General Article

Revolutionizing Open Schooling: A NEP-2020 Perspective on ICT Integration

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Abstract

Information and Communication Technology (ICT) is an integral aspect of daily life across the globe. ICT tools, such as computers, the internet, and mobile devices, have revolutionised the education landscape by providing unrestricted access to educational resources. The recent developments in ICT and the emergence of disruptive technologies have supported the accessibility, equity, and quality of education. This article delves into the need of integrating ICT in Open and Distance Learning (ODL), highlighting its ability to bridge geographical barriers, offer diverse learning opportunities, and enhance the quality of education. The article focuses on the ICT initiatives undertaken by the National Institute of Open Schooling (NIOS), a pioneer organisation of Open Schooling in India. NIOS is the world's largest open schooling system which benefitted about 4.08 million learners in the last five years (NIOS, 2021-22). NIOS has embraced various platforms like DIKSHA, PMeVidya, SWAYAM, and web radio to expand access to teaching-learning resources, ensuring an engaging and personalized learning environment. QR code integration in Self Learning Materials (SLMs) and the DEEP Library access further enrich the learning experience. This article underscores the pivotal role of ICT in shaping the future of education in the perspective of NEP-2020.

Keywords: NEP-2020, ICT, Open and Distance Learning (ODL), Open Schooling, School, Education

Introduction

Information and Communication Technology (ICT) has become an inseparable part of daily lives worldwide. It is shaping the way people communicate, work, and learn. ICT refers to the variety of tools and resources based on technology which are 'used to transmit, store, create, share or exchange information' (UNESCO, 2009). The computers, internet, television, radio are the ICT tools to share resources viz. text, graphics, videos, audios, podcasts, animations, live and recorded broadcast/telecast etc.

In the context of education, ICT practices have a transformative impact. Over the years, ICT played an important role in transforming the access and delivery of education. It is not just about formal education; both in- formal and non-formal education have been equally or more influenced by ICT. In particular, Open and distance education institutions, both in developed and developing nations, have promptly recognized the possibilities of ICT (Rahman, 2014). Thus, ICT is increasingly considered as a means to improve the quality of ODL (Kadada & Tshabalala, 2019). In the ODL system, learners often face the challenge of being geographically separated from the

conventional educational institution. In such a scenario, it is difficult for learners to interact with tutors, fellow learners, and access study materials (Arinto, 2016) at distance mode.

Despite geographical barriers, various ICT tools like computers, mobile phones, social media, radio, and television hold immense potential to connect learners with facilitators and content (Vasudevaiah, 2016). Studies such as the one on Mozambique's Open Schooling project using Aptus devices (Cossa, Nakala, & Cherinda, 2021) demonstrate the promise of ICT in expanding access to learning materials offline. However, successful implementation requires ongoing technology updates, compatible devices, increased user capacity, and broader content coverage (Cossa, Nakala, & Cherinda, 2021). This aligns with Rahman and Yeasmin's (2019) research on India's National Institute of Open Schooling (NIOS), which highlights their use of ICT (Wi-Fi, smartboards) for courses and exams, online/TV broadcasts, and virtual learning for students. NIOS is even expanding its ICT infrastructure to meet the growing demand for on-demand examinations. While Das (2019) emphasizes the potential of ICT in education, particularly its ability to transcend borders and provide access to top educators, he also acknowledge challenges like resource limitations, lack of trained personnel, and infrastructure issues. However, Das (2019) also proposed solutions like raising awareness, community involvement, and infrastructure development, which offer a roadmap for overcoming these barriers. By integrating ICT into the open schooling system with these considerations in mind, learning gap could be bridged. This aligns with India's existing policy initiatives for ICT integration in school education. The National Policy on ICT (2012) aimed to utilise ICT in school education to enhance access, quality, and equity in education. It emphasises the need for digitising educational resources to make them widely available and extensively used. In 2015, the 'Digital India' program was launched by the Ministry of Electronics & Information Technology, Government of India. It focused on transforming the country into a digitally empowered society and knowledge economy. It covered initiatives related to infrastructure, governance, and services, utilising technology to bring about positive change in the country. Additionally, the '*Samagra Shiksha*' (2018), a flagship program on education also emphasises the use of ICT for access to quality education, aligning with the motto "*Sabko Shiksha Achhi Shiksha*" (MoE, 2021). ICT@School scheme is being implemented under *Samagra Shiksha* to support digital infrastructure and pedagogy in school education.

Finally, the National Education Policy (NEP, 2020) can be seen as a torch bearer to recognise the significant role of ICT in shaping the future of education. NEP (2020) recommended that all States and reputable institutions like NCERT, CBSE, and NIOS should develop teaching-learning resources in various regional languages. It will ensure the accessibility of quality educational resources to the learners. The developed resources should be uploaded on the DIKSHA (Digital Infrastructure for Knowledge Sharing) platform which fosters learning and eliminates language barriers. Moreover, NEP (2020) advocated that the platforms of DIKSHA and SWAYAM (Study Webs of Active-Learning for Young Aspiring Minds) shall be integrated to enrich the learning experience for school students by providing user-friendly and quality resources. The policy further recognised the concern of digital divide. Hence, it supported the use of existing mass media like television, radio, and community radio for telecasts and

broadcasts of educational content. These platforms can be used to access resources in different languages in offline mode. It supports resources to reach the unreached and caters to the diverse needs of learners. NEP (2020) also acknowledged the necessity of investing in open, interoperable, and evolvable digital infrastructure in education. It will support multiple platforms and solutions, considering India's scale, diversity, and device penetration. By building a robust digital infrastructure, the ICT-based solutions will remain relevant and effective amid rapid technological advances including disruptive technologies. Overall, the policy guided towards making education more resilient and future-ready.

By leveraging ICT initiatives, we can empower our society with inclusive, equitable, and quality education. This aligns with policy recommendations and helps bridge the digital divide while enriching the learning experience. Prior to delving into ICT initiatives for open schooling, it is important to explore the need of ICT integration in the ODL system.

Need of ICT integration in ODL system

The integration of ICT in the ODL system has emerged as a game-changer, revolutionising access to learning and educational resources worldwide. ODL systems are designed to provide flexible and inclusive learning opportunities to diverse learners. Sustainable Development Goal 4 also emphasised on access to inclusive and quality education that can be achieved through integrating ICT (Muyinda, Mayende, Maiga, & Oyo, 2019).Emerging technologies, as noted by Mbatha (2014), have significantly impacted the methods of teaching and learning in ODL systems.

One of the most significant advantages of incorporating ICT in ODL is the unrestricted access to a vast repository of educational resources available globally. ICT has become a significant platform for enhancing access to education and the delivery of educational resources and services in educational systems worldwide (Isuku, 2018). Open Educational Resources (OERs), MOOCs (Massive Open Online Courses) and other online resources, have made high-quality educational materials freely accessible to learners, as advocated by Gaba and Li (2015). These resources offer a plethora of learning opportunities for both informal and formal education, bridging gaps in accessibility (Hoosen & Butcher, 2017). The integration of ICT has significantly contributed to overcoming geographical barriers between educators and learners, making education accessible worldwide (Fozdar, 2015). Kant (2020) stresses the importance of utilising ICT as an asset in conjunction with other resources to efficiently and effectively deliver education.

The ODL system has evolved as a flexible teaching approach in recent decades, enabling learning and teaching anywhere and anytime with multimedia and technology support (Faridi and Ouseph, 2014). Letseka and Karel (2015) highlighted that the ODL system enables quality teaching and learning experiences through modern technologies. Emerging iterations of ICT promote the sharing of information, resources, and experiences, creating networking opportunities that connect students, tutors, and institutions (Fozdar, 2015). Learners can access digital libraries and multimedia content to gain exposure to diverse perspectives. The advantages of an adaptable educational environment made possible by ICT are becoming increasingly evident, with many ODL institutions, especially in developed nations, adopting ICT-supported or ICT-based instruction (Fozdar, 2015). ICT effectively addresses challenges related to expenses, teacher

shortages, quality, and obstacles associated with time and distance (McGorry, 2002). Awadhiya, Miglani, and Gowthaman (2014) observe that ODL institutions worldwide are adopting ICT-based teaching and learning methods, distributing quality education to widely dispersed learners. They suggest that ICT, particularly the integration of smartphones, holds potential for delivering learner support services and educational content, thereby enhancing the retention of Open and Distance Learning (ODL) students.

Content designers and educators benefit from ICT integration as it allows them to adapt existing content to fit their curricula, expediting SLM development (Hoosen & Butcher, 2017). Teachers lacking expertise in certain subjects can rely on professionally designed learning materials to bridge the learning gaps. ICT simplifies access to academic materials, streamlines course registration processes, and eliminates the need for physical travel to access information (Isuku, 2018). Kant (2020) emphasised the role of ICT in adopting a learner-centric approach and how it can be harnessed to enhance the capacity, cost-effectiveness, and quality of education. Simulations, as noted by Herd and Mead Richardson (2015), provide learners with access to laboratory experiments even when physical laboratories are unavailable. ICT transmits content, accommodates diverse learning preferences, ensures convenient access, and provides valuable feedback (Kadada & Tshabalala, 2019). ICT elevates the quality of education, introduces new educational resources, enables 24/7 learning, and grants students access to a multitude of online resources (Shan Fu, 2013). These technologies liberate students from the constraints of time and location, enabling communication with educational institutions through email, smartphones, and Skype (Kadada & Tshabalala, 2019). Furthermore, ICTs enable students to submit assignments for online evaluation and retrieve graded assignments and results (Kadada & Tshabalala, 2019).

To sum up, the ICT integration has brought forth a multitude of advantages, from global access to educational resources and flexible learning opportunities to customised content delivery and enhanced quality in education. As we move forward, exploring initiatives like those undertaken by the National Institute of Open Schooling (NIOS) in harnessing ICT potential becomes paramount. NIOS, along with other institutions, can build upon the foundation of these advantages to further democratise education, bridge divides, and foster a culture of lifelong learning.

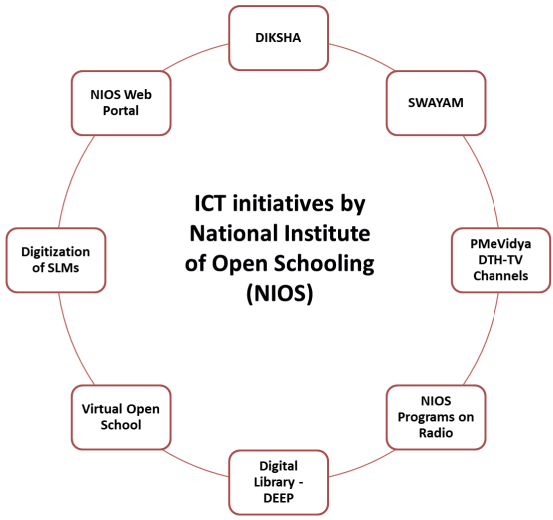
ICT initiatives by National Institute of Open Schooling (NIOS)

Established in November 1989, the National Institute of Open Schooling (NIOS), formerly known as National Open School (NOS), operates as an autonomous organisation under the Ministry of Education, Government of India. NIOS offers a diverse range of courses, including vocational, life enrichment, community-oriented, general, and academic programs at both secondary and senior secondary levels. Additionally, it provides elementary-level courses through its Open Basic Education Programs (OBE). NIOS has the authority, as per a government gazette notification, to examine and certify learners registered with it for pre-degree level courses, encompassing academic, technical, and vocational disciplines (MoE, 2021).

The National Institute of Open Schooling (NIOS) has embraced ICT initiatives to enhance the quality and accessibility of education. As a pioneering institution in the field of open and distance learning,

NIOS has made significant strides in leveraging ICT in the open schooling system across the country. Following the NEP (2020) recommendations and ICT initiatives of Govt. of India, NIOS has embarked on a journey to reach the unreached in open schooling system. Following are the ICT initiatives related to multiple platforms of content delivery through which NIOS envisions to bridge geographical barriers, expand learning opportunities, and foster an engaging learning environment that caters to the diverse needs of learners across the nation. The ICT initiatives taken up by NIOS, mainly focused on multiple approaches to access to teaching learning resources are as follows:

Figure-1: ICT initiatives of NIOS



DIKSHA (Digital Infrastructure for Knowledge Sharing)

DIKSHA, the Digital Infrastructure for Knowledge Sharing, was officially launched in 2017. DIKSHA is a national platform under the Ministry of Education, GoI, that provides access to educational resources in multiple languages. It is known as 'One Nation, One platform' to access a variety of digital resources, including teaching-learning e-content, teacher professional development modules, and resources for remote learning. DIKSHA platform is available as a mobile app on Android as well as iOS devices. This app features engaging interactive educational resources aligned with school curricula.

As a stakeholder, NIOS actively contributed quality educational resources to DIKSHA. NIOS provides digital resources, including textbooks, videos, audio and interactive resources, which are accessible to learners, tutors and parents across the country through DIKSHA platform. The SLM based on courses of secondary, senior secondary and vocational levels are available on DIKSHA. When learners access the NIOS vertical on DIKSHA, a pivotal step involves selecting their relevant class level. This action provides them with instant access to SLMs tailored to that specific subject and standard. By simply choosing their class & subject and confirming their selection, learners initiate the process of retrieving the relevant SLMs, ensuring a personalised learning experience.

Hence, open schooling resources are widely available through the DIKSHA platform. It enhances the learning experience by linking physical materials

to digital resources, enabling learners to delve deeper into topics and engage with multimedia content.

SWAYAM (Study Webs of Active Learning for Young Aspiring Minds)

SWAYAM platform facilitates the hosting of courses ranging from Class 9 to post-graduation, making them accessible to anyone, anywhere, at any time. These courses, created by top educators in the country, are freely available to all learners. Notably, more than 1,000 carefully selected faculty members and teachers from across the nation have contributed to their development. The courses on SWAYAM are organised into four sections: (1) video lectures, (2) specially developed downloadable/ printable reading materials, (3) self-assessment tests, and (4) an online discussion forum for addressing queries. To enhance the learning experience, audio, video, multimedia, and advanced pedagogies and technologies are incorporated. To ensure the delivery of high-quality content, nine National Coordinators have been appointed, including NIOS (SWAYAM Portal).

NIOS's engagement with SWAYAM showcases its commitment to open learning for a diverse audience. NIOS contributes by offering open schooling courses on SWAYAM, broadening access to quality education. In this platform, there are different parts for the learners viz. E-tutorial and multimedia instructions and lectures by best tutors, E-contents, self assessment, Discussion Forum etc. The course materials of NIOS are uploaded in e-pub, PDF format along with QR code. NIOS delivers its curriculum through the SWAYAM platform, catering to secondary, senior secondary and vocational courses for learners and individuals seeking to upskill or enhance their knowledge across various domains. NIOS coordinates 18 subjects at the secondary level and 20 subjects at the senior secondary level, consistently addressing learner inquiries and engaging in interactions with them.

PMeVidya Direct To Home - Television (DTH-TV) Channels

PMeVidya DTH-TV channels were launched in 2020 to provide continuous learning support during the COVID-19 pandemic. They offered a remote learning platform of television, bridging the gap caused by lockdowns and enabling students to study from home.

NIOS offered many live sessions and recorded video lectures through the PMeVidya DTH-TV channels. This initiative ensures that learners can continue their education remotely and mitigate learning gaps, irrespective of challenging circumstances. NIOS is managing the coordination of PMeVidya channels #17, #18, #19, and #20. Both pre-recorded video programmes and live interactive PCP sessions are being transmitted on these channels. The PCPs for learners cover all the subjects at secondary and senior secondary levels. In addition, vocational and sign language-based content is also transmitted regularly. Vocational programs provide practical training and sign language-based courses are beneficial for learners who are hearing impaired or have difficulty hearing. These sessions provide interactive learning achievement and give a platform to connect with the subject experts.

NIOS Programs on Radio

Recognizing the significance of audio-based learning, NIOS's radio programs on interactive web radio of Mukta Vidya Vani play a pivotal role in reaching learners who have limited access to digital platforms.

Mukta Vidya Vani, an internet based service by NIOS, facilitates live interactive audio PCPs and audio programs, which are web-streamed daily. Subject experts

and course coordinators utilise this platform to conduct real-time PCPs and provide academic support to learners. These PCPs' recordings are accessible 24/7 on the NIOS website (www.nios.ac.in) and its YouTube channel.

Besides, NIOS operates a Community Radio Station named Radio Vahini FM 91.2 MHz, where it broadcasts programs covering a wide range of social topics, including education, issues related to children with special needs (CwSN), yoga, adolescence education, physical and mental health, meditation, youth and women empowerment, sanitation and cleanliness awareness, voter's rights, and more. This audio content can also be found on the YouTube channel @NIOSRadioVahini.

These educational broadcasts cover subjects spanning the NIOS curriculum and provide an alternative mode of academic support. NIOS ensures that its radio programs are informative, engaging, and aligned with the needs of diverse learners.

Digital Library - DEEP (Digital Education and E-Resources Platform)

DEEP (Digital Education and E-Resource Platform) is a collection of material such as eJournals, eBooks, eDatabase, magazines, and newspapers. DEEP is available on an ePortal i.e. https://digitallibrary.nios.ac.in/. DEEP is an initiative to build digital infrastructure in alignment with the vision of NEP, 2020.

The DEEP Library aimed to address key challenges related to access to education. It serves as a tool in combating knowledge scarcity, particularly for individuals who are not enrolled in regular schools or those facing limitations in accessing learning resources due to socio-economic constraints. Importantly, the DEEP Library extends its benefits beyond NIOS learners, encompassing other students, teachers and researchers. It hosts content in multiple languages, making it accessible to a broader audience. With interfaces available in eight widely spoken Indian languages, including Kannada, Punjabi, Marathi, Bhojpuri, Urdu, Maithili, Awadhi, and English, the DEEP Library ensures that individuals from various linguistic backgrounds can seamlessly explore its extensive eResources.

Moreover, the DEEP Library is equipped with a range of user-friendly features, including options for printing and saving content. It goes a step further by providing a repository of valuable reference materials, encompassing dictionaries, encyclopaedias, and directories. The impact of the DEEP Library is evident in its remarkable outreach, with over 2,20,000 visitors accessing its invaluable resources. This underscores its significance for knowledge dissemination through access to quality resources to diverse learners, at anytime, anywhere.

Virtual Open School (VOS)

The Virtual Open Schooling initiative of NIOS provides an online platform where learners can access SLMs, supplementary educational resources, and multimedia content. NIOS's VOS ensures that learners have a self-paced, interactive, and engaging learning experience, enabling them to study at their convenience.

The VOS encompasses a range of features for enhancing the learning experience. These include the provision of job-oriented courses, enabling live and interactive sessions that foster active engagement and participation of the learners. Additionally, VOS incorporates online Tutor Marked Assignments (TMAs) and evaluation processes to streamline the assessment and feedback mechanisms. Moreover, it offers remote proctored assessments, ensuring that evaluations can be

conducted efficiently and securely in an online environment.

QR (Quick Response) Code Integration and Digitization of SLMs

Integration of QR codes in SLMs of NIOS elevates the learning process. By scanning QR codes, learners gain access to additional digital resources related to their self learning materials. This enriches the learning experience, enabling learners to explore videos, audios, and interactive content that augment their understanding of the subject matter.

QR codes have evolved to become highly versatile, capable of storing extensive information, including video, audio, and text components. NIOS has created QR codes at the Secondary and Senior Secondary Level, both in Hindi and English, providing a rich multimedia experience for learners.

NIOS Web Portal

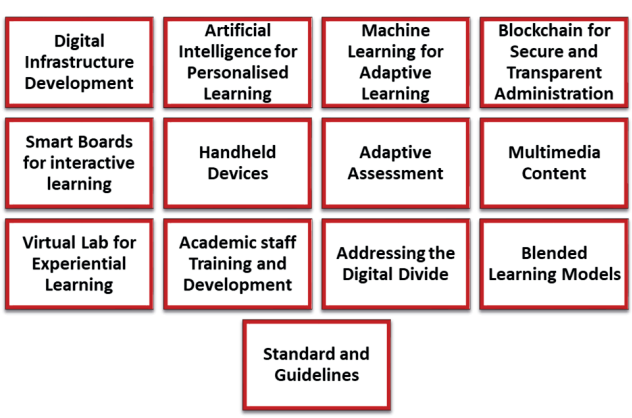
The NIOS website provides an online repository of educational resources, including freely downloadable PDF versions of Self Learning Materials (SLMs). These digital resources are readily accessible at all levels viz. Secondary, Sr. Secondary, Vocational, Indian Knowledge tradition, Open Basic Education, and more. Learners, teachers, and anyone interested in NIOS educational materials can easily obtain these SLMs from the NIOS website at no expense, thereby fostering widespread access to valuable learning materials.

NIOS's active involvement in these initiatives underscores its dedication to providing quality, inclusive, and equitable education through ICT integration. These contributions collectively position NIOS as a transformative force in the open schooling system.

Way Forward

NEP 2020 presented a visionary framework for integrating ICT into education. In this regard, the emphasis is on open schooling to democratize education, enhance accessibility, and improve quality of school education. Leveraging innovative and disruptive technologies such as artificial intelligence (AI), machine learning (ML), blockchain, smart boards, handheld computing devices, adaptive assessment, and various educational software and hardware, NEP-2020 envisions a transformative shift in how education is delivered and experienced. The key themes are identified to provide a strategic roadmap for revolutionising open schooling as per NEP-2020 recommendations:

Figure-2: Key themes under NEP-2020 for Integrating ICT in education



Investing in robust digital infrastructure is crucial for scaling ICT-based educational solutions in ODL. Creating open and, interoperable public digital infrastructure can support multiple platforms and solutions, addressing India's scale, diversity, and complexity. This infrastructure is essential for NIOS to provide seamless access to educational resources across the country. Secondly, AI can revolutionize personalized learning in ODL by analyzing student data to provide customized educational content. AI-driven adaptive learning platforms can offer real-time feedback and personalized learning paths, addressing individual student needs. This ensures that each learner can progress at their own pace, maximizing their potential. Furthermore, AI can help educators to identify learning gaps and provide targeted interventions at open schooling. Gautam and Dua (2021) suggested to ODL institutions to embrace AI to improve pedagogy and program development. Thirdly, Machine learning (ML) can further enhance personalized learning experiences by predicting learning difficulties and recommending customised resources. ML algorithms can analyze patterns in student performance, helping educators design effective instructional strategies. Furthermore, Blockchain technology can ensure secure and transparent record-keeping for student credentials and performance. Implementing blockchain at ODL can streamline administrative processes and enhance trust in the educational system, crucial for open schooling where physical presence is minimal.

In terms of instructional transection, Smart boards can facilitate interactive and engaging learning experiences in ODL environments through live or recorded video streaming. Providing ODL learners with handheld devices pre-loaded with educational content can ensure continuous learning without relying solely on internet connectivity. Incorporating multimedia content such as 3D/7D VR, AR, simulations, and educational games can make learning more engaging and effective. VR and AR can offer immersive learning experiences, allowing learners to explore complex concepts interactively. For instance, virtual labs can provide practical hands-on experience in a controlled digital environment, overcoming the limitations of physical lab infrastructure, which is particularly beneficial for ODL learners. However, adaptive assessment can provide a more accurate assessment of learners abilities by adjusting the difficulty of questions in real-time based on the learner's performance. This approach can offer more personalized and fair assessments.

To overcome challenges in ODL, Academic Staff at NIOS need rigorous training to become effective online educators. Professional development programs should focus on learner-centric pedagogy, digital content creation, and the use of online instructional tools. Digital divide is also a notable challenge in integrating ICT in ODL system. To ensure equitable access to digital education in ODL, concerted efforts such as the Digital India campaign and the provision of affordable computing devices are essential. Leveraging mass media like television and radio can also reach ODL learners with limited digital access. Educational content should be available in all major Indian languages to cater to diverse linguistic groups. Additionally, effective blended learning models should be developed and replicated, combining online and offline methods to provide a holistic educational experience for open schooling learners. Finally, the most important aspect is setting up the standards and guidelines for content, technology, and pedagogy for maintaining the quality of digital education.

Thus, the integration of ICT in open schooling, guided by NEP-2020, promises to transform education by enhancing access, equity, and quality. By leveraging disruptive technologies and innovative approaches, an inclusive, engaging, and effective educational ecosystem within the ODL framework can be created, which will further empower learners across India to reach their full potential.

Conclusion

In conclusion, the integration of ICT in the ODL system has opened up transformative possibilities in education. ICT has redefined the way learners' access, engage with, and benefit from educational resources. It has not only made quality education accessible but has also democratised learning by eliminating various socio-economic barriers and enhancing the learning experience. ICT in Open schooling has transformed school education, breaking down the confines of the traditional four-wall classroom and ushering in an era of boundary less quality learning.

As we look forward, it's imperative to recognize the critical role ICT plays in shaping the future of education, particularly in open schooling systems like that of the National Institute of Open Schooling (NIOS). NIOS has embraced a range of ICT initiatives, aligning with NEP-2020 recommendations, to bridge geographical divides through reaching the unreached and provide accessible, equitable and quality education to learners across India.

The journey ahead involves continued collaboration and innovation in utilizing platforms like DIKSHA, PMeVidya, SWAYAM, and NIOS Radio platforms to ensure quality learning experience for students. The integration of QR codes and the DEEP Library further ensures access to educational resources and facilitates knowledge dissemination. Incorporating ICT into open schooling not only empowers learners but also strengthens the foundation of inclusive, equitable, and quality education. NIOS and similar institutions are at the forefront of this transformation, working towards a future where education knows no boundaries, access is universal, and the pursuit of knowledge is lifelong.

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