2026 Volume: 02 Issue: 03 www.ijrpa.com ISSN 2456-9995 Review Article

International Journal Research Publication Analysis

Page: 01-14

EMPOWERING YOUNG MINDS: ICT IN LITERACY AND NUMERACY FOUNDATIONS

Rabindra Singh*, Priyabrat Pradhan

Research Scholar, Department of Education, Central University of Odisha.

Article Received: 5 February 2026
Article Revised: 25 February 2026
Published on: 18 March 2026

***Corresponding Author: Rabindra Singh**
Research Scholar, Department of Education, Central University of Odisha.

DOI: https://doi-doi.org/101555/ijrpa.1430

ABSTRACT

In India, every child deserves the ability to read a simple sentence and do basic addition before finishing Class III. These two abilities, i.e., reading and working with numbers, are called foundational literacy and numeracy (FLN). Together they form the base on which all further learning stands. In recent years, Technological reformation through ICT has been widely used to help children to build those foundational skills. This paper looks at how ICT is being used in Indian schools and early childhood centres to strengthen reading, writing, and number sense among young learners of Classes I to III and in pre-primary settings. The paper draws on research studies, government policy documents such as the NEP 2020, and programs like the National Initiative for Proficiency in Reading with Understanding Numeracy (NIPUN Bharat) and DIKSHA to explain what is working, what challenges remain, and what teachers, school leaders, and policymakers can do to make better use of ICT for foundational learning. The paper argues that ICT is a useful tool but is not a magic solution on its own. It must be used thoughtfully, with good teaching, proper teacher training, and support from parents and the community.

KEYWORDS: *ICT in education, foundational literacy, foundational numeracy, NIPUN Bharat, NEP 2020, DIKSHA.*

1. INTRODUCTION

Imagine a child sitting in an elementary public school in a rural area of Odisha. She is in Class III. She can write her name, and she can count on her fingers, but she cannot yet read a short paragraph or subtract two-digit numbers without help. Millions of such children exist across India. Only over 50% of Class III children in rural India could read a text at the Class

II level, and only roughly 26% could do a basic division problem, according to the Annual Status of Education Report (ASER Center, 2023). These figures unequivocally demonstrate that foundational education is a significant national issue.

The Government of India (GOI) has recognized this problem at the highest level. The National Education Policy (NEP 2020) set a clear goal: every child in India should achieve basic numerical literacy by the end of class 3, no later than the year 2026-27. To achieve this, the government launched the National Initiative for Proficiency in Reading with Understanding Numeracy (NIPUN Bharat Mission) in July 2021 which emphasised on children from the foundational stage, i.e., from pre-primary to Class II, and the preparatory stage, which is Classes III to V (Ministry of Education, 2021).

ICT has been given an important place in this effort. The DIKSHA platform, the PM eVIDYA initiative, and state-level apps such as Delhi's Reading Programme and Gujarat's Gunotsav all use digital technology for smooth transaction of teaching and learning. Even during the COVID-19 pandemic, when schools were closed for nearly two years, ICT tools such as WhatsApp messages, recorded lessons on television, and interactive voice response (IVR) systems were used to keep children connected to learning (UNICEF India, 2021).

2. UNDERSTANDING FOUNDATIONAL LITERACY AND NUMERACY

2.1 What is foundational literacy?

Foundational literacy refers to the basic reading and writing skills that a child needs to function in daily life and to learn other subjects. These skills include the ability to recognize letters and their sounds (this is called phonics or letter-sound knowledge), the ability to put sounds together to form words (called blending or decoding), the ability to read words smoothly and quickly (called fluency), and the ability to understand what is read (called reading comprehension). Writing skills forming letters correctly, spelling simple words, and expressing ideas in writing are also part of foundational literacy (National Reading Panel, 2000).

In India, foundational literacy has a special complexity because children often speak one language at home, such as Bhojpuri, Kannada, or Bengali while they are taught in another language at school, such as Hindi or English. This distinction between the mother language and the institutional language makes learning to read even harder (Jhingran, 2005). The NEP 2020 has recommended that children be taught in their native language till Class 5, which is a welcome step in making foundational literacy more accessible (Ministry of Education, 2020).

2.2 What is Foundational Numeracy?

Foundational numeracy refers to the basic number skills a child needs for everyday life and further mathematics learning. These include understanding that numbers represent quantities (this is called number sense), being able to count objects correctly, knowing the relationship between numbers (for example, that 7 is more than 5), being able to do simple addition and subtraction, and being able to measure, compare sizes, and recognise basic shapes (Clements & Sarama, 2014).

Strong number sense in the initial years is one of the important component of how well a child would perform in mathematics in higher classes (Jordan et al., 2009). Research in India has shown that children who are behind in numeracy by the end of Class I rarely catch up without targeted support (ASER Centre, 2023). This is why early and effective numeracy teaching is so important.

2.3 Why Do These Skills Matter So Much?

Foundational literacy and numeracy are not just two subjects among many - they are the tools children use to learn every other subject. A child who cannot read cannot understand a history lesson or a science textbook. A child who cannot work with numbers cannot follow geography maps or understand data in social science. The NIPUN Bharat Mission document rightly calls these skills the "bedrock of all learning" (Ministry of Education, 2021, p. 4). Without them, a child falls further and further behind with every passing yea

3. THEORETICAL BACKGROUND

3.1 Vygotsky's Zone of Proximal Development (ZPD)

The Russian psychologist Lev Vygotsky (1978) gave us a very useful idea called the Zone of Proximal Development, (ZPD). He stated that there are some things a child can do alone, some things a child cannot yet do even with help, and in the middle, things a child can do if someone gives a little support or hint. That middle zone is the ZPD, and it is the best place to teach. ICT tools like adaptive learning apps are designed to work exactly in this zone. They give the child a task that is a little bit harder than what the child can do alone, offer a hint or clue if the child is stuck, and celebrate when the child succeeds. This continuous support is difficult for a teacher to give to 40 or 50 children at once, but a well-designed app can do it for every child individually.

3.2 Multimedia Learning Theory

Richard Mayer (2009) studied how people learn from computers. He found that learning is better when information is displayed in both words and graphical pictures together, instaid in

words alone or pictures alone. He called this the principle of multimedia learning. This is very relevant for ICT tools used in foundational education. For example, when a child sees the letter 'A', hears the sound /a/, and sees a picture of an apple at the same time, the learning is much stronger than when the child only sees the letter on a blackboard. Many Indian educational apps like DIKSHA content, Mindspark, and the iSPARK app use this principle by combining animation, sound, and text.

3.3 Constructivism

Jean Piaget's constructivist theory (1972) says that a child catches more information in his existing schema when they actively explore, experiment, and discover not when they passively receive information. ICT tools can support constructivist learning very well. A child playing a number-sorting game on a tablet is actively manipulating numbers, making decisions, and learning from mistakes. This is far more engaging than copying sums from the blackboard. Similarly, when a child uses a digital storybook app and can tap on a word to hear it pronounced, the child is actively constructing meaning rather than just sitting and listening.

3.4 TPACK: What Teachers Need to Know

TPACK is a framework that is described as Technological Pedagogical Content Knowledge, or TPACK. This framework says that a teacher who wants to use ICT effectively must know three things together: the subject content (what to teach), the teaching method (how to teach), and the technology (which tool to use and how). A teacher who only knows the technology but does not know how to connect it to classroom teaching will not be effective. This is why teacher training is so critical for ICT integration in Indian schools (Mishra and Koehler, 2006).

4. ROLE OF ICT IN DEVELOPING FOUNDATIONAL LITERACY

4.1 Learning Letters and Sounds Through Digital Tools

Knowing that written letters represent spoken sounds is one of the earliest and most crucial steps in learning to read. We refer to this as the alphabetic principle. Because they are being taught to read in a language other than the one they speak at home, many Indian youngsters find this stage difficult. ICT can help here in powerful ways. Apps that play the sound of a letter when a child touches it on a tablet screen help children connect written symbols to spoken sounds in a direct and immediate way. Neumann and Neumann (2014) found that young children learn letter-sound connections more easily on touch screens than on paper because touching a letter and immediately hearing its sound creates a very clear mental link.

Thousands of pieces of content in more than 30 languages, including Hindi, Tamil, Telugu, Marathi, Bengali, Kannada, Gujarati, and Odia, are available on the DIKSHA platform in India. Teachers can use DIKSHA videos and interactive exercises to teach the sounds and shapes of letters in the child's own regional language. A study by Lall and Saeed (2021) on technology-assisted literacy in low-resource government schools in India found that children who used phonics apps in their mother tongue showed greater improvement in reading than those who used apps only in the medium-of-instruction language.

4.2 Developing Vocabulary Through Digital Storybooks and Video

Children who know more words understand more of what they read. This seems obvious, but building vocabulary takes time and a lot of exposure to language. ICT offers an enormous advantage here: a child can watch an animated story with colourful characters, hear new words spoken clearly, see pictures that show what the word means, and interact with the story all in one sitting. This is far richer than most classroom resources available in a typical government primary school.

Digital storybooks are one of the most studied tools in this area. A study established that children who used e-learning books with audio narration, word highlighting, and vocabulary pop-ups learnt significantly more new words than children who only listened to a teacher read a paper book (Shamir et al., 2012). In the Indian context, platforms like Pratham Books' StoryWeaver (available in over 300 languages) and the Bookbox animated storybooks app provide culturally relevant digital stories in regional languages, making them especially suitable for Indian classrooms. Kothari and Bandyopadhyay (2015) reported positive vocabulary gains among early primary children in West Bengal who used Bookbox videos as part of regular Hindi and Bengali literacy instruction.

4.3 Building Reading Fluency With Audio Support

Reading fluency means being able to read at a smooth, natural pace not slowly sounding out each letter but reading whole words and sentences quickly and correctly. Fluency is important because a child who reads fluently can focus mental energy on comprehending internal meaning rather than on decoding specific words. ICT supports fluency development in two main ways: first, by providing audio models (the child hears a skilled reader and then tries to read the same text); and second, through repeated reading programmes where the child reads the same short passage multiple times and tracks their own speed.

In India, the Reading Excellence and Development (READ) initiative and similar state-level programmes have started using audio-supported reading on tablets and phones to build fluency among early primary children. Chang and Lu (2019) reviewed research on

technology-assisted oral reading and found that children who practised reading aloud with digital audio support made significantly greater gains in fluency and reading speed compared to children who did not have this support. These findings are encouraging for India, where the shortage of trained reading teachers makes one-to-one reading support nearly impossible.

4.4 Helping Children Who Struggle to Read

Every classroom has some children who find reading much harder than their classmates. In India, children with reading difficulties are often assumed to be inattentive or not studying enough, when in fact they may have specific learning needs that require a different kind of support. ICT tools can provide this support in patient, non-judgmental ways. Adaptive learning systems that automatically adjust difficulty level that rooted on the child's responses ensure that a struggling reader is never asked to do something far beyond their current ability, and is always given the right level of challenge. Hurwitz and Hurwitz (2021) found that struggling readers in early primary grades who used an adaptive reading app for 20 minutes per day over one school year made significantly more progress than those who received only regular classroom instruction.

5. ROLE OF ICT IN DEVELOPING FOUNDATIONAL NUMERACY

5.1 Building Number Sense With Digital Games and Apps

Number sense is the ability to understand quantities, compare numbers, and see relationships between them is the most basic and important numeracy skill. Children with good number sense find it easy to do calculations mentally and to understand whether an answer is reasonable. ICT games and apps can build number sense in very engaging ways. A child playing a game where she has to feed the right number of bananas to a monkey, or arrange numbered tiles in order, or estimate whether there are more red balls or blue balls in a jar such activities build number sense through play.

Clements and Sarama (2007) designed the Building Blocks mathematics curriculum, which uses computer games alongside classroom activities to build number knowledge in pre-school and Class I children. Their research showed that children using this combined approach scored significantly higher in number knowledge, counting, and early arithmetic than children in regular classrooms. In India, the Mindspark adaptive learning program developed by Educational Initiatives has been used in several government schools. Research by Muralidharan et al. (2019) investigated that government school children in Delhi who used Mindspark for 90 days made three times more progress in mathematics than students who did

not use it, even though the students using it attended only one extra hour of instruction per day.

5.2 Learning Arithmetic With Interactive Platforms

Addition, subtraction, multiplication, and division are the four basic operations that every child must learn in the foundational and preparatory stages. ICT platforms make arithmetic practice more interesting than paper-based drill exercises by introducing stories, characters, time challenges, and reward systems. More importantly, they give immediate feedback the child knows instantly whether an answer is correct or not, and if it is wrong, a well-designed app shows why it is wrong and guides the child to try again.

The Khan Academy Kids app, which is freely available and works in multiple languages, uses animated characters to teach addition, subtraction, and number patterns to children aged 2 to 8. An independent evaluation by Rivas et al. (2020) found that children who used Khan Academy Kids for 30 minutes per day over 12 weeks showed significant improvement in early maths skills, particularly counting and basic addition. In India, many state governments have added Kha Khan Academy Hindi content to their school ICT programmes because it is free, high quality, and available in the national language.

5.3 Using Virtual Manipulatives

In traditional mathematics teaching, teachers use physical objects stones, sticks, beads, abacus to help children understand number concepts concretely before moving to abstract symbols. These objects are called manipulatives or teaching-learning materials (TLM). ICT offers virtual manipulatives: digital versions of these objects that a child can move, group, split, and rearrange on a screen. Virtual base-ten blocks help children understand place value; virtual fraction strips help children visualise fractions; virtual number lines help children see the order and distance between numbers.

Research by (Packenham & Westenskow., 2013) explored the utilisation of virtual manipulatives, which produced moderate to large improvements in mathematics learning, with the strongest effects for lower-achieving students who needed the most concrete support. For Indian classrooms where physical TLMs are often unavailable or in poor condition, virtual manipulatives on a shared tablet or a smartboard can serve as a cost-effective substitute. GeoGebra, an open-source tool used in many Indian secondary schools, is increasingly being adapted for primary geometry and measurement in Class III onwards.

5.4 Intelligent Tutoring Systems for Maths

A computer program that explains a subject by functioning as a personal tutor is called an Intelligent Tutoring System (ITS). It keeps track of precisely what a child knows and does not

know, pinpoints certain mistakes or misunderstandings, and then offers focused practice and guidance to fill in those particular gaps. Ma et al. (2014) reviewed 107 studies on ITS in mathematics and reading and found an average improvement of about two-thirds of a standard deviation which is a large and practically meaningful gain compared to traditional classroom teaching alone.

In India, the LEAD School platform and similar ed-tech companies are developing ITS-like adaptive systems for primary mathematics. The potential of ITS is especially significant in India because class sizes in government schools often exceed 40 or even 50 children, making truly individualised teaching by a single teacher almost impossible. An ITS, running on a shared tablet, can simultaneously give each of 10 or 20 children their own personalised practice session.

6. CHALLENGES IN USING ICT FOR FOUNDATIONAL LEARNING IN INDIA

6.1 The Digital Divide

The biggest challenge for ICT-based education in India is the implementation gap in case of the digital divide between children having access to technical devices and the internet and those who do not have availability of those technical facilities. The (UDISE+) Unified District Information System for Education Plus data from (2022-23) showed that while about 52 per cent of government schools in India had computers, only about 27 percent had internet connectivity, and only about 10 per cent of primary schools (Classes I to V) had functional computer labs (Ministry of Education, 2023). In remote, hilly, or tribal areas, access is even lower.

The COVID-19 pandemic made this problem very visible. When schools were closed, children from wealthy families in cities studied on smartphones and laptops, while millions of children in villages had no device at all. UNICEF India (2021) estimated that about 247 million school-going children were affected by school closures, and a large majority of them, especially in rural areas, could not access digital learning during this period. Warschauer and Tate (2022) have cautioned that giving devices alone without connectivity, content, and teacher support does not close the learning gap it can actually widen it if only some children benefit.

6.2 Teacher Readiness and Training

A digital device in a classroom is only as useful as the teacher who is using it. Many primary school teachers in India especially in rural government schools have not received adequate training in using digital tools for teaching. A survey by the Central Square Foundation (2021)

found that while about 70 per cent of primary teachers in India owned a smartphone, fewer than 30 per cent had received any structured training on using digital tools for classroom instruction. Without such training, teachers either do not use available technology or use it in passive, ineffective ways such as simply showing a video instead of using it as a starting point for interactive discussion.

Initiatives like the National Initiative for School Heads and Teachers' Holistic Advancement (NISHTHA) have attempted to address this gap. NISHTHA has trained over 25 lakh primary school teachers across India in modules that include ICT integration and FLN strategies (Ministry of Education, 2022). However, observers have noted that online training, while reaching large numbers, does not always change classroom practice unless it is followed up with school-level mentoring and support (Kapur et al., 2022).

6.3 Language and Content Diversity

India is a multilingual nation where many people speak various dialects of the 22 official languages. Children in many parts of India speak languages for which digital educational content is either very limited or not available at all. Even on platforms like DIKSHA, most content is available only in Hindi and English, with partial coverage in about 10 to 12 regional languages. Content in tribal languages, which are the home languages of about 10 crore children in India, is extremely scarce (Jhingran, 2005).

When digital content is available in a single language, the child faces difficulties comprehending, it does not help foundational learning; it may actually confuse the child further. The NEP 2020 emphasises multilingual education and the development of content in home languages (Ministry of Education, 2020), but translating and creating high-quality digital educational content in all Indian languages requires substantial investment and time.

6.4 Quality and Alignment of Digital Content

Not all digital content is good content. The internet and app stores are full of educational apps for children, but many of them are designed for entertainment rather than for systematic learning. They may not follow a proper sequence of skills, may not align with the Indian school curriculum, and may not be based on evidence about how children actually learn. Teachers and parents who do not have the knowledge to evaluate app quality may give children apps that are entertaining but not genuinely educative.

Research that reviewed instructional technology discovered that the effect sizes of various programs varied greatly; some showed significant advances, while others produced virtually no improvement at all (Cheung and Slavin, 2013). The key difference was usually the quality of instructional design and the alignment between the digital content and the classroom

curriculum. In India, the government has tried to address this through DIKSHA's quality review process, but private app markets remain largely unregulated for educational quality.

7. RECOMMENDATIONS FOR TEACHERS, SCHOOLS, AND POLICY-MAKERS

7.1 For Classroom Teachers

Teachers should use ICT as a support tool, not as a replacement for direct teaching. The most effective approach is called blended learning a combination of teacher-led instruction and digital practice. For example, the teacher might teach a phonics lesson using the blackboard and flashcards, and then allow children to practise the same sounds on tablets for 15 to 20 minutes. This way, the digital tool reinforces what the teacher has already taught. Teachers should also pay attention to individual children's progress on digital platforms, as many adaptive apps generate reports showing which children are struggling and which concepts they need more practice on. Using this data to guide follow-up instruction is a powerful way to make ICT work in the classroom.

7.2 For School Principals and Leaders

School leaders play a critical role in creating a school culture where ICT is used thoughtfully and regularly. Principals should ensure that devices are maintained in working condition, that charging and storage facilities are available, and that there is a regular timetable for ICT use in foundational classes. More importantly, school leaders should invest in ongoing teacher support not one-time training workshops, but regular peer-learning sessions where teachers share what is working and what is not. Observing classes where ICT is used effectively and discussing the lessons learnt is one of the most powerful forms of professional development (Darling-Hammond et al., 2017).

7.3 For Policy-Makers and Programme Designers

Policy-makers must prioritise equitable access to ICT infrastructure, especially in rural and remote schools. This includes not just providing devices but also ensuring relia0ble electricity, internet connectivity, and device maintenance support. The PM eVIDYA initiative and the PM SHRI schools programme are steps in the right direction, but implementation must be monitored closely to ensure that schools in the most disadvantaged areas are not left behind (Ministry of Education, 2021).

Digital content must be developed in local and tribal languages, not just in Hindi and English. States should be encouraged and funded to develop ICT content aligned with their local language curricula, as several states notably Kerala, Tamil Nadu, and Karnataka have already done with some success. Furthermore, content should be designed according to evidence-

based principles of instructional design, and should be independently evaluated before being scaled up (UNESCO, 2023).

Privacy and safety of children using digital platforms must also be protected. Child data collected by educational apps must be governed by strict data protection rules, and parents must be informed about how their children's data is used. A useful framework for protecting children's rights in digital environments is provided by the United Nations Convention on the Rights of the Child's General Comment No. 25 (United Nations, 2021).

8. CONCLUSION

India is at a critical moment in its educational journey. The National Initiative for Proficiency in Reading with Understanding Numeracy (NIPUN Bharat) has set a bold and necessary goal: ensuring that each child in India should achieve FLN by the end of Class III. Achieving this goal will require every available resource, and ICT is one of the most powerful resources at our disposal. As this paper has shown, well-designed digital tools can help children learn letter sounds, build vocabulary, improve reading fluency, develop number sense, practice arithmetic, and explore mathematics with virtual manipulatives. Adaptive platforms can give every child personalized practice in a way that no single teacher with 40 children in a classroom can easily provide.

However, this paper has also been honest about the limitations. ICT alone cannot solve the foundational learning crisis. It needs good teachers who understand how to use it purposefully. It needs content in the child's own language. It needs infrastructure that actually works. And it needs a genuine commitment to equity, ensuring that the benefits of digital learning reach children in rural schools, tribal communities, and economically poor families, not just those in well-resourced urban schools.

The National Education Policy (NEP 2020) has given a clear and inspiring vision for foundational education. ICT, used wisely and equitably, can play a powerful supporting role in making that vision a reality. The challenge and the responsibility now lie with teachers, school leaders, program designers, and policymakers to ensure that every child, wherever she lives and whatever language she speaks, gets the benefit of good teaching supported by the best tools available.

REFERENCES

1. ASER Centre. (2023). Annual Status of Education Report (Rural) 2022. ASER Centre. https://www.asercentre.org/
2. Central Square Foundation. (2021). State of the sector report: Primary education in India 2021. Central Square Foundation.
3. Chang, A. C.-S., & Lu, Y. (2019). Using automated speech recognition to improve learner fluency: A meta-analysis. TESOL Quarterly, 53(3), 682-706. https://doi.org/10.1002/tesq.499
4. Cheung, A. C. K., & Slavin, R. E. (2013). The effectiveness of educational technology applications for enhancing mathematics achievement in K-12 classrooms: A meta-analysis. Educational Research Review, 9, 88-113. https://doi.org/10.1016/j.edurev.2013.01.001
5. Clements, D. H., & Sarama, J. (2007). Effects of a preschool mathematics curriculum: Summative research on the Building Blocks project. Journal for Research in Mathematics Education, 38(2), 136-163. https://doi.org/10.2307/30034954
6. Clements, D. H., & Sarama, J. (2014). Learning and teaching early math: The learning trajectories approach (2nd ed.). Routledge.
7. Darling-Hammond, L., Hyler, M. E., & Gardner, M. (2017). Effective teacher professional development. Learning Policy Institute.
8. Hurwitz, L. B., & Hurwitz, S. (2021). App-based supplementary reading instruction for students at risk for reading difficulties. Journal of Educational Computing Research, 59(3), 401-430. https://doi.org/10.1177/0735633120963207
9. Jhingran, D. (2005). Language disadvantage: The learning challenge in primary education. A.P.H. Publishing.
10. Jordan, N. C., Kaplan, D., Ramineni, C., & Locuniak, M. N. (2009). Early math matters: Kindergarten number competence and later mathematics outcomes. Developmental Psychology, 45(3), 850-867. https://doi.org/10.1037/a0014939
11. Kapur, S., Bhatt, D., & Srivastava, R. (2022). NISHTHA and teacher professional development: Lessons from implementation. Azim Premji University Working Paper Series.
12. Kothari, B., & Bandyopadhyay, T. (2015). Read India: A mass-scale, rapid literacy campaign. In J. Limage (Ed.), Democratizing education and educating democratic citizens (pp. 145-162). Routledge.

13. Lall, M., & Saeed, A. (2021). Youth, education and technology in South Asia. UCL Press.
14. Ma, W., Adesope, O. O., Nesbit, J. C., & Liu, Q. (2014). Intelligent tutoring systems and learning outcomes: A meta-analysis. Journal of Educational Psychology, 106(4), 901-918. https://doi.org/10.1037/a0037123
15. Mayer, R. E. (2009). Multimedia learning (2nd ed.). Cambridge University Press.
16. Ministry of Education. (2020). National Education Policy 2020. Government of India. https://www.education.gov.in/nep/about-nep
17. Ministry of Education. (2021). NIPUN Bharat: National Initiative for Proficiency in Reading with Understanding and Numeracy-Guidelines for implementation. Government of India.
18. Ministry of Education. (2022). NISHTHA 3.0: Annual progress report 2021-22. Government of India.
19. Ministry of Education. (2023). UDISE+ 2022-23: Unified District Information System for Education Plus. Government of India.
20. Mishra, P., & Koehler, M. J. (2006). Technological pedagogical content knowledge: A framework for teacher knowledge. Teachers College Record, 108(6), 1017-1054. https://doi.org/10.1111/j.1467-9620.2006.00684.x
21. Moyer-Packenham, P. S., & Westenskow, A. (2013). Effects of virtual manipulatives on student achievement and mathematics learning. International Journal of Virtual and Personal Learning Environments, 4(3), 35-50. https://doi.org/10.4018/jvple.2013070103
22. Muralidharan, K., Singh, A., & Ganimian, A. J. (2019). Disrupting education? Experimental evidence on technology-aided instruction in India. American Economic Review, 109(4), 1426-1460. https://doi.org/10.1257/aer.20171365
23. National Reading Panel. (2000). Teaching children to read: An evidence-based assessment of the scientific research literature on reading and its implications for reading instruction. National Institute of Child Health and Human Development.
24. Neumann, M. M., & Neumann, D. L. (2014). Touch screen tablets and emergent literacy. Early Childhood Education Journal, 42(4), 231-239. https://doi.org/10.1007/s10643-013-0608-3
25. Piaget, J. (1972). The psychology of the child. Basic Books.
26. Rivas, M. O., Mayberry, M., & Yeager, B. (2020). Khan Academy Kids: A comprehensive study of early learning outcomes. Digital Promise Global.

27. Shamir, A., Korat, O., & Fellah, R. (2012). Promoting vocabulary, phonological awareness and concept about print among children at risk for learning disability: Can e-books help? Reading and Writing, 25(1), 45-69. https://doi.org/10.1007/s11145-010-9247-x
28. UNESCO. (2023). Global education monitoring report 2023: Technology in education — A tool on whose terms? UNESCO Publishing. https://doi.org/10.54676/UZQV8501
29. UNICEF India. (2021). COVID-19 and children in India: Situation report. UNICEF India Country Office.
30. United Nations. (2021). General comment No. 25 (2021) on children's rights in relation to the digital environment. Committee on the Rights of the Child.
31. Vygotsky, L. S. (1978). Mind in society: The development of higher psychological processes. Harvard University Press.
32. Warschauer, M., & Tate, T. (2022). Digital equity and educational technology. In M. Warschauer & Y. Zheng (Eds.), The handbook of technology and second language teaching and learning (2nd ed., pp. 415-428). Wiley-Blackwell.