For schools that are connected to the grid and have access to technology, a chronic electricity shortage makes technology difficult to use. By 2021-22, India's power deficit is forecast to reach 5.6% according to a 2015 industry report by ASSOCHAM and PwC, making this constraint more severe.<sup>42</sup> Both the insufficient electrical infrastructure and the limited digital

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<sup>41</sup> <http://www.dise.in/downloads/publications/documents/u-dise-schooleducationinindia-2015-16.pdf>

<sup>42</sup> <https://www.pwc.in/assets/pdfs/publications/2015/changing-rules-of-indian-power-sector-empowering-the-economy.pdf>

infrastructure must be expanded for the rural schools standing to benefit the most from ICT-driven development to reap the rewards.

### *Public-Private Partnership Potential*

Many of the limitations in scalability so far derive from the difficulty inherent in encouraging users to generate their own content and upload it to platforms that do not yet host a strong user base. At the same time, what content is uploaded is likely to be closely aligned to the needs of state-level curricula. Whether or not these curricula train students for the needs of the future economy varies by state, but India's service sector and tech giants will need a larger and more highly trained workforce if they are to assume the role they envision for themselves in the global economy. Finding enough talented potential employees with the requisite skillsets will require a more thorough and society-level approach to recruitment, workforce development and employee selection. In an India powered by a digital economy, identifying promising students in STEM fields at the upper secondary and university levels will not suffice. All students must have a basic understanding of ICT and its role in the new economy in order to cultivate the broadest possible talent base for the next generation of researchers, engineers, and entrepreneurs.

Involving the private companies that will employ the generation of students currently being educated in the future solves both the problem of scalability and skill development for the new economy. These companies have a vested interest in providing content that will help students start to develop the skills that will make them more employable in the future. They also have more resources to create engaging content fulfilling both skill development and curricular needs than teachers do. At the least, inviting private companies to contribute materials to platforms gives teachers the discretion to choose whether or not to use their content. Even if this content is not used, it adds to the critical mass of material on these platforms that will encourage other users to make their own contributions. If teachers do determine that privately produced resources are engaging and helpful, then their students will benefit from a higher quality education that has also started building the skills necessary for their success in a radically different economy than the one they currently inhabit.

### **CONCLUDING REMARKS: DEFINING THE DIGITAL SCHOOL**

Never before has the overwhelming value that integrating technology into schools, and the urgent need to do so, been felt so acutely by actors in the Indian education system. Digitization yields high returns in areas from content sharing and delivery to academic tracking that are simply too large to ignore. Furthermore, with the future looking increasingly digital, schools can scarcely afford to mortgage their students' futures by refusing to let them participate in an ongoing information revolution that will transform the ways they work, earn money and live their lives.

It's understandable, then, that facing overwhelming pressure to integrate ICT into their curricula from parents, school boards and government bodies at all levels, many schools have begun asserting that they are, in fact, "digital schools." In practice, though, schools have bent the definition of this term beyond recognition to obscure the lack of progress they have made in incorporating ICT into education, frequently through no fault of their own. In Maharashtra, SCERT officials have defined a "digital school" as one with at least one mobile device and one magnifier *per school*, a threshold that, if followed, would produce negligible if any

impact on the quality of education provided at that school. As a stricter threshold would only lower the reported digitization rate of government schools, officials have little incentive to make this requirement more stringent. Yet stricter criteria for digitization is necessary to guide the investment of public resources into the infrastructure and skillsets necessary to provide students with an education for the 21<sup>st</sup> century.

A new framework for recognizing schools' digital status is key to revealing the types and magnitudes of investment necessary to make the transition to digitally enabled education as efficiently as possible. One possibility would be a rubric grading schools on their achievement in several critical areas of ICT integration. Such a rubric would require a large-scale data collection effort around the digital status of schools along the criteria of this new framework. Yet such an inquiry would be an important first step regardless toward improving the digital infrastructure of schools. Introducing a systematic method of digital school evaluation would not only yield key information for such investment, it could produce a motivating benchmark for schools and communities to aspire to in pursuit of improved education for their children.<sup>43</sup>

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<sup>43</sup> For an in-depth discussion on defining “digital schools,” please review the DIKSHA Needs Assessment Report.

## APPENDIX: OVERVIEW OF ICT IN INDIAN EDUCATION

Platform Name	Objective	Functionality	Reach and Impact
<b>EkStep</b>	The EkStep Foundation has recently taken a leadership role in developing technology platforms that incorporate the best features of local crowdsourcing efforts while partnering with government and institutional actors to encourage uptake and implementation. The foundation developed its own platform as a proof of concept before refining it into user-oriented platforms such as DIKSHA that could be advertised to state governments.	EkStep's basic functionality allows crowd-sourced curation of content by approved providers in multiple languages according to the needs of a local population. EkStep's platform also allows for the development of gamified apps which can be used to encourage a more engaging and in-depth learning process. Students can either interact directly with the platform, by taking assessments online, or indirectly through their teachers, who can upload paper-and-pencil assessment results to the platform.	EkStep aims to reach 200 million children in India by 2020 by engaging schools, government agencies, and NGOs. At this point, the platform is operational in five languages including English, Kannada, Hindi, Marathi, and Telugu, and more will be enabled in the future. 18 states are currently using EkStep technology through partnerships with various NGOs.
<b>DIKSHA (Digital Infrastructure for Knowledge Sharing)</b>	DIKSHA is the EkStep-supposed platform owned by India's Ministry of Human Resource Development. Using the same technology as EkStep's original platform, it aims to provide Open Educational Resources (OERs) to teachers, students, and parents. In addition, the platform applies the same networking tools to provide	DIKSHA's partnerships with the government, public institutions, nonprofit and for-profit organizations, and school personnel provides a wealth of resources for teachers to access. Among some of the materials teachers can use or upload themselves on the platform are in-class resources, teacher training content, and assessment aids.	DIKSHA makes itself available to any state government that expresses interest. State governments are then responsible for setting up their own content curation committees, handling data analysis and data-driven decision making through the platform, and implementing the platform at the school level.

	<p>teachers with access to improved training materials and a framework for student data analysis.</p>	<p>Online content is also linked to existing textbooks through QR codes to ease the transition to ICT-enabled education for teachers and students using the platform. DIKSHA's functionality is highly flexible according to the needs of individual states and the existing digital resources in use. The platform is able to soft-link to other platforms within its own framework, serving as an umbrella for bringing together existing ICT efforts and encouraging synergies between them.</p>	<p>Implementation strategies vary widely by state, making it more appropriate to view DIKSHA as a separate platform for each adopting state rather than a single, central platform. As EkStep takes a largely hands-off role in this implementation, DIKSHA's reach and impact will depend largely on these states' ability to implement the platform thoroughly and successfully, their ability to communicate and share best practices with each other, and the interest of states that have not yet adopted the platform.</p>
<b>E-Pathshala</b>	<p>E-Pathshala provides free digital access to books and learning resources for students, teachers and parents. The goal of this is to both remove barriers to access for these materials and to help teachers tailor their instruction to the diverse needs and skill levels of their students.</p>	<p>Students are provided digital textbooks, E-Resources, and access to exhibitions, festivals, contests and workshops through the platform. In addition to this, teachers can access lesson plans, curricular resources, and pedagogical resources such as journals and periodicals. Parents are also provided access to these materials in order to support their children's learning</p>	<p>E-Pathshala will soon be made available in the 22 Indian languages listed in Schedule VIII of the Indian Constitution. Core teams, responsible for disseminating and creating digital resources, are already active in 31 States and Union Territories. While some states, such as Haryana, have already developed mobile apps (Meri ePustak) to distribute digitized textbooks, other</p>

		experience in the classroom. All resources are available either through the platform website or on a mobile app.	states are currently in the process of digitization.
<b>SWAYAM (Study Webs of Active Learning for Young Aspiring Minds)</b>	SWAYAM, another MHRD initiative developed with the help of Microsoft, provides MOOC-based distance learning across India in order to provide high-quality higher education to all students at an affordable cost. The platform conducts examinations and awards certificates to participants, in addition to partnering with other higher education institutions to allow students to transfer their credits.	323 courses are currently offered on SWAYAM in areas covering all higher education subjects and skill sectors from 9 <sup>th</sup> class onwards. Adequate bandwidth is currently available on the platform to allow one million users to view resources concurrently. Courses are comprised of video lectures, supplemental reading material, self-assessments and an online discussion forum. Certificate courses up to the post-graduate level are available through some of India's top universities.	A national-level initiative founded in July 2017, SWAYAM aims to reach 10 million enrolled students within the initial 2-3 years.
<b>Shaala Siddhi</b>	Shaala Siddhi aims to improve schools through a comprehensive ICT-based evaluation framework. Standardized evaluations allow schools to strategically identify their strengths and weaknesses, and provide transparent evidence for large groups of	Shaala Siddhi is available on a web portal on which each school is identified according to its Unified District Information System (U-DISE) code. Seven key domains are evaluated, including school enabling resources, teaching learning and assessments, learning attainment,	The program intends to reach 1.6 million schools across all of India. So far, Tamil Nadu, Maharashtra and Madhya Pradesh have taken the lead in implementation through state-specific adaptation and translation. Trials of Shaala Siddhi have been completed in Andaman and

	stakeholders to act on for school improvement.	teacher performance management, school leadership and management, inclusion, health and safety, and productive community participation. Data from school evaluations is consolidated at cluster, block, district, state and national level to identify common needs across geographic areas and education levels.	Nicobar Islands, Delhi and Tamil Nadu, as well as the Kendriya Vidyalaya and Navodaya Vidyalaya systems.
<b>Saransh</b>	Saransh promotes ICT in schools by serving as a tool for students and parents to review and analyze their own performance. This evaluation framework is coupled with a platform for interaction between teachers and parents and an e-book database to help provide students with the tools needed to succeed.	Saransh is accessible through both a website and a mobile app. The platform is divided into sections for self-review, performance, decision-making, communications, data visualization, and data uploading.	The platform is currently available for students studying in class nine and above in all CBSE (Central Board of secondary Education)-affiliated schools.
<b>FIRKI</b>	FIRKI is Teach for India's online teacher training platform. It is intended to cultivate pedagogical skills and positive mindsets among incoming teachers through a hybrid approach blending online sharing of best practices and	Student teachers are guided through the platform by experienced facilitators who lead them through classroom approaches. Teachers can access courses according to their needs thanks to the platform's modular design,	FIRKI aims to reach 50,000 users directly through the teacher training platform, indirectly impacting 196,500 children.

	face-to-face peer facilitation. Courses focus on strengthening classroom competence, increasing student engagement and striving towards excellence.	which enables flexibility in course selection according to teacher needs. Coursework is minimized under FIRKI’s approach, which encourages practical application of course techniques.	
<b>A-VIEW (Amrita Virtual Interactive E-learning World)</b>	A-VIEW aims to provide a digital classroom experience for students in higher education across India. By doing so, it aims to increase access to qualified and experienced instructors, connect future professionals to vocational training institutes, and provide free tuition programs to college students.	A-VIEW uses audio/video, Whiteboard collaboration, document sharing and multi-display chat in its education modules. The platform runs on all major operating systems for computers and mobile devices, and is actively developing additional features such as facial recognition and handwriting recognition in partnership with the University of Buffalo.	A-VIEW has been deployed at over 3500 colleges and 400 universities across India. The platform has been used to train 10,000 teachers simultaneously at IIT Bombay, and the Maharashtra State Government has used it to train 35,000 school teachers simultaneously.
<b>Meghshala</b>	Meghshala, or “school on the cloud,” is a private effort to provide teachers with classroom resources, connect students to quality educational content, and revitalize the learning experience by teaching lessons steeped in relevant content and targeted to students at all skill levels.	The Meghshala app includes over 2500 “Techkits,” or multimedia lessons with a focus on contextualization of information. Lessons are prepared by “Master Teachers” who coordinate units with the required state curriculum. Teachers are provided computers and solar-powered projectors to display these lessons in	Meghshala aims to reach 100,000 teachers by 2020 both through its cloud-based lesson plans and other methods of support. The effort is limited to government and low income private schools in Karnataka in rural and urban areas. Currently, 40 schools are beneficiaries of the program.



		class, and receive trainings and ongoing support in using the technology. Lesson usage is tracked by teacher to understand what is effective and how to improve.	
<b>Jugnuu</b>	Jugnuu is a narrowly-targeted solution for teaching English speaking, reading and listening to students in marginal areas. The platform serves as a personalized learning space outside of school, bridging the gap between the classroom and home.	Jugnuu delivers audio and text content to students via phone calls and SMS, accessible on a basic feature phone. English level is assessed via a diagnostic test administered prior to summer holidays. Lessons on grammar, critical thinking, vocabulary and comprehension are then issued to students three times a week according to their skill level.	Jugnuu currently operates only as a pilot project in one state in partnership with a handful of schools and NGOs.
<b>Khan Academy</b>	With a stated mission of providing a free, world-class education to anyone, anywhere, Khan Academy has grown into one of the world's largest distance learning platforms since its founding in 2007.	Khan Academy provides highly personalized learning to students, as well as means for parents and teachers to monitor student progress. Content is currently available in 28 languages for all levels of education from pre-primary to the graduate level. The company recently partnered with the Karnataka government to make material for use in government schools available in Kannada as well.	Within India, Khan Academy is a leading independent digital resource in use in the classroom. Tata Trusts recently partnered with Khan Academy to expand its offerings to further suit the needs of Indian students by creating content targeted to the needs of low-income and urban middle school students in larger cities. This effort will eventually scale up available resources by offering them in

			more regional languages. Khan Academy has also partnered with the Kerala government to coordinate the delivery of ICT equipment and the training of teachers in using online resources under the state government's Technology Assisted Learning Programme.
<b>StoryWeaver</b>	StoryWeaver provides native language reading content for children whose mother tongues lack adequate literacy materials. This makes it easier for teachers, literacy organizations, and parents to find resources to boost their child's reading ability and capacity to benefit from their education.	The platform is available for free online, and stories are written and translated into target languages for free by contributors. All content can be accessed online or offline via computers or mobile devices.	StoryWeaver currently has 7800 stories available in 111 languages. The platform has built significant partnerships with Google, which has provided funding to provide more content, and Oracle, which has focused on providing STEM resources. StoryWeaver aims to reach 500,000 active users and 20,000 titles.
<b>ChalkLit</b>	ChalkLit builds capacity for teachers in low-cost private schools by providing them with online learning modules including lesson plans and multimedia. Modules are aligned with local curricula and accessible through a lightweight app to enable teachers in environments with limited connectivity	The platform is available on a website and mobile app, where it curates and develops its own resources organized by curricular topics. Resources available include lesson planning, pedagogical training, and updates on global practices and individual success stories. Individual modules use OERs as their primary	The State Council of Educational Research and Training (SCERT) in Delhi was the first to start working with ChalkLit, using the platform as part of its In-Service Teacher Training Program. Since then, SCERT Haryana, SCERT Goa and SCERT Uttar Pradesh have also adopted the platform for similar use.

	to succeed in their classrooms.	resources and emphasize the practical application of knowledge discussed.	
<b>Learning Delight</b>	Learning Delight works to support the digitization of rural schools in Gujarat by providing engaging online content to students. Animations, riddles and puzzles are used to stimulate critical thinking and curiosity among students.	Learning Delight works as a customized software suite featuring multimedia e-books in the regional language and aligned to the public curriculum. Students view the content on LCD screens installed directly in classrooms, while teachers receive technical and logistical support through a dedicated helpline and in-person logistical and technical assistance under the Computer Aided Learning Program.	The platform is exclusive to Gujarat, where it works in partnership with the Sarva Shiksha Abhiyaan charter to implement simple and accessible educational technology in rural schools. From five schools in 2011, the platform has now reached over 10,000 rural government schools across 13 districts in the state.
<b>MindSpark</b>	MindSpark is an adaptive learning platform focused on Math and English. Questions and activities are selected in a data-driven fashion on the basis of classroom studies to ensure that students build their understanding from basic concepts. Gamification is used to personally engage students and encourage them to push themselves while still learning at their own pace.	Common student misconceptions are identified through analysis of ASSET testing over the past ten years, a database with two million points. Questions are finely graded to ensure steady, even progression of difficulty and to help the software identify and isolate student misconceptions leading to mistakes. Interactive activities, a timing mechanism, and a reward system gamify participation to engage students further, and a	MindSpark, currently available for students in grades 1-10, claims to raise math scores of participants by an average of 20%. With this track record, the software has been made available in both private and government schools, with time explicitly set aside for it in some cases. Online and offline versions are currently available in Gujarati, Hindi and English, and a retail edition is available as well for

		layered review system requiring the application of multiple concepts helps with student retention.	independent learners.
<b>Karnataka Learning Partnership</b>	The Karnataka Learning Partnership (KLP) brings stakeholders including nonprofits, corporations, academic institutions, and citizens together to contribute to improving government schools in the state. An initiative of the Akshara Foundation, KLP helps groups engage in data-driven education advocacy through data compilation and visualization, while helping schools generate more accurate and standardized data on their school facilities and learning outcomes.	KLP shares datasets including school demographics, financial allocations, and school infrastructure with actors at all levels of government and outside advocacy groups, supporting data visualization to simplify the communication of results from these datasets.	KLP's database covers the entire state, with schools able to be disaggregated by the number in each electoral region, school category, local language, enrollment statistics, gender profiles, and more.
<b>CLIX (Connected Learning Initiatives)</b>	A Tata Trusts initiative in partnership with MIT, CLIX brings in experts in STEM and English to develop engaging and relevant subject-specific modules for classroom use. The platform aims to improve student learning and teacher classroom practice through higher quality IT-enabled	CLIX software targets the barriers the initiative views as the major barriers to better educational and employment opportunities for large segments of the population within India, and ultimately between India and other countries – language and skill-specific knowledge acquisition. The curriculum uses	CLIX is currently in partnership with the state governments of Chhattisgarh, Mizoram, Rajasthan, and Telangana. Other major partner institutions include the Centre for Education Research and Practice, Eklavya, Homi Bhabha Centre for Science Education, the Centre for Learning Resources,

	curricular resources and improved ICT usage, leading to sustainable growth for the initiative.	mother tongue learning to consolidate higher-order knowledge.	the National Institute of Advanced Studies, SCERT Telangana, Tata Class Edge, and the University of Mizoram.
<b>Coursera</b>	Coursera is another giant in the online learning space, bringing interactive university courses to students around the world.	The primary components of a Coursera course include video lectures, peer-reviewed and auto-graded assignments, and discussion forums, as well as an occasional final project. Courses on offer are highly specialized, particularly in subjects like engineering, humanities, medicine, biology, social sciences, and data science.	Coursera has partnered with the Indian School of Business to offer courses through the university on the website.
<b>EdX</b>	EdX, the nonprofit cousin of Coursera, brings interactive university courses online with direct support from teachers and faculty based at institutions. Founded by Harvard and MIT, EdX courses offer a supportive and comprehensive higher education experience.	EdX courses are divided by week, with each module including recorded lectures, interactive learning exercises and problem sets, an online textbook, and a discussion forum. Online laboratories are integrated into the course where applicable – in EdX’s first MOOC, an electrical engineering course, students designed circuits in an online lab.	As of 2016, India made up 11% of EdX’s global user base with 730,000 learners overall. In response to this, EdX has made a strategic commitment to build partnerships with Indian universities and other major institutions. IIM Bangalore has become one of the first major contributors to the platform, offering courses ranging from managerial economics to managing innovation.

<p><b>eVidyaloka</b></p>	<p>The eVidyaloka platform works to provide improved instruction to students in rural areas by crowdsourcing volunteer teachers and using IT infrastructure delivered to schools to connect them to students in remote classrooms.</p>	<p>Digital classrooms involve a 32” LCD screen, a camera facing the classroom, and a conference microphone. Remote teachers require a headset, webcam and broadband internet connection. Local NGO partners are responsible for classroom setup. Lessons are conducted in the local language of instruction according to the prescribed State Board syllabus, with a focus on Math, Science and English.</p>	<p>Digital classrooms available through eVidyaloka are currently operational for students between 5<sup>th</sup> and 8<sup>th</sup> grade situated in remote areas across various states in India.</p>
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