NATIONAL CONFERENCE ON BASIC ROLE OF ICT IN SCHOOL EDUCATION

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It is true that there are many challenges and problems in integrating ICT into school education, and various conferences and seminars have addressed these issues. However, this conference aimed to go beyond merely identifying challenges and instead focused on harnessing the true potential of government initiatives towards school and teacher education, particularly in using current and emerging ICT tools and technologies to improve learning outcomes.

The National Curriculum Framework (NCF) 2005 emphasises that teachers and students should be treated as active producers rather than passive consumers in the learning process, and that technology should not be used as a medium to bypass the teacher. Instead, technology should be used to create new, open learning environments that shift the emphasis from teacher-centric to learner-centric. This means that teachers should create learning environments that enable students to actively engage in their own learning, rather than simply transmitting knowledge.

To achieve this, the government and NGOs have made various efforts to develop training resources, create e-content, design e-learning platforms, establish IT infrastructure, and provide training for teachers. These efforts have the potential to enable learners to access vast stores of knowledge beyond the boundaries of their schools, and to use technological tools to enhance their learning experiences.

Overall, the aim of this conference was to provide recommendations and policy perspectives on how to use ICT to improve the learning outcomes of children and adults, and to encourage a shift towards more learner-centric approaches to education.

Keywords: ICT in school education, National Conference, NCF 2005, Government initiatives, Digital India

Basic Role of ICT in School Education

Information is processed data. Data and Information are key sources for most of the decisions around the world. Information is the key guiding force of the world today. For a wider use of the information, the information must be communicated to people. The purpose of creation of information along with its communication would be served only when it reaches to the intended audience. The information may be created, stored, processed, transmitted, displayed and shared in digital form and through electronic media. The technologies emerged in this entire processes are Information and Communication Technologies (ICTs). Thus, Information and Communication Technologies are nothing but tools, devices, forums, content resources and services based on digital platform. ICT can be deployed for realising the goals of teaching-learning, enhancing access to and reach of resources, building of capacities, also as management of the knowledge network. Thus, these will not

only include hardware devices connected to computers, and software applications, but also interactive digital content, internet and other satellite communication devices, radio and TV services, learning management systems (LMS), management information systems (MIS), web-based content repositories and interactive forums and platforms.

There are various challenges and problems in ICT integration in school education and many conferences and seminars have already elaborated upon them at length. This conference may not be a mere repetition of the same exercise of identifying old and new challenges alone. The government is aware of most of these challenges and has already initiated many schemes in overcoming these challenges. This conference was focused on harnessing the true potential of Government of India's several initiatives towards the school and teacher education system and to provide recommendations and policy perspectives in reference of using current and emerging ICT tools and technologies to improve the learning of children and adults.

One of the major objectives of the education community is to find out, how ICT can create new, open learning environments? National Curriculum Framework (NCF)-2005 expresses a strong belief that teachers and children must be treated not merely as consumers but also as active producers. The learning process is the two-way interactivity rather than one-way reception that would make the technology educational. Hence, NCF-2005, which guides the teaching-learning effort in schools, is aware that technology must not be used as a mere medium to disseminate information that attends to bypass the teacher. In the current scenario, ICT is providing learners access to huge stores of knowledge beyond the school boundaries, as well as with technological tools to add to this store of knowledge. To shift the emphasis in learning environments from teacher-centric to learner-centric; where teacher's role will shift from the key source of information and transmitter of knowledge to that of a creator of learning environment for student learning; and where student's role changes from the passive receiver of information to actively involved in their own learning, ICT is largely instrumental and plays a very efficient role. To this end, there were several efforts consisting of developing training resources, creating e-content, designing e-learning platforms, creating IT infrastructure, and organising training that has been made by the government as well as NGOs.

What follows is a brief discussion about the major government initiatives to help schools integrate ICT in education and reap its benefits for improving learning.

Digital India Programme

Transforming India into a digitally empowered society and knowledge economy is the key vision of the 'Digital India' flagship programme of the Government of India. The Digital India programme is centred on three key vision areas:

(i) Digital Infrastructure as a Utility to Every Citizen

- Availability of high-speed internet as a core utility for delivery of services to citizens.
- Cradle to grave digital identity, that is unique, lifelong, online and authenticable to every citizen.

- Enabling citizen participation in digital and financial space through mobile phone and bank account.
- Availability of a Common Service Centre.
- Public Cloud with shareable private space.
- Safe and secure cyber-space.

(ii) Governance and Services on Demand

- Error-free integrated services across departments or jurisdictions.
- Real-time availability of services from online and mobile platforms.
- All citizen entitlements to be portable and available on the cloud.
- Digitally transformed services for improving ease of doing business.
- Making financial transactions electronic and cashless.
- Leveraging Geospatial Information Systems (GIS) for decision support systems and development.

(iii) Digital Empowerment of Citizens

- Universal digital literacy
- Universally accessible digital resources
- Availability of digital resources or services in Indian languages
- Collaborative digital platforms for participative governance
- Citizens not required to physically submit government documents or certificates

Government of India has a firm belief that prerequisite to a well-served nation is a well-connected nation. To achieve in reality the delivery of electronic government services, targeted social benefits, and financial inclusion to every citizen, the remotest of the Indian villager needs to be digitally connected through a broadband and high-speed internet.

To ensure that all panchayats in the country have high-speed connectivity, the Department of Telecom (DoT), Government of India has established Bharat Broadband Network Limited (BBNL).

In fact, the National Optical Fiber Network (NOFN) will be worked out by BBNL. In each of the 2,50,000 gram panchayats in the country, BBNL will layout the optic fiber cable as information highway by providing 100 Mbps link to be used by all the stakeholders to ensure that digital inclusion. This will ensure digitisation and connectivity of the local institutions, such as the panchayat office, schools, health centres, libraries, etc. The e-literacy goal through the National Digital Literacy Mission has also been supported by the industries.

This is the fact that digital resources are truly accessible when they are easily available and everywhere, anyone can navigate easily. Open resources, which are widely usable and customisable, are widely and inexpensively available. In comparison to resources developed from proprietary systems, Open Digital resources can be accessed everywhere. To make access and customisation user-friendly, owner departments and agencies have the responsibility of the high quality of their digital resources.

According to languages written and spoken in different parts of the country, India

has a remarkable diversity. There are 22 official languages and 12 scripts. However, knowledge of English is limited to a small section of the population in the country. The rest often cannot access or comprehend digital resources that are available mainly in English. To overcome this barrier, the government is formulating a new mission mode project named e-Bhasha to help develop and disseminate digital content in local languages to India's largely non-English speaking population. As per accessibility standards, the specially abled friendly content and systems are under development.

Under its Digital India Programme, the government is providing access to digital resources for citizens with special needs, such as those with visual or hearing (partial or complete) impairments, learning or cognitive disabilities, physical disabilities which hinder the operation of ubiquitous access devices such as phones, tablets, and computers.

(Website: http://digitalindia.gov.in/content/vision-and-vision-areas)

Other Government ICT-based Initiatives

National Knowledge Network: To establish robust Indian network which may be capable of providing secure and reliable connectivity, Government of India has launched the project 'National Knowledge Network (NKN)'. Across the world, mainstream research and innovations are shifting towards multidisciplinary and collaborative paradigm which need substantial communication and computational power. In India, to effect such a paradigm shift across the country with multi-gigabit capability, NKN aims to attach all research institutions, universities, laboratories, libraries, agricultural institutions and healthcare.

(Website: http://nkn.gov.in/home)

SWAYAM (Study Webs of Active-learning for Young Aspiring Minds): The ministry of Human Resource Development (MHRD) and All India Council for Technical Education (AICTE) with the help of Microsoft have indigenously developed this platform. To cover school, under-graduate, post-graduate, engineering, law, and other professional courses, SWAYAM would be ultimately capable of hosting 2000 courses and 80000 hours of learning. The four quadrants approach, i.e., video lectures, specially prepared reading materials which can be downloaded or printed, self-assessment tests through tests and quizzes, and a web discussion forum for clearing the doubts are the special features of the courses hosted on SWAYAM. Steps are being taken to complement the training experience by using audio-video and multi-media and state of the art pedagogy and technology. Efforts are there to produce and deliver highest quality content and, therefore, seven National Coordinators are appointed— NPTEL for engineering, UGC for post-graduate education, CEC for under-graduate education, NCERT and NIOS for school education, IGNOU for out of varsity students and IIMB for management studies.

(Website: https://swayam.gov.in)

NMEICT: As a centrally sponsored scheme to leverage the potential of ICT, the National Mission on Education through Information and Communication Technology (NMEICT) has been envisaged. The main objective is that for the advantage of all the learners in education institutions, teaching and learning

process in anytime anywhere mode may be worked out. It is a landmark initiative of the Ministry of Human Resource Development to affect all the education and learning-related needs of students, teachers, and lifelong learners.

(Website: http://www.nmeict.ac.in/#)

National Digital Library of India: To develop a framework of virtual repository of learning resources with a single-window search facility, The ministry of Human Resource Development (MHRD) under its National Mission on Education through Information and Communication Technology (NMEICT) has initiated the National Digital Library (NDL) pilot programme. Filtered and federated searching is used to facilitate focused searching in order that learners can determine the proper resource with the smallest amount of effort and in minimum time. NDL is meant to carry the content of any language and provides interface support for leading vernacular languages (currently Hindi and Bengali) and learning resources— books, articles, thesis, manuscripts, and AV lectures.

(Website:https://ndl.iitkgp.ac.in/)

NROER: National Repository of Open Educational Resources (NROER) is a collaborative platform, which brings together everyone interested in school and teacher education. Initiated by the Department of School Education and Literacy, MHRD, and managed by CIET, NCERT, it offers digital and digitizable resources (audio, video, interactive images, and documents) in different languages along with online activities.

(Website: http://nroer.gov.in)

***Shaala Darpan*:** For all Kendriya Vidyalayas, *Shaala Darpan* is an e-governance platform. It aims to improve the quality of learning, the efficiency of school administration, governance of schools and service delivery to key stakeholders, namely, students, parents, teachers, community, and schools. Parents will get entire information at a united platform about their children in respect of attendance status, performance, health challenges, and entire academic record from Class I to XII. Students will have facilities of e-tutorials and learning aids to complement their knowledge.

(Website:https://darpan.kvs.gov.in/shaaladarpan/)

***Shaala Siddhi*:** The need for effective schools and improving school performance is increasingly felt in the Indian education system to provide quality education for all children. It works on enabling resources of school: availability, adequacy, and usability, teaching-learning and assessment, etc. Developed by the National University of Educational Planning and Administration (NUEPA), the National Programme on School Standards and Evaluation (NPSSE), known as Shaala Siddhi is a comprehensive instrument for school evaluation resulting in school improvement. It aims to enable schools to upgrade their performance in a more focused and strategic manner and facilitate them to make professional judgements for improvement.

(Website:http://shaalasiddhi.nuepa.org/)

***Saransh Portal*:** A CBSE Initiative, *Saransh* is a tool for comprehensive self-review and analysis for CBSE affiliated schools and parents. It enables them to analyse students' performance so as to make remedial measures. *Saransh* brings schools, teachers, and parents closer in order that they will monitor the progress

of students and help them improve their performance.

(Website:http://saransh.nic.in/?language=en)

E-Pathshala: Developed by NCERT, e-Pathshala portal is for showcasing and disseminating all educational e-resources including video, audio, periodicals, textbooks, and a variety of other print and non-print materials through the website and mobile app. The platform addresses the twin challenge of reaching out to a diverse clientele and bridging the digital divide (geographical, socio-cultural, and linguistic), offering a comparable quality of e-contents and ensuring its free access at every time and every place.

(Website:http://epathshala.nic.in/)

***e-PG Pathshala*:** Under this initiative high quality, curriculum-based, interactive e-content is being developed in several subjects across all disciplines of natural and mathematical sciences, social sciences, arts, fine arts and humanities, linguistics and languages at PG level.

(Website:http://epgp.inflibnet.ac.in/)

***OLabs*:** Online Labs (OLabs) for school lab experiments provide students with the ease and convenience of conducting experiments over the internet. Keeping the objectives in focus to supplement the traditional physical labs, bridging the constraints of time and geographical distances, it has been developed. This not only reduces the costs incurred for conducting experiments in real-time but gives a student the flexibility to explore and repeat experiments until they are thorough.

(Website:http://www.olabs.edu.in/)

e-*Basta*: Towards accessing the school books in digital form as e-books to be read and used on tablets and laptops, C-DAC has created this framework in tune with the government's Digital India initiative. The main aim is to bring publishers (free and commercial) and schools together on a single platform. To facilitate the organisation and easy management of such resources, a back-end framework in addition to the portal has been developed. For navigating the framework, web-based applications that can be installed on tablets have also been developed.

(Website:https://www.ebasta.in/)

GIS in School: To manage, store, capture, analyse, manipulate, and present spatial or geographic data, a system has been designed, known as "Geographic Information System (GIS)". The Web GIS application enables to plan for the access, retention, enrolment, budget and expenditure, quality, and monitoring aspects, facilities, integration of school infrastructure, mid-day-meal programme, child and teacher information, attendance, results, school complexes along with required visuals. A proximity analysis helps to meet the norms of the government in establishing the new schools and upgrading the existing schools wherever required.

(Website:http://schoolgis.nic.in/)

***Swayam Prabha*:** Through this programme, educational contents through 32 Direct to Home (DTH) television channels are operationalised for providing high-quality educational contents to all teachers, students, and citizens across the country interested in lifelong learning. To allow the student to choose the time of his/her convenience, it has been decided that there will be new content

of four hours every day, which would be telecasted six times a day.

(Website:http://www.swayamprabha.gov.in/)

National Policy on ICT in School Education: In order to improve access, quality, and efficiency in the school system, the policy is here to devise, catalyse, support, and sustain ICT and ICT enabled activities and processes. Keeping the overall objective of all-round socio-economic development of the nation and global competitiveness, it aims at preparing youngsters to participate creatively in the sustenance, establishment, and growth of a knowledge society.

(Website:http://ictschools.gov.in/Policy/national-policy-ict-school-education-2012)

National ICT Curriculum: National ICT Curriculum aims at realising the goals of the National Policy of ICT in School Education and the National Curriculum Framework. With the dynamic nature of ICT and emphasising the core educational purposes, the curricula with a generic design, aim at a wider exposure to technologies, enhancing creativity and imagination of the learners, has been visualised.

(Website: http://ictcurriculum.gov.in/)

National Award for Teachers Using ICT for Innovation in Education: To motivate the teachers and teacher educators for innovative use of ICT in teaching-learning along with promotion of computer-enabled learning and use of ICT in teaching in government and government aided secondary and higher secondary schools. Under the 'ICT in Schools' scheme, there is a provision for instituting the national award for innovative use of ICT.

(Website:http://mhrd.gov.in/ict_awards)

About the Conference: This is a fact that in our way of communicating, learning and even living as well, the Information and Communication Technologies (ICTs) are playing an increasingly important role. For both face to face and online learning environments, the web and mobile technologies and the convergence of these recent technologies are providing unique opportunities and appropriate infrastructure. All the above-said programmes/schemes are aimed at bringing synergy among the ICT integration efforts and systematic scaling-up of projects and its sustainability. In this background, it is important that the education system needs to harness the potential of these schemes and initiatives in improving the learning and assessment practices in our schools and classrooms. Keeping these in focus, the conference had been planned to create an opportunity for sharing experience on ICT in school education, spreading information, exchanges of national and international initiatives and making appropriate recommendations for policy planners, academic and administrative staff. The conference is expected to focus on (a) Exploring innovative use of ICT as a teaching-learning-assessment process, (b) Use of FOSS tools and OER practices in subject teaching and learning, (c) To discuss the usage of sophisticated access devices/ Ubiquitous Technologies and everywhere learning, (d) To explore efficient management strategies for technology integration initiatives, (e) To discuss on more self-directed human resource development approaches using emerging technological possibilities, (f) Use of sophisticated assistive technology tools and solutions for specially abled learners and making classrooms more inclusive supported the principles of universal design for learning,

(g) Implementing design-based research, action research and other applied research in technology integration in education to develop better insight, and (h) Exploring means of rewarding and recognising the performers and showcasing best practices.

The objectives, themes, and subthemes are mentioned below:

Objectives of the Conference

1. To showcase the innovative practices of ICT integration in school education.
2. To supply a discussion forum for improving the standard of the teaching-learning process with ICT based support to high school education.
3. To explore various current and emerging ICT tools, services, the culture of learning (development of learning skills, expansion of optional education, open-source of education, etc.) and discuss the implications of these on school education.
4. To explore the ICT based tools for the learners with special needs to integrate themselves within school and society by increasing their independence and by developing their abilities and interests.
5. To provide platform for sharing innovative experiments for enhancing efficiency of assessment and administrative practices through ICT integration for school education.
6. To explore various professional development alternatives in enhancing ICT integration competencies.
7. To explore the ICT trends in instructional designing and pedagogical practices for school education.
8. To discuss the challenges in integrating ICTs in school education and measures to overcome these challenges.
9. To provide an opportunity to share research studies on ICT integration in school education today.

Themes and Sub Themes

Theme 1: Policies and issues related to ICTs in school education

1. Planning and analysis of policies on ICT, OER in school education.
2. Universal access to quality content.
3. Technological issues in education (E-learning, Apps for learning, mobile learning, phones, tablets)

Theme 2: ICT in Teaching-Learning-Assessment Process

1. OER practices in subject teaching and learning.
2. Mathematical fundamentals of ICT and educational change.
3. ICT in assessment and learning.
4. ICT and issues in science and other fields of human culture related to ICT education.
5. ICT enhanced language teaching and learning.

Theme 3: Research related to ICT in Schools

1. Research on effective practices of ICT in school education.

Theme 4: ICT in Teacher's Professional Development

1. Teacher's professional development for promoting ICT in school education.
2. Technological innovations for teaching in schools
3. ICT skills and competencies among teachers.

Theme 5: ICT in Innovative Schools, School Governance

1. ICT in innovative schools, its impacts and effective use of ICT for quality learning.
2. Monitoring and evaluation of the impact of ICT on school education.
3. Beneficial effects of e-governance in schools.
4. ICT for inclusive education.

Expectations of the National Conference

Following presentations on areas are followed by some leading questions, which need to be addressed in the papers and various sessions and discussions to arrive at valid conference recommendations.

ICT in Teaching-Learning-Assessment Process

- In order that the teachers would be ready to bring new knowledge into schools and can create an impact from the onset, there is a requirement for innovative design to promote the mixing of ICT with best pedagogical practices. Accordingly, ICT tools should be leveraged to help teachers shift from transferring information to facilitate learners to create knowledge and help them to shift from an acquisition mode of learning to one that engages in creativity, innovation, higher-order thinking, and collaboration. There are many innovative pedagogical practices like flipped learning, MOOC, PBL, Makerspace, game-based learning, and mobile applications. For authentic assessments technology tools like rubrics and e-portfolio can be used productively. Learning analytics and other developments are promising developments in individualising assessment and providing feedback.
- **Questions:** Teachers need to work on the framework of thinking what? how? and why? Regarding pedagogical practices, with the help of ICT tools, what are the initiatives to shift the predominantly teacher-centric to include more student-centric pedagogy practices? How to facilitate self-directed learning among students? How to leverage ICT for formative assessment and summative assessment? How to use ICT for providing and engaging students in authentic and meaningful learning experiences? Focusing on real-world problems, how to plan and implement alternative authentic assessment with the help of technology? What are the issues with our teachers to use innovative pedagogical approaches mentioned above in the classrooms?

OER Practices in Subject Teaching and Learning

- Open Educational Resources (OER) and Artistic Common Licenses are gaining wider acceptability among the tutorial community. Realising technology potential for improving

the educational practice, it is on priority in the national agenda of many countries and India is not an exception. Many of the government initiatives including NROER, as mentioned within the previous section is developing web-based resources to satisfy the increasing demand for ICT-enriched teaching and learning environments. The extent of OER creation, use, reuse, and adaption remains in its primitive stage in many countries including India. Lack of excellent quality educational resources in regional languages is another problem in integrating technology in class education. There is a necessity of developing repositories of open educational resources for all college education subjects in Indian languages.

- **Questions:** The conference could focus on how these resources could be used to enhance learning, what pedagogical practices using these resources can maximize learning and thinking? How can repositories be used as a practice field for teachers in creating contents and transfer these contents to national repositories after validation?
- Still, there are huge end-users who are not even aware of what is OER, let alone where to find it, how to find it, how to use it, and how to create and modify it. How to create this awareness and required skills in using it? Creating a network that facilitates the creation, use, and management of OER is the first stage in harnessing the complete potential of OER, and therefore, the conference must discuss the possibilities. Creating such a network necessitates strong national policy guidelines, accessible tools, and technologies for creating and adapting OER, technologies to host and deliver the OER resources, mechanisms to popularise its use and adaption, and an institutional culture in which such practices are accounted and rewarded. Deliberations on these issues are of utmost importance.

Free and Open Source Software (FOSS)

- The use of proprietary software would become too expensive which may be one of the main concerns for the implementation of the ICT curriculum successfully. This has been pointed out in the ICT curriculum. And accordingly, throughout the curricula Free and Open Source Software (FOSS) has been recommended. By enabling customisation and use of FOSS applications, society will also get rid of issues like software piracy, etc. There is a necessity of making a nationwide effort by central and state governments in popularising FOSS among all users. To this end proper policy guidelines, training programmes need to be developed and deployed.
- **Questions:** What are the main reasons that people are not coming forward to the use of FOSS tools? How to popularise the use of FOSS tools among teachers and teacher educators? For school education, which are the main FOSS tools available? Will there be any possibility for a centralised platform for downloading, installation trial, feature reviews, tutorials of

FOSS tools, and sharing their ideas for effective use in education?

Flipped Learning in School Education

- Flipped learning is a pedagogical approach in which the conventional notion of classroom-based learning is inverted so that students are introduced to the learning material before class. And during the class time, learners, while discussing with peers, will get the opportunity to deepen understanding and with activities facilitated by teachers will enrich their problem-solving skills.

Mobile Learning or M–Learning

- The understanding, knowledge, and shifting of skills from one generation to the next are basic procedures under education. Today there are two forms of school education—conventional education and distance education. In fact, handheld devices such as tablet computers, MP3 players, smartphones, and mobile phones, supporting learning procedures are offered under Mobile Learning or 'M-Learning'.

MOOC (Massive Open Online Course)

- Without any limit on attendance, the model of delivering learning content online to any interested person is known as Massive Open Online Course (MOOC) model. In this line 'Study Webs of Active Learning for Young Aspiring Minds' (SWAYAM) has been made available. Using information and communication technology (ICT), an integrated MOOC platform, and portal for online courses that is catering to high school till all higher education subjects and skill sector courses, ensuring that every student benefits from its learning material has been offered under SWAYAM.
- **Questions:** The National Conference on ICT in School Education has focused on exploring different challenges associated with M-learning, Flipped learning, and developing and delivering MOOCs in school subjects, etc. How to integrate learning from such initiatives into the existing context? Could it be used for enrichment or remediation? How to account for the learning from these courses into the existing assessment contexts? Who will develop and how will it be delivered?

Access Devices

- In educational environment, teachers and students should be given adequate access to hardware and software. On priority, computer laboratories, multimedia-enabled smart classrooms, etc., like adequate infrastructure need to be taken up. Financial support could be made available to students and teachers to bring their own devices and this will help in overcoming one of the major concerns of upgrading and maintenance of both hardware and software. The onus of maintenance and up-gradation is passed on to individual users. Also, most of the time power supply availability is the major concern in the effective integration of technology.
- **Questions:** The conference can focus on the issues related to allowing students, may be from primary stage on the concept of 'bring your own

device' (BYOD). In these scenarios, what are the possible pedagogical and structural innovations?

- Measures to fund the creation of computer laboratories and smart classrooms and its upgradation and maintenance might be explored. Who should fund this and how the funding should be provided? Can someone from outside decide what is needed in the school or should the school be given more autonomy in deciding their technology requirements? Could they be provided with ICT funds to purchase equipment and develop infrastructure to support customized ICT programs in their own schools? Could such autonomy bring ownership and accountability? Keeping in view the established standards, could they be asked to evaluate and benchmark ICT practices and institutional arrangements? Can we use solar panels and batteries to power digital devices?

Internet Connectivity for Access Devices

- As part of the Digital India initiative, the Bharat Broadband Network Ltd. (BBNL) will provide 2,50,000 *gram panchayats* with high-speed internet connectivity of 100 Mbps to be used as information highway by all the stakeholders to ensure that digital inclusion reaches all villages across the country. This will ensure digitisation and connectivity of the local institutions, such as the panchayat office, schools, health centres, libraries, etc. In addition to the widespread access and use of 3G and now popular fourth-generation (4G) of mobile communication technology standards will ensure high-speed wireless internet access a reality. It would be ensured to provide universal access to mobile connectivity to around 55,619 villages in the country which do not have mobile coverage through the digital India programme of the government.
- **Questions:** The conference should explore, in such a scenario, what should be the policy directions in effective utilisation of this internet connectivity to transform the teaching, learning, assessment, and management practices in the schools.

Ubiquitous Technologies and Everywhere Learning

- Providing high-speed broadband internet and Wi-Fi access to more powerful mobile/tablet devices with 3G and 4G features which are affordable to all children is necessary precondition for reaping the full potential of technology for learning. Added to this, making free 3G/4G access to their mobile devices will extend learning beyond the physical confines of the classroom and rigidly structured school time.
- **Questions:** The discussion could focus on the policy directives in relation to what pedagogical approaches will facilitate this mobile learning? Could teachers use flipped classroom approaches to harness the potential of this ubiquitous computing? Will it be possible to develop Android mobile educational applications in Indian languages to be downloaded from

Google play store? Should we provide unmonitored access to the internet? How to provide free access to 3G/4G access to students? What are the security concerns and how to address these concerns?

Managing Technology Integration Initiatives

- There are many agencies involved in technology integration initiatives within the country. Central government, state governments, business organisations like Google, Microsoft, Oracle, Intel, Azim Premji Foundation, Excelsoft, etc. and many NGOs. Many of these IT companies have developed e-content of varied formats, e-learning solutions, and MIS and ERP solutions additionally for training teachers. They can play a vital role in supporting schools. There is a necessity to compile the efforts of these organisations.
- Secondly, at the varsity level itself, there is a necessity of an efficient ICT management structure to provide the required digital leadership to make a digital culture where everyone collaborates to make things happen. Participation from all stakeholders for creating, maintaining, and upgrading ICT infrastructure is needed. The involvement of Panchayat, SMC, PTA, alumni, and other stakeholders in the implementation of ICT integration should be considered. Every school could use open-source comprehensive educational management and enterprise resource planning (ERP) software/MIS for managing all their affairs effectively. Creating a digital culture through technology leadership is needed to transform educational organisations.
- **Questions:** Is there any way to compile the efforts of all stakeholders to possess a unified approach? What are the potential industry partnerships? How to develop technology leadership practices among administrators? How to maintain the ICT infrastructure? Could the varsity appoint a technical person to upgrade and maintain the system? Should this be given as AMC? Could we involve the Linux user groups and other experts from the community? Is there a necessity for separate ICT in education policy and curriculum for every state? If so, why? Will it be possible to have a technology integration plan for each school? And the question is: Will it be possible to develop and implement a workable school-specific technology plan for every school? How?

Human Resource Development (HRD)

- It is the need of the hour to equip all teachers with the necessary ICT skills and knowledge on the appropriate pedagogical use of ICT in teaching and learning. The syllabus and the training modules have been developed by the national ICT curriculum.
- **Questions:** The conference has deliberated upon the methodology to reach out to all the teachers in the country. How ICT modules can be integrated with the existing training programmes and activities conducted by several entities? Could there be Massive Online Open Courses on continuous professional development

(CPD) in the area of technology integration in school and college education? Rather than one size fit all approach, how to plan more need-based and school-based training? Is training by a trainer/master trainers always effective? Are there possibilities of developing communities of practice among teachers to share and learn together? The next question is related to motivation, how to encourage the teachers to get involved in self-directed professional development in ICT integration? Is social networking an educational tool? Concerning social media, how can we leverage social media for professional development?

ICT and Special Learners

- Under the Digital India programme, the government is also committed to provide access to digital resources for citizens with special needs, such as those with visual or hearing impairments (which may be partial or complete), learning or cognitive disabilities, physical disabilities which hinder the operation of ubiquitous access devices such as phones, tablets, and computers. Towards inclusiveness, content, and systems for special children are being developed as per accessibility standards. In fact, it is the need of the hour to take special efforts to help the special children by equipping our teachers and educational institutions to adopt innovative, cost-effective assistive technologies to enable access to education for special children.
- **Questions:** What are the assistive technologies available for children with special needs? How to help teachers develop awareness and skill in using this? Next question is related to availability. How to make assistive technologies available in every school to create an inclusive classroom? For integration, how to integrate training use of these technologies in pre-service training programmes? Towards development, how to develop ICT based educational resources for learning and assessment of children with special needs, how to make existing digital resources accessible to disabled learners? What is Universal Design for Learning? How to implement UDL in our classrooms?

Research in Technology Integration

- There is a necessity of applied and action research in the area of ICT integration that could inform pedagogical and assessment practices in schools. It is the only research that will tell us whether they use technology to engage the students in learning effectively. Research is needed to implement innovative practices of using ICT and to investigate how these practices lead to a change in learning and achievement. Such research will help us sustain the good practices and make it scalable.
- **Questions:** The conference has discussed the issues raised here to reflect this in the recommendations. Is there a sufficient amount of applied research to make an informed decision in our own diverse context to know

what works and what doesn't? Do our teachers and teacher educators involve in innovative practices, if so, do they conduct action research on these innovations and report/disseminate it? Do we have a database of all the researches in this area? The question here is about analysis, is there a meta-analysis of these studies to find the major recommendations? Could there be an R&D unit that focuses on taking up applied research in this area to inform policymakers, planners, administrators, and teachers what works? Talking about the design, what is the role of design-based research in technology integration? Could there be evaluation studies? In terms of evaluations, how and who will take up programme evaluation studies? Who and how will the result of such evaluation studies be used? What is game-based learning? Towards game-based learning, what are the steps in developing and popularising game-based learning?

ICT and Teacher Education

- The National Curriculum Framework for Teacher Education (NCFTE, 2009) considered among other things the issues related to ICT in schooling as well as e-learning in the centre stage. The report states that ICT in spite of its potential to make learning liberating, its implementation is often not more than cosmetics. The curriculum recommends inclusion of ICT as an important curricular resource, according to primacy to the role of the teacher, ensuring public ownership of digital resources, and promoting constructivist approaches that privilege anticipation and co-creation over mere access to ICTs.
- **Questions:** The other curiosity was, how to transact the ICT curriculum in teacher training courses more effectively than covering it as theoretical inputs? What are the problems associated with implementing technology pedagogy integration in teacher training institutions? Talking about competencies, how to develop the competencies in e-content development, and providing e-learning among teacher trainees? How to develop the competencies among teacher trainees to use ICT as an enabler for collaborative and self-directed learning?

Rewarding and Recognising the Performers

- National ICT award was initiated by the government to encourage and motivate teachers in technology integration. In addition, there are also many state and private initiatives in rewarding teachers for innovations in the ICT areas.
- **Questions:** Is there a necessity to motivate the teachers in technology integration, if they themselves are convinced about the strength of it in facilitating learning? If there is a necessity, then how to strengthen the existing practices? Do they need to be provided with additional incentives, if so, how? Can they be funded and encouraged to attend and present their innovations in regional, national, and international conferences, seminars, and workshops? In terms of finance,

could there be financial support for teachers to take up technology integration projects? Talking about the exchange programme, can study tours and teacher exchange help in professional development? If so, how to implement the same?

Conclusion

We have discussed ideas and concerns for the successful integration of technology in school education for teachers and students. The conference aims to grow using ICT into schools and help teachers and children make the best use of the opportunities that ICTs provide. Based on National Curriculum Framework-2005, the ICT curriculum for teachers and students intends to introduce ICT in school education. The National Repository is a collaborative platform, which proposes to bring together the best of digital resources for different subject domains, across different stages of the school system and in different languages. Some of the issues to be taken by the conference on ICT for school education—exploring the potential; Implementing the national policy on ICT for school education in India, Challenges, and Issues; Showcasing ICT practices, Going Beyond Computer Literacy, learning from state/BOOT partners/NGO experience, e-governance mission mode programme in school education. The Ministry of Education, CIET/NCERT, state education ministry/SCERT/SIET, and school leaders need to work together to create a system of responsibility and accountability in implementing policy guidelines, monitoring its progress, conducting evaluation studies through programme evaluation, generating feedback and revising the guidelines in the light of these evaluation studies. ICT changes rapidly and affects both discipline, knowledge and pedagogical possibilities in ways that influence teachers' perspectives for employing ICT as a constant part of the learning process. It is hoped that by ICT in school education indicators on teachers, a more comprehensive view of the role of the teacher in influencing learner outcomes, including achievement and school completion can be achieved.

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