Research Article

Exploring School Teacher ICT Competency, Awareness, and Challenges in using Technology in the Classroom Teaching and Learning: Consequences for Pedagogical Alignment and Policy Frameworks

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Abstract

The present study explores the use of information and communication technology (ICT) skills, awareness, and difficulty faced by school teachers in using ICT for classroom teaching and learning. The objective of the research is to find the current levels of ICT competency among school teachers, to examine the benefits and challenges of using ICT in teaching practices, and to determine the ICT-related training requirements for educators. We self-administered the questionnaire in printed copies to 85 in-service school teachers in the Jaintia Hills District of Meghalaya. Findings show that teachers never use ICT applications for teaching. Another finding indicated that the majority of teachers claimed to be unaware of the Ministry of Education's digital education initiatives. Overall research findings demonstrate teachers strongly agree on the benefits and challenges of incorporating ICT into teaching practices. Furthermore, school teachers expressed a desire to receive ICT-related training in the future, pedagogical alignment, and policy frameworks to address identified challenges effectively. In conclusion, this study highlights the significance of appreciating the advantages as well as the difficulties of incorporating ICT into instructional strategies.

Keywords: ICT incorporation, teaching and learning, Learning Management Systems (LMS), digital initiatives, blended learning.

Introduction

ICT stands for information and communication technology. It pertains to the process of accessing information through information technology. Today's education field extensively uses computers, the Internet, and electronic delivery systems like radios, televisions, and projectors, among other ICT tools. According to UNESCO (2020), ICT increases educational opportunities by enabling learning to happen anywhere, at any time. The 1992 update to the National Policy on Education strongly emphasised the application of ICT to enhance educational standards. The framework has also emphasised how crucial ICT is to education (NCF, 2005). However, the current global pandemic, COVID-19, has only partially utilised ICT in education and has not fully integrated it into the LMS platform. The epidemic has significantly altered the functioning of the Indian educational system, incorporating ICT in a manner that simplifies its adaptation and support of students' educational needs. During COVID-19, teachers used computers, smartphones, the internet, and other devices to teach students from the comfort of their homes via the online platform. (Gurung, 2021). However, integrating ICT into the classroom presents challenges, especially in areas where there is a

digital divide and teachers lack access to technology. (Selwyn, 2011). Teachers in areas like Jaintia Hills District of Meghalaya exemplify this situation. The infrastructural constraints and physical isolation compound the digital divide (Lyngdoh, 2017).

This introduction situates the study within the broader address on ICT in education, highlighting its transformative potential and the persistent challenges posed by the digital divide. It underscores the relevance of the study in the specific context of Meghalaya's Jaintia Hills and sets the stage for examining strategies to report the digital divide and promote ICT incorporation in pedagogy.

Statement of the problem

Although the significance of ICT in education is becoming more widely acknowledged, less is known about the difficulty and experiences faced by teachers when incorporating ICT into teaching and learning. Despite the advantages of ICT integration, more research is still needed to identify the challenges teachers encounter in actually utilising ICT in the classroom for teaching and learning. Supporting and improving ICT incorporation in education may not have effect if teacher experiences and difficulties are not fully understood. The Indian Ministry of Education introduced the National Policy on ICT in School Education to encourage teachers to use ICT more often (DSEL Policy, 2012). Eighty-four (84) percent of teachers noted they had trouble teaching online in a recent survey. Most educators lack the skills and experience required to oversee and instruct in an online learning environment. (Bao, 2020).

The current study aims to report on the critical need to bridge the digital gap among school teachers in rural areas in the District of Meghalaya. The objective is to improve teaching methods, encourage student centred learning, and develop digital literacy in this underprivileged area by equipping teachers with ICT competencies.

Research Questions

Q1. What are the ICT levels of school teachers in terms of classroom teaching and learning?

Q2. What are the benefits and challenges of integrating ICT into teaching and learning practices?

Q3. What are the training needs of teachers for incorporating ICT into classroom teaching and learning?

Research Objectives

1. To determine school teachers' current ICT competency levels;
2. To determine the benefits and challenges of using ICT in teaching and learning practices;
3. To identify the teacher training needs for integrating ICT into classroom teaching and learning practices.

Literature Review

In Umar and Yusoff's (2014) research on teachers in Malaysia, no association was found between the years of service of teachers and their perceptions of the impact of ICT use on students' learning and their impact on teaching and learning. Additionally, the survey showed that junior instructors utilise ICT more frequently than senior teachers do for generating presentations and delivering reading materials, looking for educational resources, and teaching-learning.

In a study conducted in 2014 by Simon and Lydiah at Kenya's public secondary schools, there is a low degree of teacher

awareness regarding ICT integration readiness. Even though 90 per cent of teachers stated that computer literacy increased national advantages, yet many have not incorporated ICT into secondary education in public schools.

According to a 2015 study by Ghavifekr and Rosdy, ICT integration had benefited both the teachers and students equally. The results also demonstrate that the capacity of teachers to use ICT tools for lesson planning and learning material preparation is the key success element for technology-based teaching- learning.

Davis (2015) stated that the application of ICT has become essential to modern education, greatly impacting the technique of classroom teaching-learning. Studies have indicated a clear correlation between teachers' ICT skills and their capacity to improve learning outcomes through the application of these tools.

Bhattacharjee and Deb (2016) in their study on the "role of ICT in 21st century teacher education" stated that teachers need to understand how to use ICT in their subject areas to support learners more effectively.

A study by Lalchhanhimi (2016) found that between 94 per cent and 95 per cent of teachers and students from both DIETs pointed that using ICT makes them feel uncomfortable, but it also helps them learn things more quickly. Additionally, they reported that ICT enhanced their classroom teaching and that it might increase educational standards by 56 per cent to 67 per cent and 75 per cent to 94 per cent, respectively.

Arigusman (2019) explored the teachers' ICT readiness, implementation of ICT use, and challenges and found that 86 per cent of the teachers have already had good ICT skills, while 14 per cent of them still have low skills.

According to Hassan and Mirza (2020), in addition to knowing how to utilise ICT, teachers need to apply it to enhance classroom teaching-learning. The determination of ICT as a pedagogical tool for learning cannot be fulfilled by using it as a simple teaching tool in a passive manner; rather, application of ICT technology must lead to the development of new learning environments to meet the demands of learners.

The study conducted by Subaveerapandiyan and Nandhakumar in 2021 focused on the integration of ICT and the proficiency of teacher educators in online instruction amidst the epidemic in India. Zoom and Google Meet are the most highly suggested online platforms to use.

Lameras and Moumoutzis (2021) present a digital competency framework and show that teachers may need to learn digital skills in order to make a positive, welcoming digital learning space where synchronous and asynchronous learning tools can be used to plan flexible, activity-based learning.

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Prodani et al. (2022) try to identify and analyse the factors that make a high school teacher in southeastern Albania integrate the application of digital technologies in the classroom. These factors were used to analyse the correlation between them employing the Pearson correlation coefficient.

Jiang (2023) expresses the importance of aligning technology use with pedagogical goals, supporting active learning, and meeting the varied needs of students, as well as the need for

teacher professional development to facilitate effective integration of technology.

Permata and Purnawarman (2024) emphasise the need for pedagogical adjustments, emphasising that the educational institution or external body should enhance and continue to train teachers in ICT and teaching strategies for better adaptation and enhancement of their teaching methods.

Rawal (2024) investigates the digital competency of school teachers in India and finds that despite government interventions, growth rates of teacher training in computer usage slowed down post-COVID-19. There is a high positive correlation between Teachers' training in computer usage and the availability of computer and Internet facilities in schools

Methodology

Research Design

A purposive sampling design was employed to select in-service school teachers from rural areas of the Jaintia Hills Districts in Meghalaya. These teachers were chosen because they possess unique insights and experiences related to the challenges of teaching in rural areas, which are central to the study's objectives. 85 teachers completed the questionnaires and therefore, they served as the sample of the study.

Tools for data collection

The tools consist of a survey questionnaire in printed copies, which was administered to 85 school teachers. The questions consist of three parts. The first part consisted of a demographic representation of school teachers, in which questions such as gender, age, teacher qualification, years of teaching experience, types of schools, as well as questions about the computer experiences. The second part contains questions on ICT skills and tools used by school teachers, which include questions on ICT competency, use of learning management system (LMS), access, and use of digital education initiatives of NCERT under the aegis of the Ministry of Education, Government of India (NCERT, 2020). The last part consists of questions on ICT training and challenges.

Data analysis

Data were recorded in Excel sheets and SPSS spreadsheets, with each variable labelled and coded for analysis purposes. We assessed the data using SPSS version 28 to obtain the survey results. A descriptive statistical test was used to derive the frequencies, percentages, mean and standard deviation. We displayed the quantitative data in a tabular format, recorded each table's explanation, and recorded the significance results.

Ethical Considerations

The University Research Committee (UREC) granted ethical permission before the data collection. The option to withdraw at any point in time from the study was granted to participants.

Validity and reliability

Validity was assured in this study by positively correlating the research instruments with the core concepts of ICT competency, awareness, and technology use pedagogical implications in classrooms. Validation begins with a review of existing literature, followed by a content validity review by educational experts who assessed the survey.

Cronbach's alpha and a threshold of 0.7 were used to test the internal consistency of the survey instrument, that is, the items of each construct were measuring the same underlying dimension.

Findings and Discussion

Demographic profile of School Teachers

Data in Table 1 demonstrates the demographic profile of school teachers. Most of the teachers fall within the age range of 25-35 (54.1 per cent), a significant gender disparity within the teachers, with females (87.1 per cent) and males (12.9 per cent). Further, it indicates that (12.5 per cent) are graduates and postgraduates (7.3 per cent). The most prevalent category in teacher experiences is 10+ (43.5 percent), followed by 1-3 years (18.3 per cent). The majority of the teachers (17.5 per cent) are teaching in private schools, followed by government 24 (7 per cent). The data shows a wide range of computer experiences in years; among the teachers, the common category is less than 1 year (34.1 per cent) and no experience (38.8 per cent).

Table-1: Demographic profile of School Teachers (n=85)

Variables	Categories	Frequency	Percentage
Gender	Female	74	87.1
	Male	11	12.9
Age	18-24	3	03.5
	25-35	47	55.3
	36-45	15	17.6
	45+	20	23.5
Teacher Qualification	Class X	1	0.3
	Class XII	15	4.4
	Graduate	43	12.5
	Post Graduate	25	7.3

Table 2 demonstrates the representation of school teachers by teaching experiences, types of school, and computer experiences. The most prevalent category in teacher experiences is 10+ (43.5 percent), followed by 1-3 years (18.3 per cent). The majority of the teachers (17.5 per cent) are teaching in private schools, followed by the government 24 (7 per cent). The data shows a wide range of computer experiences in years; among the teachers, the common category is less than 1 year (34.1 per cent) and no experience (38.8 per cent). Similar studies show a range of demographic representation (Ertmer and Ottenbreit-Leftwich, 2010; Ingersoll and Strong, 2011; Ingersoll and Merrill, 2017; OECD, 2019).

Table-2: Teaching experiences, Types of School and Computer Experiences (n=85)

Variables	Categories	Frequency	Percentage
Teaching Experiences	1-3	16	18.8
	10 or more	37	43.5
	4-5	7	8.2
	6-7	10	11.8
	8-9	6	7.1
	Less than 1 year	9	10.6
Types of School	Deficit	1	0.3
	Government	24	7.0
	Private	60	17.5
Computer Experiences	1-3	15	17.6
	10+	4	4.7
	4-5	2	2.4
	8-9	2	2.4
	Less than 1 year	29	34.1
	No Experience	33	38.8

ICT Tools used by School Teachers

Data in Table 3 displays the use patterns of several ICT tools and technologies by teachers. As a result, the majority said they never use ICT tools in the classroom. However, a sizable percentage (48.1 per cent) said they used WhatsApp or Youtube for teaching and learning practices.

Table-3: ICT Tools use by School Teachers (n=85)

ICT competency	Yes (%)	No (%)
PowerPoint Presentation	8.9	32.8
Internet Browsing	15	22
Emailing (Eg. Gmail, Yahoo)	6.6	31
Social media (Whatsapp, Youtube etc)	48.1	11
Word processing (Eg.Word)	16.8	20.6
Spreadsheet (Eg. Excel)	8.4	28.3

Laptop/ PC/ Desktop	5.7	31.9
Mobile phone	10.2	27.5
Projector	24.8	12.8
Interactive whiteboard	5.3	32.3
Microphone / camera/Speakers	14.6	23
Tablets	4	33.7

Access and use of LMS and Digital education initiatives

According to data in Table 4, the majority of teachers are not knowledgeable of how to use LMS and access to digital education initiatives under the aegis of the MoE, Govt. of India (NCERT, 2020). Findings revealed that teachers do not use Google Classroom (80.2 per cent), Moodle (87.6 per cent), Zoom Meet (83.9 per cent), and Google Meet (76.5 per cent) for teaching learning practices. Further data presents the awareness levels of school teachers regarding the access and use of digital education initiatives. A portion of teachers are not knowledgeable of ePathshala (71.6 per cent), NISHTHA (84.9 per cent), Diksha (70.7 per cent), Swayam Prabha (81.3 per cent), and SWAYAM (68.9 per cent). This analysis sheds light on the lack of awareness and knowledge about the NCERT digital projects. It draws attention to suggest recommendations to address this issue. Similar studies suggested that Zoom and Google Meet are the most highly suggested LMS platforms to use (Subaveerapandiyan and Nandhakumar's, 2021). Further other related findings indicated that the absence of awareness among teachers about these initiatives can limit their capacity to leverage available resources (Kumar and Kumar, 2021).

Table-4: LMS and Digital education initiatives use by Teachers (n=85)

Use of LMS	Yes (%)	No (%)
Google Classroom	19.8	80.2
Moodle	12.3	87.6
Zoom meet	16	83.9
Google meet	23.4	76.5
Digital Education Initiatives	Yes (%)	No (%)
ePathshala	0.6	71.6
NISHTHA	3.4	84.9
Diksha	4.4	70.7
Swayam Prabha	1	81.3
SWAYAM	3.1	68.9

ICT Training for Teachers

Data in Table 5 presents responses regarding ICT training among teachers. 45.3 per cent of teachers have not received ICT related training programs. 22.0 per cent of teachers indicate that involvement in ICT training is compulsory, while 34.7 per cent of teachers stated that it is not compulsory. 69.3 per cent of teachers express a desire to receive ICT-related training in the future. Professional development is crucial; ongoing training helps teachers translate ICT knowledge into effective classroom practices. A similar study expressed that limited teacher training and digital skills among teachers pose barriers to utilising ICT tools in pedagogy (Ertmer, Ottenbreit-Leftwich, and Tondeur, 2015; Zinger et al., 2017; Saxena, 2017; Rawal, 2024).

Table-5: ICT Training for Teachers (n=85)

ICT Training	Yes (%)	No (%)
Have you received ICT-related training program in your school or elsewhere?	11.3	45.3
Are teachers in your school required to take ICT training?	22.0	34.7
Would you like to received ICT related training in future?	69.3	6.8

Challenges faced by School Teachers

Table 6 presents various problems associated with the incorporation of ICT in education. Result provides understandings into the various challenges faced by teachers when ICT is used for teaching and learning practices. Lack of knowledge on ICT use (46.6 per cent), lack of technical support (52.5 per cent), access and network connection issues (52.4 per cent), and absence of fundamental ICT facilities like printers, whiteboards, PCs, and projectors (50 per cent) are the major challenges expressed by school teachers. It identifies potential areas for improvement or interventions to enhance the effective use of ICT in educational environments. Common obstacles include inadequate training, lack of access to resources, and the rapid pace of technological change, which can overwhelm educators. The gaps and needs for involvement, teachers desire for further ICT training, and the challenges in incorporating ICT into education are addressed in similar studies (Ertmer et al., 2012; Admiraal et al., 2017; Saxena, 2017; Zinger et al., 2017).

Table-6: Challenges faced by Teachers (n=85)

Challenges	Yes (%)	No (%)
Lack of knowledge about how to make full use of ICTs	46.6	18.6
Lack of technical support	52.5	12.7
Lack of time	43.3	22

Access and network connection issues	52.4	12.7
Lack of understanding about how to incorporate ICTs into teaching	44	21.2
Lack of basic ICT services in schools (printer, whiteboard, PC, projector)	50	15.3
Security and safety issues	40.7	24.6
Inadequacy of training	47.5	17.8
Inadequacy of teachers' skills	44.1	21.2

Positive impact of ICT uses in education

Table 7 displays the teachers' perceptions of the beneficial effects of ICT. The study highlights the advantages of teachers using ICT, including how it affects learning, engagement, communication, and skill development. The results demonstrate that the majority of teachers have favourable views regarding the integration of ICT into the classroom. Teachers' evaluations of the advantages of using ICT in the classroom highlight several significant benefits, including improved communication, increased student engagement, improved learning, and skill development, which have been addressed in similar studies (Higgins et al. in 2012, Means et al. in 2013, Voogt et al. in 2013, Davis in 2015, Ghavifekr and Rosdy in 2015, Hassan and Mirza in 2020, and Lameras and Moumoutzis in 2021).

Table-7: Positive impact of ICT uses in education

Positive impact of ICT	Strongly Agree	Agree	Neither Agree nor Disagree	Strongly Disagree	Disagree
ICT improves subject learning	3.8	21.2	3.5	0	0
ICT use encourages learning	4.9	19.8	3.1	0.3	0.3
ICT improves engagement and knowledge retention	4.5	19.8	4.2	0	0
Ease of use and quick sharing of notes or materials	4.2	14.9	8.0	1.4	0
Promote working in group projects	4.2	20.5	3.8	0	0
Encourage interaction with teacher/students	4.5	20.5	3.1	0	0
Flexibility, learn anytime and anywhere	4.5	18.4	5.2	0.3	0

Improves the modes of communication	3.5	21.5	3.5	0	0
Skills in technology increase	4.5	20.8	3.1	0	0
ICT for multimedia resources and support like texts files, images, audios files, videos files	3.5	20.1	4.5	0.3	0

Attitude towards the use of ICT in classroom

Table 8 presents the attitudes of a teacher associated with use of ICT in education. A considerable number of teachers concur that utilising ICT is a positive experience (46.6 per cent), that it should be a priority in school education (43.1 per cent), that they implement ICT because of school policies (39.7 per cent), that ICT enhances student engagement (46.6 per cent), that ICT encourages further exploration (43.1 per cent), that I use ICT in my class (40.5 per cent), and that we should encourage teachers to use ICT in the classroom (40.5 per cent). A notable percentage (12.9 per cent) of teachers disagree with the statement that ICT is a waste of time due to technical issues, with a smaller portion expressing agreement. Few teachers agree (23.3 per cent) that ICT is not effectively used in education, with a notable portion expressing neutrality or disagreement. A significant percentage of teachers agree (40.5 per cent) that students learn better when incorporating ICT for classroom teaching and learning. Similar findings indicate a generally positive perception of ICT among teachers, with recognition of its benefits for student engagement and learning (Kurt, 2010; Means et al., 2013; Ertmer et al., 2015; OECD, 2018).

Table-8: Attitude towards the use of ICT in classroom

Attitude	Strongly Agree	Agree	Neither Agree nor Disagree	Strongly Disagree	Disagree
Using ICT is a good experience	18.1	46.6	6.9	0	0
ICT should be a preference in school education	13.8	43.1	13.8	0	0
I use ICT because it is necessary by school policy	4.3	39.7	17.2	1.7	8.6
ICT in the classroom make the topic or subject more engaging for students	13.8	46.6	6	0	5.2
ICT makes the students to explore further	17.2	43.1	11.2	0	0
I enjoy and prefer to utilised ICT in my class	12.1	40.5	13.8	0	5.2

Teacher should be encouraged for applying ICT in classroom	16.4	40.5	9.5	0	5.2
Because of technical issues ICT is total waste of time	8.6	20.7	19.8	8.6	12.9
ICT is not use in education effectively	0.9	23.3	27.6	5.2	13.8
Students learn better when incorporating ICT for classroom teaching and learning	6.5	40.5	20.7	0	0

Conclusion

In conclusion, the study brought to light the difficulties and barriers that educators face while incorporating ICT into the classroom. The study assessed teachers' perceptions of Learning Management System (LMS) and their level of ICT proficiency. The result shows that teachers have little idea how to apply ICT in the classroom for teaching and learning and are not aware of digital education initiatives. Nonetheless, many teachers are aware of the potential benefits and difficulties associated with incorporating ICT into their classroom. However, teachers have stated that they would want more ICT-related training in the future. In conclusion, it will take consistent work from various stakeholders to bridge the digital divide in Meghalaya's Jaintia Hills. In-service teachers can be empowered, and local children's educational programs can be improved by investing in infrastructure, creating digital content, offering focused teacher training, and encouraging community involvement. These suggestions provide feasible policies to close the digital gap and guarantee that every student may take advantage of the benefits of the digital revolution in education.

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References

Admiraal, W., Louws, M., Lockhorst, D., Paas, T., Buynsters, M., Cviko, A., ... & Kester, L. (2017). Teachers in school-based technology innovations: A typology of their beliefs on teaching and technology. *Computers & Education, 114*, 57-68.

Anoop, Saxena. (2017). Issues and Impediments Faced by Canadian Teachers While Integrating ICT in Pedagogical Practice. *Turkish Online Journal of Educational Technology*, 16(2):58-70.

Anggi, Arigusman. (2019). The use of ICT in efl classrooms: teachers' readiness, implementation, and challenges.

Bao, W. (2020). COVID-19 and online teaching in higher education: a case study of Peking University. *Human Behavior and Emerging Technologies, Wiley,* Vol. 2 No. 2, pp. 113-115, doi: 10.1002/hbe2.191.

Davis, N. (2015). Global and local perspectives on ICT in education. *Educational Technology & Society*, 18(2), 37-40.

Department of School Education and Literacy, Ministry of Human Resource Development Government of India, 2012.

D., Rawal. (2024). Mapping of school teachers' digital competency in the context of digital infrastructure: a systematic review and empirical study of India. *Journal of professional capital and community,* doi: 10.1108/jpcc-01-2024-0016

Doron, Zinger., Tamara, P., Tate., Mark, Warschauer. (2017). Learning and Teaching with Technology: Technological Pedagogy and Teacher Practice. 577-593. doi: 10.4135/9781526402042.N33

Ertmer, P. A., Ottenbreit-Leftwich, A. T., Sadik, O., Sendurur, E., & Sendurur, P. (2012). Teacher beliefs and technology integration practices: A critical relationship. *Computers & education, 59(2),* 423-435.

Ertmer, P. A., Ottenbreit-Leftwich, A., & Tondeur, J. (2015). Teachers' beliefs and uses of technology to support 21st-century teaching and learning. *International handbook of research on teachers' beliefs,* 403-418.

Gurung, S. (2021). Challenges faced by teachers in online teaching during covid-19 pandemic. *The Online Journal of Distance Education and e-Learning*, Volume 9, Issue 1

Ghavifekr, S., & Rosdy, W. (2015). *Teaching and Learning with Technology: Effectiveness of ICT Integration in School.* Retrieved April 16, 2022, from https://files.eric.ed.gov/fulltext/EJ1105224.pdf

Government of India. (2020). National Education Policy 2020. Retrieved from https://www.education.gov.in/sites/upload_files/mhrd/files/NEP_Final_English_0.pdf

Higgins, S., Xiao, Z., & Katsipataki, M. (2012). The impact of digital technology on learning: A summary for the education endowment foundation. *Education Endowment Foundation.*

Hassan, M. M., & Mirza, T. (2020, July). *Impact of ICT in changing the role of a Teacher: An Overview.* Retrieved April 27, 2022, from https://www.researchgate.net

Indah, Wahyu, Permata., Pupung, Purnawarman. (2024). Teacher's Perspective on the Use of ICT in the Classroom: Teacher Elementary School Context. doi: 10.35905/inspiring.v7i1.7096

Ingersoll, R. M., & Strong, M. (2011). The impact of induction and mentoring programs for beginning teachers: A critical review of the research. *Review of Educational Research,* 81(2), 201-233.

Kumar, V., & Kumar, V. (2016). Awareness, use and attitude of students and teachers towards e-learning: A case study of Panjab University Chandigarh, India. *DESIDOC Journal of Library & Information Technology*, 36(1), 26-31.

Kumar, P., & Kumar, A. (2021). Awareness of digital initiatives among school teachers in India. *Journal of Educational Technology,* 18(2), 115-123.

Lalchhanhimi, G. (2016). ICT in Elementary Teacher Education Programmes: Case Studies of DIETs in Aizawl and Lunglei. Retrieved from http://mzuir.inflibnet.ac.in

Lyngdoh, D. T. (2017). Bridging the Digital Divide in Meghalaya. *Economic & Political Weekly*, 52(36), 42-48.

Means, B., Toyama, Y., Murphy, R., Bakia, M., & Jones, K. (2013). The effectiveness of online and blended learning: A meta-analysis of the empirical literature. *Teachers College Record*, 115(3), 1-47.

Minda, Jiang. (2023). The Impact and Potential of Educational Technology: A Comprehensive Review. *Research and Advances in Education*, doi: 10.56397/rae.2023.07.05

National Curriculum Framework (2005). Retrieved from https://ncert.nic.in › nc-framework › nf2005-english

OECD. (2019). PISA 2018 results (Volume II): Where All Students Can Succeed. OECD Publishing.

Petros, Lameras., Nektarios, Moumoutzis. (2021). Towards the Development of a Digital Competency Framework for Digital Teaching and Learning. 1226-1232. doi: 10.1109/EDUCON46332.2021.9454027

Rafail, Prodani., Silvja, Çobani., Aigars, Andersons., Jozef, Bushati. (2022). Digital technologies integration in the classroom. A teacher's perspective. *Cypriot Journal of Educational Sciences,* 17(8):2823-2837. doi: 10.18844/cjes.v17i8.7781

Subaveerapandiyan, A., & Nandhakumar, R. (2021). A Study of Teacher Educators' Skill and ICT Integration in Online Teaching during the Pandemic Situation in India. Retrieved April 16, 2022, from https://digitalcommons.unl.edu

Selwyn, N. (2011). Education and Technology: Key Issues and Debates. London: Continuum International Publishing Group.

UNESCO. (2021). Reimagining education: Guidance for implementing the framework for reopening schools. Paris: UNESCO.

Voogt, J., Erstad, O., Dede, C., & Mishra, P. (2013). Challenges to learning and schooling in the digital networked world of the 21st century. Journal of Computer Assisted Learning, 29(5), 403-413.