How can Smartphones Bring About a Developmental Breakthrough in School Education?

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Abstract

India being the second-highest producer of smartphones in the world, has been exploring ways to make the digital tool reach everyone. With the availability of a variety of low-cost smartphones and affordable internet data plans, the country has witnessed a substantial increase in the ownership of smartphones. This penetration has not been limited to the urban peripherals of the country but the rural areas as well. India's rural internet user base has grown over three times faster and is quickly catching up to surpass the urban user base. The opportunity must be utilized well by the government, as the growth and familiarity of rural India with smartphones make it an ideal platform to deliver information and services that encompass the ecosystem of the digital divide. Smartphones in the field of education have already been widely disseminated, with enormous potential for future growth. Low-cost smartphones with the features like high speed, affordable internet, pre-installed applications, and audio-assistant features, can prove revolutionary in the transformational journey. The digital tool is foreseen to bring the latest ed-tech advancements in the education sector, especially in rural India. Smartphones hold the potential to support the Anganwadi workers, teachers, and school nutrition program, by introducing new and effective ways of functioning. This will play a big role in supporting early education, primary & secondary education, and teachers' continuous development, especially at the grass-root level. This paper explores how smartphones have been and can further support the public school system in the country.

Introduction

Mobile technologies, in the form of smartphones, have changed lives fundamentally. The tool has been a synonym with new-age technologies and innovations. The increase in smartphone ownership has been crucial for enabling many people's first internet experiences and has offered a gateway to enter the digital economy and benefit from life-enhancing opportunities[1]. India is already the second-highest producer of smartphones in the world, and in recent years various companies have been exploring ways to get smartphones into the hands of ordinary people. The country with a vast potential pool of 550 million feature phone users, has the potential to make the switch to smartphones. The most significant development to prompt this transition will be the substantial reduction in the price of smartphones to make them accessible and affordable for new segments of the population. The fact that it doesn't require huge infrastructural needs, such as wireline connection, and a consistent source of electricity, will make it a widely used digital tool in the country.

Smartphones have been the brightest spot in the journey of the digital revolution of the Indian Education Sector. New generation smartphones combined with stable internet networks have played a big role in the conceptualization of the smart education system. A major catalyst in this journey of digital transformation has been the availability of affordable internet services. Approximately 97 percent of the internet users across India access the internet through mobile phones[2]. Among these active users, 40 percent users are based in rural India, so the penetration is not only limited to the urban areas. According to the ASER 2020 report[3], the ownership of smartphones in rural households across the country increased from 36.5% in 2018 to 61.8% in 2020. Interestingly, this increase in smartphone ownership is evident in children enrolled in government and private schools alike[4]. This provides an insight into the considerable reach of smartphones in a common household.

Low-cost smartphones with pre-installed applications are removing the existing barriers and are empowering citizens to connect to governments to access a wide range of information and services in several policy areas. Under the umbrella of the digital Initiative, various web/mobile-based ed-tech platforms have been launched and, smartphones have played a major role in delivering them. Amid the recent pandemic outbreak, smartphones became the most used device to continue the learning journey for children. It emerged as a multipurpose tool for the government to deliver educational services. By leveraging key features of an open ecosystem such as low development time, cost-effectiveness, and customization, many state governments have developed their apps for a range of services. This momentum has helped to increase efficiency, reduction in processing time, and most importantly access to the beneficiaries. Various applications and software, have made the process of generating and sharing knowledge easy and possible. Big tech giants like Google, Microsoft, and Apple are continuously developing applications that operate in a variety of languages and are creating paths for every citizen to be connected to the government. Integrating digital platforms through the smartphone in various aspects of the educational process will help in the coordinated functioning of the schools. It will be a powerful accelerator in every mechanism, teacher training, local curriculum, local-language instruction, monitoring and assessment of student performance, education-systems management, coaching and mentoring, and preparing students for a world in which technology is a necessity, for successfully navigating their future careers and lives and contributing to their national economies. This paper explores how smartphones have been and further support the public school system in the country.

[1] https://www.gsma.com/mobilefordevelopment/wp-content/uploads/2018/08/Accelerating-affordable-smartphone-ownership-in-emerging-markets-2017_we.pdf
[2] https://www.mmaglobal.com/documents/kantar-imrb-mma-smartphone-usage-and-behaviour-report-overview-india-2016-17
[3] http://www.asercentre.org/Keywords/p/371.html
[4] https://centralsquarefoundation.org/articles/navigating-education-in-2021-from-remote-learning-to-blended-learning.html

Smartphones for the Improved Access to Education

India has made noteworthy progress towards the goal of *Education for All* in recent years. The National Education Policy 2020 (NEP), emphasizes the importance of technology in aiding teachers, bridging the language barrier between teachers and students, creating digital libraries, as well as ensuring greater access to education. In the movement, smartphones have been a significant enabler, by transforming the content and modes of delivery and acquisition of learning. Any technology is successful if it can be accessed and leveraged by a majority of the beneficiaries in any nation. In India, this technology has been mobile phones. Digital platforms like DIKSHA[5], e-Pathsahala[6], NISHTHA[7], and other mobile-based applications, have paved the way for a huge number of teachers and students with the help of smartphones. Digital books and distance learning platforms have contributed to continuous learning opportunities for so many learners, especially with the transition of online learning during the pandemic.

Although, unequal access to educational resources is the major challenge in the journey of learning for children from marginalized communities and those with special needs. With the help of assistive technology, smartphones can ensure providing equal educational opportunities. Programs like distance learning allow students with special needs to continue learning in the comfort of their homes. Students with intellectual, hearing, or reading disabilities, impaired vision, dyslexia, or any other disabilities, can make effective use of audio applications on their smartphones to complete the educational courses. Smartphone-enabled students will be better equipped to study in the classrooms. This will create an environment of inclusive education and awareness among the other children in the classroom. New edge technologies available in smartphones have the potential to alleviate some of the barriers or constraints that prevent women and girls from accessing educational opportunities, such as illiteracy, poverty, time scarcity, sociocultural factors, mobility, and relevancy, leading to women empowerment and gender equality.

Smartphones for All

The increase in the availability the low-cost smartphones and affordable internet in recent years has pushed for various digital platforms to reach the rural parts of the country. India's rural internet user base has grown over three times faster and is quickly catching up to surpass the urban user base[8]. Mobile phone penetration extends to outreach and access to groups that are often difficult to reach and expands the government's accountability and transparency to a higher number of citizens. The development of mobile communication technologies has not only created a new venue for governments to reach out to a much greater number of people than ever, but it has also brought citizens previously unimaginable opportunities to communicate with each other conveniently and to access both public and private information and services, with diminishing time and space boundaries and limits[9]. It has been emerging as a multipurpose tool for the government to deliver digital services. Integration of features like high bandwidth, voice assistance, and affordable prices will no doubt serve as a bridge for digital services to reach the masses optimally. Smartphones with the following features can be proven revolutionary in the transformational journey.

[5] https://diksha.gov.in/
[6] https://epathshala.nic.in/
[7] https://itpd.ncert.gov.in//
[8] https://images.assettype.com/afaqs/2021-06/b9a3220f-ae2f-43db-a0b4-36a372b243c4/KANTAR_ICUBE_2020_Report_C1.pdf
[9] https://www.oecd.org/gov/digital-government/49300932.pdf

Low-Cost of the Smartphones

In recent times, there have been a variety of entry-level smartphones in the Indian market. Open operating systems such as Android are the key contributor to reducing smartphone prices and increasing functionality, including vernacular applications[10]. The Reliance JioPhone Next, at a retail price of just 6500 INR (86 USD), appears set to open up this market for the millions of predominantly rural users who have, until now, formed the main user base for feature phones. The smartphone is powered by an optimized version of the Android Operating System, which has been jointly developed by Jio and Google. The JioPhone Next manages to achieve a low price without compromising its specifications to such a degree that users would struggle to complete basic tasks – with a 1.3 GHz processor and 2GB of RAM, its performance is roughly on par with the iPhone 6. Other domestically produced smartphones, as well as foreign brands already in widespread use in India such as Xiaomi, Samsung, Vivo, Redmi, and OPPO, are likely to cross similar thresholds soon. Significantly such lower prices of smartphones will make it feasible to integrate technologies in the classrooms, without the presence of much of the hardware and software requirements.

High Speed, Affordable Internet

With the help of cheap internet data prices and 4G infrastructure, the way the internet is consumed in the country has been revolutionized. Access to the internet in rural areas has tripled since 2015 and is growing at a rate of 35% a year[11]. Internet plans at cheaper rates by telecommunication giants like Reliance, Airtel, and Vodafone are leading the way. Jio[12] launched in 2015, provides the cheapest 4G internet connection in the country, and made internet reach everyone. Over the past four years, Jio has gained almost 400 million subscribers and become the largest mobile network on the planet. Affordable internet has fundamentally transformed what internet access in India looks like for millions of people. For people living in rural areas, access to the internet also means access to better opportunities.

Pre-Installed Applications

Several latest applications and features in smartphones make them a better tool for service delivery than other digital tools, particularly in environments that would be challenging to reach. Digital illiteracy can pose a big challenge in this journey. Smartphones with pre-installed applications will reduce the barriers. It will avoid the hassle of setting up and learning the process of installing the apps. This will make the process convenient for first-time users. With the help of these apps, users can take the advantage of the digital platforms and resources launched by the government. Inbuilt applications of translation for the users will also add seamless language functionality to the phone users.

Audio-Assistant Features

Features like voice assistant, audio search, and real-time translations, allow the users to access resources in their native languages easily. Students could be the biggest beneficiary of these features. As recommended in the new National Education Policy[13], young children learn best in their mother tongue and ensure faster learning and retention. Audio applications in the phones will cater to the

[10] https://icea.org.in/wp-content/uploads/2020/07/Contribution-of-Smartphones-to-Digital-Governance-in-India-09072020.pdf
[11] https://economictimes.indiatimes.com/tech/internet/internet-users-in-india-to-reach-627-million-in-2019-report/articleshow/68288868.cms
[12] https://www.jio.com/selfcare/plans/mobility/prepaid-plans-list/?category=Popular%20Plans&categoryId=UG9wdWxhciBQbGFucw==
[13] https://www.education.gov.in/sites/upload_files/mhrd/files/NEP_Final_English.pdf

unique demand of the people comfortable with their native language. Regional content, voice, and rural advertising, automatic read aloud off-screen text, language translation, augmented reality filters, and much more, will expand the possibilities in the education sector. It will be a great medium and language-neutral will reach a greater number of learners as compared to video content considering the quality bandwidth. Finally, smartphones offer unique technological capabilities which can improve users' ability to interface with these services.

Instalment Schemes

A large number of users, especially from lower-income backgrounds might struggle to purchase smartphones through upfront payments. However, many might see value in getting the phone in easy monthly instalments. Various schemes for providing smartphones at affordable EMIs (equated monthly instalments) and at affordable loans will help smartphones to reach a larger audience. Underlying issues like digital literacy and gender imparity can be addressed well with the availability of smartphones. Affordability of the smartphones will be a game-changer in bridging the digital gap, especially for users from the rural community.

Smartphones for Anganwadi Workers

The Indian Government's main delivery platform for preschool education is the Integrated Child Development Services (ICDS), a centrally sponsored and state-administered early childhood development program, with preschool education as one of the six basic services provided through 1.37 million Anganwadi centers (AWCs). AWCs are expected to provide preschool education through low-cost, locally sourced material that caters to the sociocultural context of mothers, and children below six years. Thus, Anganwadi workers (AWWs) become the most important functionary of ICDS services. They are the focal point for the implementation of all the health, nutrition, and early childhood education-related initiatives. They play a big role in imparting early childhood care, pre-school education, and nutritional support at the grass-root level. In recent years, under the POSHAN Abhiyan, AWWs have been technologically empowered with the provisions of smartphones for efficient service delivery. The smartphones have the application of the Poshan Abhiyan, which digitizes and automates the physical registration process used by the AWWs. This has proved to be time-saving and improves the quality of their work. The workers have been using smartphones to track the distribution of the take-home ration and chart the growth of the child automatically on a graph based on the weight and height of the child. Anganwadi workers can also use smartphones to perform other sets of activities like preparing their job charts, surveying houses in their neighborhood, marking the attendance of the children, and sharing the picture of the hot cooked meals being served at the center.

Smartphones for the Anganwadi workers will support them further in the process of collecting and documenting the data. These smartphones if catered to the needs of the AWWs will improve their quality of work, allowing them real-time monitoring, and equip them with better decision-making resources. Pre-installed training modules in their native languages will strengthen their knowledge and skills about health and nutrition. These phones can provide a repository of resources on videos, and recipes about the hot cooked nutritious meal for pregnant women, lactating mothers, and children below 6 years, which could be shared further with the beneficiaries. Technology integrated well with the context of their regional areas will help them to build trust within their community. Anganwadi workers empowered with smartphones will take the country forward in the journey of quality health, nutrition, and early education for young children. Smartphones can further support the AWWs with the following responsibilities.

Strengthening Early Childhood Education

Early childhood education (ECE) provides a solid foundation for future learning for all students, making every stage of education that follows more efficient and productive. But the evidence drawn from the recent studies done in the country indicates that neither AWCs nor private schools in India can provide holistic development for young children. An impact study[14] on early childhood by ASER Centre found that children who regularly participate in a preschool program perform better than children who do not. But at the same time, preschool education (AWCs or private preschools) is not developmentally appropriate for the children. The report indicates that while 91% of four-year-olds are enrolled in some form of pre-primary education, a much smaller proportion exhibit age-appropriate foundational skills to be able to engage effectively with schooling. One of the major causes of such a learning crisis also lies in the fact that AWWs are under resourced and overburdened, with multiple roles and responsibilities, and limited availability of ECE resources. The NEP 2020[15], also states, that for the delivery of early or pre-school education by the AWWs, it is important to upskill their curriculum and training so that they can connect to the community and children in a better way.

The introduction of smartphones for AWWs will help them to equip with the right resources and reduce their workload. Digitization of the routine tasks or activities like conducting surveys or data entry will be quicker, providing them more time to focus on ECE activities. The availability of a meaningful, age-appropriate curriculum, aligned with the national framework, will provide the resources for AWWs to select the appropriate activities to suit their context. Play-based activities in the form of the audio-video format will be easier for AWWs to demonstrate. Delivery of specially curated resources for different learning styles of the children will provide the children the right environment to learn, This will help in the delivery of meaningful activities, that recognize the ground realities with autonomy to reflect the local context and setting. Smartphones will also be an ideal tool for the AWWs to be in touch with their parents. Tech solutions like IVR, YouTube, and WhatsApp are great for maximizing the outreach of distribution of learning content and helping parents to get more comfortable with tech-based learning platforms. This will enable creating a learning environment at home as well. The recent initiative of empowering AWWs with smartphones has been a welcomed step toward the digital journey. This can now build on this to provide an age-appropriate curriculum and learning environment for the children. Smartphones supporting early childhood education through AWCs can be an ideal launchpad for children entering primary schools.

Real-Time Data Monitoring

The ICDS – Common Application Software (CAS) is one of the main components of POSHAN Abhiyaan. Under the Abhiyaan, Anganwadi Workers have been equipped with Smartphones pre-installed with the software. The software application facilitates the collection of the data by the frontline functionaries and a six-tier dashboard ensures the monitoring and intervention mechanism. It has been enabling the monitoring of children with the help of auto plotting of growth charts on the application. The application then generates the task list and home visit scheduler for enabling AWW to focus on the beneficiaries based on priority. The data collected at the regular interval will provide a trend of the situation, based on real-time tracking and monitoring. The system can also generate and shares SMS alerts for timely actions by the stakeholders and the beneficiaries. Empowering more and more Anganwadi workers in the country with smartphones will reduce their tedious workload of data entry and they can focus more on their training and counseling.

[14] http://www.asercentre.org/Keywords/p/306.html
[15] https://www.education.gov.in/sites/upload_files/mhrd/files/NEP_Final_English_0.pdf

Addressing Malnutrition and Women's Health

Anganwadi workers are responsible for monitoring the child's growth, teaching them numbers and the alphabet, supervising hot lunches for the 3-6-year-olds, and distributing rice, pulses, and jaggery for the pregnant mothers and the younger children to take home. They also challenge the age-old practices of feeding and caring for young children, in the community. Smartphones have been helping them to prioritize what they need to do and review the work they have done and take action where necessary. The Anganwadi centers provide various recipes for an age-appropriate hot-cooked meal for pregnant women, lactating mothers, and children below 6 years. Smartphones can be used to share these resources with the beneficiaries, along with the recipes, and videos can also be shared. Low-cost mobile-enabled applications like SMS, voice message, and Interactive Voice Response system (IVR) can be used to be continuously in touch with pregnant women. Communication can be used them getting access to free government health facilities. Women can also use the dedicated helplines and report pregnancy-related issues in their preferred language. This would allow the AWWs workers to be well informed about the beneficiaries and support them better with their health check-ups and nutrition.

Continuous Training

AWWs being the lifeline of community outreach and upliftment in the rural areas, need constant upscaling of their skills and knowledge. Continuous training can be provided with the help of the smartphone. These trainings can be designed to allow first-time users to learn and assimilate at an easy pace. The availability of an in-built manual for using the ICDS-CAS software in the phones will make them more comfortable with the software. Smartphones will serve as a smooth channel to communicate with the training team for doubts and queries. To be able to use mobile phones will generate a sense of empowerment for many workers, and they will be able to mobilize the community better.

School Nutrition Programs

Education and adequate nutrition are both very critical for the development of children and their future livelihood. Programs based on knowledge and awareness about nutrition are helpful to prevent hunger, increasing school enrolment, and improve learning outcomes. The Health and nutrition levels of the students can be monitored regularly and stored on smartphones using the applications. This data then can be used to plan a dedicated school nutrition program for a school depending on the need of the school. Smartphones hold the potential to make such programs reach every school in the country. The program and the resources can be broken down into smaller formats, to make them easily accessible to the beneficiaries. Promotion of healthy eating practices, infant and young feeding practices, and hygiene through videos will make it more informative and interesting. These resources and learnings can be best shared among the schools using the dedicated digital platforms.

Schools and Kitchen Garden

Having kitchen gardens in schools and Anganwadi centers has been contributing to reducing malnutrition among children and mothers. Teachers and children being involved in the process of growing their food, help them to reconnect with nature and make them aware of the true source of their food. The MHRD has issued guidelines to all schools in the country for setting up, kitchen Gardens. The goal is to teach all students in India that growing food is independent and possible even in an urban setting. The program is run in collaboration with "*Krishi Vigyan Kendras*". These centers partner with the Department of Agriculture, Food and Nutrition Boards, agriculture universities, and the Forest Department to supply

schools with seeds, saplings, and manure, as well as training and technical assistance to create School Nutrition Gardens. This will demand a smooth channel of communication among various departments and the documentation process. Smartphones can ease the process with specially designed digital platforms to share all this knowledge and track the mechanism. Fruits and vegetables grown in the kitchen gardens can be encouraged to be used in the preparation of the Mid-Day-Meal. Cooks in the school can be shared with videos of interesting and innovative recipes for tasty and healthy dishes.

Capacity Building of the Teachers

The majority of the teachers in India have been experimenting with utilizing technology in their classrooms. This has carved a path for promoting teacher training programs through various digital platforms. National Digital initiatives like NISHTHA, and others, are providing the training modules to the teacher located remotely. The process of the ICT training helps teachers to understand both its benefits and limitations as well, giving them space to explore more ways of innovative teaching and exploring new educational avenues. In the recent pandemic times, the online mode of training has been proved as a time and resource saver way of training the teachers. Affordable smartphones for embedding teacher training to the teachers in remote areas fit well in the digital momentum. It will help teachers to acquire the necessary digital skills for their personal and professional lives and for participating in the digital movement.

National digital platforms like e-pathshala, DIKSHA, NISHTHA, and the National Teacher Platform (NTP) have become rapidly popular among teachers. These platforms provide extensive teacher training modules to enable and equip the teachers with quality resources and overcome their technological challenges. Continuous Professional Development enables the teachers to stay updated on new methods of teaching, skill development, and techniques to map students learning and academic progress. Smartphones have played a huge role in delivering this training to teachers across India. The device has become the most convenient tool to be used the teachers. Various studies have shown that teachers prefer smartphones to create and deliver lessons. They are using the device for upgrading their teaching and assessment methods, enabling them to explore more advanced and updated techniques. The process of the whole ICT training helps teachers to understand both its benefits and limitations as well, giving them space to explore more ways of innovative teaching and exploring new educational avenues. In one of the surveys by the CSF[16], the trend shows that trained teachers have more willingness to use technology in their classrooms. This, helps them create a positive learning environment that enables the teachers to encourage the students further towards productive tech-led learning.

Smartphones cater to the different learning styles of learners and allow individuals to learn at their own pace. The process of training can be made more impactful by, customizing the teacher training modules for mobile usage. Training modules should be designed in a way to complements the smartphone's interface. Breaking down the training modules into smaller forms will enable teachers to pick up easily digestible learning tasks. Usage of more audio and video prompts in the modules as compared to the text, considering the small screen size of the phone, will be more user-friendly. This will make the content easier to register and remember. Phones with inbuilt options to translate the content into a preferred language can be a welcoming move for a large number of teachers. This will provide good quality content in different languages. Options like offline downloading will help the teachers to access the resources based on their needs, also in the areas with limited internet bandwidth. This will require the smartphones to have enough space to save all the data. These features will contribute to making teachers, especially in rural areas, more comfortable with the tool.

[16] https://www.centralsquarefoundation.org/70-percent-tech-savvy-teachers-use-mobile-phones-and-internet-in-their-profession/

Promoting Holistic Education

In recent times, the educational communities in India recognize the importance of Social-emotional Learning (SEL) as a holistic approach to educational learning. While SEL can be addressed in the home and community, the spotlight has recently shifted to the role of schools in the promotion of SEL[17]. The National Education Policy (NEP) 2020 brought a much-needed focus on whole child development, both in terms of curriculum and assessment. It emphasizes the importance of "developing good human beings capable of rational thought and action, possessing compassion and empathy", through education. Being a still-emerging field, it is challenging for the administrators and teachers to fully understand the range of SEL competencies, much less how to promote them. This is where technology helps in promoting SEL at scale. Digital tools, like smartphones, can be a powerful supplement to existing SEL instruction, but also helps in addressing the barriers schools might encounter when balancing academic instructions with SEL. Recently various initiatives have been taken by the central and the state government in the direction of promoting emotional well-being. Amid the pandemic, the state education team promptly leveraged digital platforms like DIKSHA, Zoom, and Google classrooms to reach out to the students remotely. Resources were shared in the form of audio and video format, which were mostly consumed with the help of smartphones. Technology is seen as a potential for parents, educators, or caregivers to complement and extend such learning experiences.

Social-Emotional Awareness Programs

Schools are the place where students are initially exposed to people who hail from a range of different backgrounds, hold different beliefs, and have unique capabilities. To account for these differences and help put all students on an equal footing to succeed, SEL programs aim to help students and adults. It helps them to better understand their thoughts and emotions, become more self-aware, and develop more empathy for others within their community and the world around them. Technology holds enormous promise to foster these social and emotional skills. Tools like smartphones can personalize learning, engage the disengaged, complement classroom learning and extend classroom learning to the outside world. SEL-based programs aim to benefit the school system to help the students take their learnings beyond their classrooms. One such program "*Happiness Curriculum*", was launched by the Delhi state to help students and teachers to practice emotion regulation, relationship building, and action orientation. The curriculum focus is on building awareness, self-awareness, and reflective practices among the students. Skills that build the core nature of any individual. And these skills must reach every child, especially in the formative years, without any geographical or economic barriers. Smartphones can help in overcoming these barriers. Features of translating the content into different languages will make this learning reach teachers and students of the remotest corners of the country. Training by well-qualified SEL trainers can be conducted for the teachers and the students virtually. This will ensure that the right kind of knowledge and skills are being shared. Smartphones can play a pivotal role in fostering SEL efficiently and cost-effectively.

Introduction of Yoga and Meditation Practices

Studies have shown that mindfulness and yoga-based skills, conscious breathwork, and body awareness improve academic performance and emotional regulation.[18] Mindful practices from an early stage in school can be the building blocks for a healthy life. Yoga encourages individuals to endure, be patient, and strive towards their goals, which boosts their self-esteem and confidence. Yoga also teaches compassion, awareness, generosity, attention, strength, and flexibility, among other virtues. With the help of smartphones, the right knowledge and skills can be shared with the students. Phones can have built applications for age-appropriate resources on yoga and meditation practices.

[17] https://medium.com/inspired-ideas-prek-12/fostering-social-emotional-learning-through-technology-8da6974e54bb
[18] https://www.sonima.com/meditation/mindful-living/wellness-in-the-schools/

These resources can have videos by trusted yoga and meditation experts, to avoid any scope for misinformation. Smartphones can also have built monitoring applications to track the insights on individuals' mindfulness journey.

Increased Community Participation

Parent involvement in early childhood education can enrich the experience of a child in all aspects – social, emotional, and, mental. A quality family-school partnership and school-community, all can play a significant role in the smooth coordination among all the stakeholders. A blend of digital and in-person strategies can play a huge role in making parents participate in school activities. Low-cost smartphones can be the bridge between the schools and the parents, providing them to participate in their children's school journey. Literacy levels of the parents could be a potential hindrance in this process, especially for parents in rural areas where the majority of the parents have not received education themselves. Features like voice assistance, translator, or audio messages could be used well to overcome these challenges. Parents can receive updates, not just about their children's academic status but also the important school activities. Phones can be a great source of involving and mobilizing the School Management Committee (SMC) members. Regular meeting and open communication channel is the main component of the functioning of the SMC, and smartphones can be a great push in that direction. This way, students, school administrators, and parents all benefit greatly from the impact of the smartphone revolution.

Smartphones for Data Management

The growth in the availability of mobile phones even in the remotest communities has led to the exploration of the role of smartphones in data management for the education sector. Schools contain so much data in various domains. If studied well, this data can be crucial for better decisions making process in educational institutions, ranging from the classroom, state, and national levels. Smartphones could be the most convenient way to collect large-scale data, they could be the primary source for the collection, storing, and analysis of the data. Depending on the functionality of the phone used, textual data captured via mobile phone can be combined with data in other formats such as photographic images, audio, and video as a way to substantiate the information provided by a text. In addition, features like GPS or geolocation data can be passively collected and transmitted along with the data. Data in smartphones can be captured in many ways, including SMS, MMS, USSD, Bluetooth, wireless internet, etc. This reduces the limitation of the internet connectivity as well, as data can be stored on the phone and transmitted later once the phone is within a sufficient range.

Taking an innovative approach to improving the learning outcomes and the public education system is the need of the hour. Technology can play a very crucial role in the form of a swift and scalable solution for the government to improve the learning outcomes at scale. Teachers can track the attendance and performance of their students, and the data can be stored and tracked using mobile-friendly applications. The visibility of the data will also help teachers to plan better and according to the shown trends. This might need some additional training of the teachers and the admin staff of the schools to use these applications or software. But this will help the system make evidence-based policy decisions to improve learning through effective collation and interpretation of data, enabled by technology[19].

[19] https://development.asia/insight/keeping-track-school-performance-through-mobile-technology

Smartphones for Sustainable Development Goals

Sustainable Development Goal 4 is the education goal, it aims to "ensure inclusive and equitable quality education and promote lifelong learning opportunities for all.[20] The goal takes into account the specialized learning needs of vulnerable people, including women and girls, children of migrant workers, refugees, children with disabilities, and minorities. SDG 4 seeks to ensure inclusive and equitable quality education and to promote lifelong learning opportunities for all. Mobile technology contributes to SDG 4 by allowing teachers, and students to teachers, learn from any location and on the move. With the help of smartphones, learning opportunities are no longer limited to a traditional classroom, it has reached the hands of the people. Smartphones have made it possible to avail unlimited knowledge and resources about anything and everything possible. It has become an efficient tool for distance learning opportunities and learners can learn at any stage of a student's learning life cycle and upgrade their skill sets.

Under the *Digital India* initiative, there have been various digital platforms being launched, to make educational resources reach everyone. Mobile education has proved to be effective in addressing basic literacy and numeracy skills, as well as higher education and vocational training. With the help of various digital platforms, young people can access various scholarships and university sponsorship to reach their full potential. It improves their employability chances and further advances their socioeconomic levels. Platforms like DIKSHA[21] and NISHTHA[22] are dedicated platforms to provide resources for teachers and students. SWAYAM-like platforms provide resources for higher education. Various studies and data have shown that own low-tech Ed Tech solutions like messaging apps or phone calls have been the most accessible in rural India. ASER 2020[23] report finds WhatsApp to be the most common medium through which learning resources are being shared. This data validates the comfort level of the users across regions for the phones. The increased affordability and proliferation of smartphones coupled with cheaper data prices, the development of crucial applications, etc would provide a significant platform for the government to provide crucial educational services. Smartphones with in-built applications based on priority needs could bring the primary education sector to par with the latest ed-tech advancements, especially in rural India.

[20] https://sdg4education2030.org/the-goal
[21] https://diksha.gov.in/
[22] https://www.india.gov.in/spotlight/nishtha
[23] https://img.asercentre.org/docs/ASER%202021/ASER%202020%20wave%201%20-%20v2/aser2020wave1report_feb1.pdf

Way Forward

India has been witnessing an impressive increase in the penetration of smartphones. For most users, smartphones have become the primary access point for the internet and have become instrumental in its progress towards digitization. They are now an integral part of transforming the lives of the Indian citizens, both urban and rural through communication and assimilation of important information. The government of India has recognized the potential of smartphones, as the most effective tool to fulfill, and has advanced various objectives and missions related to the socio-economic empowerment of the citizens. It is helping the government to reach citizens based in different settings, and effectively provide services in a transparent manner. With the availability of the vast number of digital services, the focus is on developing innovative ways in the future, to deliver these services to every citizen.

For the education sector, smartphones hold great potential as an effective tool for essential educational delivery. The increase in the growth and the familiarity of rural India with smartphones, make it an ideal platform to deliver information and services that encompass the ecosystem of the digital divide. Open operating systems such as Android are the key contributor to reducing smartphone prices and increasing functionality, including vernacular applications[24]. Factors like increased affordability and proliferation of smartphones coupled with cheaper data prices, in-built applications, etc have been helping the government to provide crucial educational services. Integration of features like high bandwidth, voice assistance, and affordable prices will be serving as the bridge for digital services to reach the masses optimally. It allows the users to access resources in their native languages easily. All these features make it an essential component for delivery and improving the effectiveness of the digital educational initiative. Smartphones with in-built applications based on priority needs could bring the primary education sector at par with the latest ed-tech advancements, especially in rural India.

There is no doubt smartphone with the in-built digital educational resources is seen as a possible solution to make learning reach the underprivileged, marginalized, remote, and rural corners of India. But this will require our educational communities to take collective actions and not function in silos. The one app approach might not make much impact in rural India, where the needs and context of the schools and learners are different. To complement the digital movement, increased focus on the digital infrastructures, such as wi-fi and mobile connectivity by the central and state government will be an enabler for the digital services. Making the smartphones more accessible, potentially through subsidies, EMI schemes, and affordable loans will help the buyers to break up the upfront cost of the device into more manageable sums. Partnering with the local NGOs to help deliver not only alternative distribution methods, but training on smartphone usage. Facilitating affordable smartphone ownership for low and middle-income consumers in emerging markets should be made a key priority. The existing curriculum should be tweaked to compliment the digital impact of the teaching and learning process. Ed-tech resources must be aligned to the local curriculum to make it relevant. With the rapidly evolving world of technology, the government must constantly update its processes and service delivery mechanism to keep pace with the best practices.

[24] https://icea.org.in/wp-content/uploads/2020/07/Contribution-of-Smartphones-to-Digital-Governance-in-India-09072020.pdf

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