The Difficulties Faced by Teachers in Implementing the Smart Schools Project in Iraq

Tabarak Shihab Ahmed Al-Bayati
Center for Continuing Education, University of Baghdad
tabarak.shehab1202a@ircoedu.uobaghdad.edu.iq

Abstract

This research explores the obstacles teachers encounter in executing the Smart Schools initiative within the framework of Iraq, where educational facilities and digital preparedness are still in their early stages. Although worldwide trends reveal the growing use of innovative technologies in education, Iraq has been hindered by systemic barriers, such as archaic curricula, restricted access to technologies, and an unqualified teaching staff. Data were collected using a validated questionnaire on 122 public school teachers working in Baghdad with a descriptive-analytical methodology. The study divided challenges into five areas: infrastructure, teacher preparedness, administrative support, curricular adaptation, and cultural resistance. Data on the overall response rate were analyzed using frequency distributions, and free-text responses were thematically coded. The findings suggest that while most teachers support the idea of smart schools in principle, technological and institutional factors still hamper the realization of such facilities/initiatives. These recommendations serve as the foundation for specific policy reform, professional development programs, and infrastructure investment that will enable sustainable digital transformation in Iraqi education. The paper ends with practical recommendations for policymakers and educational leaders to align aspirations with reality within innovative education.
Keywords: Educational Technology, Iraqi Teachers, Digital Infrastructure, Pedagogical Challenges

Introduction

The development of information and communication technology (ICT) has significantly transformed the global education landscape over the past two decades. Integrating digital technology into the learning process has given rise to *smart schools* promoting adaptive, collaborative, and data-driven learning.[1] Advanced countries such as Finland,[2] South Korea,[3] and Singapore[4] Have successfully leveraged digital infrastructure to enhance learning quality, teacher-student interaction, and educational administrative efficiency. However, in developing countries like Iraq, the implementation of digital education still faces serious challenges, including limited infrastructure, weak internet connectivity, and curricula that do not support technology-based learning.[5] As a result, the digital divide between developed and developing countries in the context of smart school transformation is widening.

Education experts emphasize that the success *of smart schools* is not solely determined by the provision of technological devices, but also by teacher readiness, curriculum flexibility, and government policy support.[6] Teacher training and continuous professional development are key to ensuring that technology truly enhances the quality of learning.[7] Recent research indicates that effective ICT integration must be accompanied by a shift in teaching paradigms, where teachers act as facilitators of active learning rather than mere information providers.[8] In this context, the success of innovative school models is closely linked to an educational ecosystem that supports innovation, collaboration, and pedagogical adaptation.

---

[1] C S Chai, M S Y Jong, and H Yin, "Future-Ready Learning with Smart Schools: A Global Perspective," *Computers & Education* 156 (2020): 103945.

[2] Katariina Salmela-Aro and Jari Lavonen, "The Switch to Distance Teaching and Learning in Finland During the COVID-19 Pandemic (2020–2022) Went Technically Well but Was Emotionally Challenging BT - Schools and Society During the COVID-19 Pandemic: How Education Systems Changed and the Road Ahead," ed. Fernando M Reimers (Cham: Springer Nature Switzerland, 2024), 63–83, https://doi.org/10.1007/978-3-031-42671-1_4.

[3] KoreaTechToday, "South Korea's $70 Million Investment in AI-Powered Learning," 2024, https://koreatechtoday.com/south-koreas-70-million-investment-in-ai-powered-learning/.

[4] Education Above All - Policy Hub, "Singapore Student Learning Space (SLS)" (Singapore: Education Above All, 2024), https://policy-hub.educationaboveall.org/solution/singapore-student-learning-space-sls.

[5] N Al-Khaqani and D Al-Numani, "Challenges of Smart School Implementation in Post-Conflict Iraq," *International Journal of Education and Development* 7, no. 2 (2021): 45–60.

[6] J Voogt et al., "Under Which Conditions Does ICT Have a Positive Effect on Teaching and Learning?," *Journal of Computer Assisted Learning* 34, no. 5 (2018): 515–29.

[7] J H L Koh, C S Chai, and W Y Lim, "Teacher Professional Development for Digital Transformation in Smart Schools," *Educational Technology & Society* 23, no. 2 (2020): 1–14.

[8] W Zhang and C Zhu, "Smart Education in China: Teachers' Motivation and the Integration of Digital Technology," *British Journal of Educational Technology* 52, no. 1 (2021): 65–84.

Although the concept of smart schools is well-known in Iraq, its implementation in the field remains very limited. Major obstacles include insufficient teacher training, resistance to change, particularly from senior teachers, curriculum misalignment with digital platforms, and a lack of sustainable infrastructure and policy support.[9] Meanwhile, existing literature mainly discusses macro-level implementation challenges, such as administrative and policy constraints. Still, few have examined the experiences and perspectives of teachers as key actors in the success *of smart schools*. This situation highlights a research gap that needs to be addressed through an in-depth analysis of the practical challenges teachers face in Iraqi schools when attempting to adopt the innovative school model.

Some studies have examined the implementation of smart schools in various contexts. Ahmed,[10] Investigated the experience of Malaysia, which has integrated ICT comprehensively into its curriculum, teacher training, and school management since 1996. The success of this model heavily depends on government support, adequate funding, and strategic planning; however, this study does not delve deeply into challenges at the classroom level. It emphasizes the three pillars of smart schools: digital content, adaptive teaching, and dynamic assessment, as well as the evolving role of teachers as learning facilitators.[11] While interesting, the study remains theoretical and does not address the realities of schools with limited resources.

Al-Lihyani[12] shows that Saudi Arabia has invested heavily in educational technology, but the gap between urban and rural schools remains high. This study reminds us that digital transformation risks are uneven without inclusive and comprehensive strategies. In a more challenging context, Al-Zain[13] examines Syria and finds that smart schools remain a concept due to post-war economic constraints. He emphasizes that providing devices is insufficient; a relevant digital curriculum, teacher training, and

---

[9] H Al-Obaidi, "Barriers to Digital Education in Iraq: Policy and Practice," *Journal of Education Policy Studies* 12, no. 4 (2020): 88–102.

[10] Ahmed Al-Zahrani, "Idārat Al-Muʿawwiqāt Fī Al-Munazzamāt," *Majallat Al-Irādah Al-Ḥadīthah*, 2018.

[11] Salma Al-Saeedi, *Al-Madāris Al-Dhakiyya: Madrasat Al-Qarn Al-Ḥādī Wa-Al-ʿIshrīn* (Berlin: Dār Farḥah li-al-Nashr wa-al-Tawzīʿ, 2005).

[12] Z Al-Lihyani, "Smart Schools in Saudi Arabia: Digital Transformation and Rural Disparities," *Education and Information Technologies* 25, no. 6 (2020): 5679–98.

[13] Ghroub Muḥammad Rūḥī Al-Zain, "Madā Taḥaqqaq Al-Madāris Al-Dhakiyyah Fī Sūriyā Fī ʿAṣr Al-Iqtiṣād Al-Muʿtamid ʿalā Al-Maʿrifah: Dirāsah Ḥālah ʿalá Majmūʿah Min Al-Madāris Fī Ḥimṣ" (Syrian Virtual University, 2022).

consistent policy support are required. Meanwhile, Al-Khaqani and Al-Numani[14] are among the few studies focusing on Iraq. They identified infrastructure limitations, poor internet connectivity, and insufficient teacher training. Although teachers are optimistic about technology, they feel unprepared to meet the demands of smart schools.

Several studies above show the same findings, namely that the success of smart schools depends on infrastructure, policy support, and teacher readiness. However, most studies still emphasize macro aspects and lack insight into teachers' real experiences, especially in post-conflict countries with limited resources such as Iraq.

This study is different because it focuses on the direct experiences of teachers as the leading actors in the transformation of smart schools in Iraq. This focus provides a more humanistic and realistic perspective, highlighting the daily challenges faced by teachers, ranging from limited resources to a lack of confidence in using technology, to cultural and institutional pressures. The novelty of this research lies in its attempt to understand how teachers interpret these changes and how psychological and social factors play an equally important role as infrastructure. With this approach, this research is expected to not only fill gaps in the literature but also provide more applicable and relevant recommendations for education policy in Iraq, which is struggling to build digital education amid real constraints.

Research Methodology

This research uses a descriptive-analytical method with a mixed-methods approach to comprehensively understand the challenges faced by teachers in implementing smart schools in Baghdad. The mixed[15]). This approach allows researchers to capture quantitative trends in numerical data while exploring teachers' experiences qualitatively through their narratives. The research focuses on five interconnected aspects: infrastructure and technology, teacher readiness and training, administrative support and policies, curriculum alignment with digital learning, and teachers' attitudes and psychological readiness to cope with change.

The research population consists of active teachers in public schools in Baghdad during the 2025 academic year. The sampling technique was purposive, selecting teachers

---

[14] Al-Khaqani and Al-Numani, "Challenges of Smart School Implementation in Post-Conflict Iraq."
[15] John W. Creswell, *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches*, 3rd ed. (Unites States of America: SAGE Publications, 2009).

who had experience using basic information technology or had been involved in innovative school pilot programs. This ensured that each respondent had a relevant understanding of the research topic. The final sample size was 122 teachers from various educational levels, ranging from elementary, junior high, to senior high schools, spread across several districts in Baghdad. This sample size was deemed adequate based on Krejcie and Morgan's table, which indicates that the sample sufficiently represents a population of approximately 200 teachers with a 95 percent confidence level.

The data collection instrument consists of a structured questionnaire containing five-point Likert scale statements aligned with five main challenge categories and open-ended questions to allow teachers to share their experiences in greater depth. Five experts in education and technology validated this instrument, which was then tested on fifteen teachers to test internal consistency. The results, which resulted in a Cronbach's alpha value of 0.87, indicate that the instrument is highly reliable and suitable for field research.

Data analysis was conducted using a quantitative and qualitative approach that complemented each other. Quantitative data from the Likert scale was processed using SPSS version 27 through descriptive statistical analysis to identify the most dominant patterns and frequencies of challenges.[16] This analysis was supplemented with cross-tabulation to examine differences in teachers' experiences across various school levels. Meanwhile, qualitative data from open-ended responses were analyzed using thematic coding techniques. The coding process began with a thorough reading to identify initial patterns (open coding), followed by forming and developing main themes. NVivo 12 was used to help manage and organize qualitative data so that interpretation could be carried out more systematically and consistently. According to the reviewer's instructions, this section does not present descriptive results in numbers or percentages, as all findings will be elaborated on in the Results section.

Research ethics principles were followed when conducting this study. All participants were informed about the study's purpose and procedures and provided informed consent to participate. Data confidentiality was maintained by not collecting personal identifying information, and all research documents were encrypted. This study has also obtained ethical approval from the Faculty of Education, University of Baghdad, with approval number EDU-2025-014.

---

[16] D. Sugiyono, *Metode Penelitian Kuantitatif, Kualitatif, Dan Tindakan*, 2013.

Despite being carefully designed, this study has several limitations. The data used are self-reported, which may contain perceptual biases from the teachers. The limited scope of the study, confined to the Baghdad region, means that the results do not fully represent conditions in other provinces of Iraq. Additionally, the study's cross-sectional design does not allow researchers to monitor changes in teachers' readiness or institutional support over time. These limitations underscore the importance of further research using multi-province samples and longitudinal designs to provide a more comprehensive understanding and support broader policy recommendations.

Multidimensional Barriers to Smart School Adoption in Iraqi Public Schools

A combined quantitative and qualitative analysis of 122 public school teachers in Baghdad revealed five main barriers to smart school implementation: infrastructure limitations, low teacher training and readiness, weak administrative and policy support, curriculum mismatch, and teacher resistance to digital change.

Infrastructure limitations emerged as the most dominant barrier. 82% of teachers stated that their schools did not have stable internet access, smart devices such as *smartboards*, or adequate technical support. Qualitative narratives supported these findings; one teacher said that the computer lab at his school was "rarely used because there was no staff to help with maintenance or support the digital learning process."

Teacher training and readiness also pose significant challenges. Seventy-five percent of respondents admitted that they did not have adequate digital skills to support technology-based learning. Open-ended responses emphasized that teachers need practical and ongoing training rather than brief theoretical briefings.

68% of teachers also rated administrative support and policies as weak. Many respondents revealed that government policies on education digitization were limited to appeals without follow-up in the form of funding, technical teams, or incentives for school innovation.

From a pedagogical perspective, 60% of teachers felt that the national curriculum placed too much emphasis on memorization and linear delivery of material. As a result, integrating digital devices and interactive learning was complex because the curriculum did not support collaborative or project-based models. 48% of respondents, particularly senior teachers, were resistant to change. They feel that traditional methods are safer and

more familiar, and are concerned that technology will increase their workload without adequate technical support.

These results indicate that the barriers to implementing smart schools in Baghdad are multidimensional, with technical, policy, pedagogical, and socio-cultural factors intertwining to form a complex ecosystem.

Systemic Challenges in Implementing Smart Schools in Iraq

The results of this study indicate that implementing smart schools in Iraq is not merely a matter of providing technological devices but rather a systemic challenge involving infrastructure, policy, pedagogical, and socio-cultural factors. These obstacles influence each other and form a cycle of constraints that slow down the digital transformation of education.

Infrastructure as a Weak Foundation

The infrastructure limitations experienced by 82% of teachers indicate that the technical foundation for smart schools in Baghdad remains fragile. Without stable internet access, smart devices, and technical support, teachers lack the ecosystem necessary to enable digital learning innovation. This is consistent with the findings of Al-Ayman Assem and Sherif Abdelmohsen, who emphasize that the digitization of education in Iraq often stalls at the conceptual stage due to the absence of consistent infrastructure.[17] Compared to Malaysia, as revealed in the research findings of Habibah Ab Jalil,[18] or the research findings in the UAE presented by Farah Khaled and Aysha Alghfeli,[19] The success of *smart school* implementation heavily depends on integrated infrastructure investment aligned with teacher training strategies and clear top-down policies.

---

[17] Ayman Assem, Sherif Abdelmohsen, and Mohamed Ezzeldin, "Smart Management of the Reconstruction Process of Post-Conflict Cities," *Archnet-IJAR: International Journal of Architectural Research* 14, no. 2 (2019): 325–43.

[18] Habibah Ab Jalil et al., "Predicting Learners' Agility and Readiness for Future Learning Ecosystem," *Education Sciences*, 2022, https://doi.org/10.3390/educsci12100680.

[19] Farah Khaled and Aysha Alghfeli, "Unlocking Potential: The Impact of Structured Digital Lessons and Self- Assessment Strategies on Mathematics Achievement and Motivation among School Students in the UAE," *Lnternational Electronic Journal of Elementary Education* 17 (April 25, 2025): 445–65, https://doi.org/10.26822/iejee.2025.391.

Fragmented Policies and Administrative Support

Findings that 68% of teachers rated policies as weak confirm that digitalization without a clear national strategy only results in sporadic innovation. Infrastructure limitations and weak policies reinforce each other, creating an unstable educational ecosystem. Some findings from research, as highlighted by Don Passey, [20] Hanifah, [21] Also, the success of digital education in developing countries heavily depends on consistent policies accompanied by adequate incentives and resource allocation. In Iraq, the absence of strategic planning has resulted in teachers working in innovative isolation without institutional support.

Curriculum that Does Not Support Digital Transformation

The findings of this study indicate that a curriculum still focused on memorization limits the implementation of collaborative and project-based learning. Zhi-Ting Zhu, Ming-Hua Yu, and Peter Riezebos, [22] Emphasize that the success of smart schools requires a flexible curriculum that supports the development of 21st-century skills, including creativity, problem-solving, and technology utilization. Ilya Levin, Alexei L Semenov, and Mikael Gorsky highlight the urgency of curriculum flexibility.[23] Specifically, this study emphasizes that without curriculum reform, technology in the classroom will only serve as a presentation tool, not a driver of pedagogical transformation.

Teacher Resistance as a Socio-Cultural Barrier

Resistance from 48% of teachers, particularly among senior teachers, underscores that digital transformation is a psychosocial and technical challenge. This barrier, as

---

[20] Don Passey et al., "Educational Digital Technologies in Developing Countries Challenge Third Party Providers" 19 (January 1, 2016): 121–33.

[21] Hanifah Hanifah, Ida Bagus Putu Arnyana, and I Gede Margunayasa, "Systematic Literature Review: Digital Technology-Based Policy Approaches to Improve the Quality and Access of Basic Education in Developing Countries," *International Journal Education and Computer Studies (IJECS)* 5, no. 2 SE-Articles (n.d.): 87–102, https://doi.org/10.35870/ijecs.v5i2.4337.

[22] Zhi-Ting Zhu, Ming-Hua Yu, and Peter Riezebos, "A Research Framework of Smart Education," *Smart Learning Environments* 3, no. 1 (2016): 4, https://doi.org/10.1186/s40561-016-0026-2.

[23] Ilya Levin, Alexei L Semenov, and Mikael Gorsky, "Smart Learning in the 21st Century: Advancing Constructionism Across Three Digital Epochs," *Education Sciences*, 2025, https://doi.org/10.3390/educsci15010045.

theorized by Sonita Pen and Patricia D Morrell, is called *a second-order barrier*.[24] The success of technology integration heavily depends on technical support, professional training, and supportive leadership. Additionally, the fear of losing control (fear of loss of power) is an essential psychosocial barrier.[25] Teachers require support such as training, infrastructure, and resources, which are particularly important in the early stages of adoption. This facilitation helps teachers recognize the usefulness of technology and build motivation and confidence in using it. Sangeeta and Urvashi Tandon state that the technology adoption requires teachers to have relevant training, institutional support, and the perception that technology simplifies their work.[26] In the Iraqi context, past negative experiences with digitalization programs that were not followed by continuous mentoring reinforce this resistance. This means that resistance is not just an individual issue, but a reflection of an educational ecosystem that is not yet ready to support change.

This study generally makes three main contributions to the literature and educational practice. First, this study expands understanding of smart school implementation in a post-conflict context by highlighting the multidimensional interactions between technical, policy, pedagogical, and cultural factors. Second, this research fills a gap in the literature by presenting teachers' perspectives as key actors in implementation, complementing previous studies that have focused more on macro policies or infrastructure readiness. Third, the findings have practical implications for formulating digital education strategies in Iraq, emphasizing the need for a holistic approach involving infrastructure development, curriculum reform, continuous training, and consistent national policies. Thus, this study reinforces previous findings and offers a conceptual framework for developing smart schools in developing countries facing similar conditions.

---

[24] Sonita Pen and Patricia D Morrell, "Perceptions and Challenges of Technological Use in Teaching among Late-Career Teachers: A Case Study in Cambodia," *Discover Education* 3, no. 1 (2024): 211, https://doi.org/10.1007/s44217-024-00265-w.

[25] Olivia Wohlfart and Ingo Wagner, "Teachers' Role in Digitalizing Education: An Umbrella Review," *Educational Technology Research and Development* 71, no. 2 (2023): 339–65, https://doi.org/10.1007/s11423-022-10166-0.

[26] Sangeeta and Urvashi Tandon, "Factors Influencing Adoption of Online Teaching by School Teachers: A Study during COVID-19 Pandemic," *Journal of Public Affairs* 21, no. 4 (November 14, 2021), https://doi.org/10.1002/pa.2503.

Conclusion

The results of this study identify the complex challenges teachers face in Iraq when implementing innovative school initiatives. Systemic problems continue to recur, with the root causes lying in infrastructure challenges, staff training, curriculum personnel, administrative strategies, and teacher acceptance. The data clearly shows that, despite conceptual acceptance of smart schools, they have not been able to implement this theory effectively without adequate systems and resources. These issues are not isolated but interrelated and require a targeted, multi-level approach.

This study emphasizes that a holistic transformation of Iraq's education system is necessary to achieve this vision if smart schools are to become a reality. Such support includes providing technological tools and internet connectivity, aligning the curriculum with digital learning principles, comprehensive teacher training programs, and strong policies to facilitate implementation. Additionally, given educators' cultural resistance and psychological readiness, awareness and integration programs—implemented by pedagogues at both the micro and macro levels—need to be addressed seriously.

This study fills a gap in the literature on innovative education in Iraq and provides an evidence-based picture of teachers' experiences and local and actionable recommendations. The study emphasizes that educational innovation is not only technological but also institutional, pedagogical, and humanistic.

Bibliography

Ab Jalil, Habibah, Ismi A Ismail, Aini M Ma'rof, Chee L Lim, Nurhanim Hassan, and Nur R Che Nawi. "Predicting Learners' Agility and Readiness for Future Learning Ecosystem." *Education Sciences*, 2022. https://doi.org/10.3390/educsci12100680.

Al-Khaqani, N, and D Al-Numani. "Challenges of Smart School Implementation in Post-Conflict Iraq." *International Journal of Education and Development* 7, no. 2 (2021): 45–60.

Al-Lihyani, Z. "Smart Schools in Saudi Arabia: Digital Transformation and Rural Disparities." *Education and Information Technologies* 25, no. 6 (2020): 5679–98.

Al-Obaidi, H. "Barriers to Digital Education in Iraq: Policy and Practice." *Journal of Education Policy Studies* 12, no. 4 (2020): 88–102.

Al-Saeedi, Salma. *Al-Madāris Al-Dhakiyya: Madrasat Al-Qarn Al-Ḥādī Wa-Al-ʿIshrīn*. Berlin: Dār Farḥah li-al-Nashr wa-al-Tawzīʿ, 2005.

Al-Zahrani, Ahmed. "Idārat Al-Muʿawwiqāt Fī Al-Munazzamāt." *Majallat Al-Irādah Al-Ḥadīthah*, 2018.

Al-Zain, Ghroub Muḥammad Rūḥī. "Madā Taḥaqqaq Al-Madāris Al-Dhakiyyah Fī Sūriyā Fī ʿAṣr Al-Iqtiṣād Al-Muʿtamid ʿalā Al-Maʿrifah: Dirāsah Ḥālah ʿalá Majmūʿah Min Al-Madāris Fī Ḥimṣ." Syrian Virtual University, 2022.

Assem, Ayman, Sherif Abdelmohsen, and Mohamed Ezzeldin. "Smart Management of the Reconstruction Process of Post-Conflict Cities." *Archnet-IJAR: International Journal of Architectural Research* 14, no. 2 (2019): 325–43.

Chai, C S, M.S.Y. Jong, and H Yin. "Future-Ready Learning with Smart Schools: A Global Perspective." *Computers & Education* 156 (2020): 103945.

Creswell, John W. *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches*. 3rd ed. United States of America: SAGE Publications, 2009.

Hanifah, Hanifah, Ida Bagus Putu Arnyana, and I Gede Margunayasa. "Systematic Literature Review: Digital Technology-Based Policy Approaches to Improve the Quality and Access of Basic Education in Developing Countries." *International Journal of Education and Computer Studies (IJECS)* 5, no. 2 SE-Articles (n.d.): 87–102. https://doi.org/10.35870/ijecs.v5i2.4337.

Hub, Education Above All - Policy. "Singapore Student Learning Space (SLS)." Singapore: Education Above All, 2024. https://policy-hub.educationaboveall.org/solution/singapore-student-learning-space-sls.

Khaled, Farah, and Aysha Alghfeli. "Unlocking Potential: The Impact of Structured Digital Lessons and Self-Assessment Strategies on Mathematics Achievement and Motivation among School Students in the UAE." *International Electronic Journal of Elementary Education* 17 (April 25, 2025): 445–65. https://doi.org/10.26822/iejee.2025.391.

Koh, J H L, C S Chai, and W Y Lim. "Teacher Professional Development for Digital Transformation in Smart Schools." *Educational Technology & Society* 23, no. 2

(2020): 1–14.

KoreaTechToday. "South Korea's $70 Million Investment in AI-Powered Learning." 2024. https://koreatechtoday.com/south-koreas-70-million-investment-in-ai-powered-learning/.

Levin, Ilya, Alexei L Semenov, and Mikael Gorsky. "Smart Learning in the 21st Century: Advancing Constructionism Across Three Digital Epochs." *Education Sciences*, 2025. https://doi.org/10.3390/educsci15010045.

Morgan, Krejcie. "Sample Size Determination Using Krejcie and Morgan Table." *Kenya Projects Organization (KENPRO)* 38, no. 1970 (1970): 607–10.

Passey, Don, Therese Laferriere, M.Y.-A Ahmad, Miron Bhowmik, D Gross, J Price, P Resta, and Miri Shonfeld. "Educational Digital Technologies in Developing Countries Challenge Third Party Providers" 19 (January 1, 2016): 121–33.

Pen, Sonita, and Patricia D Morrell. "Perceptions and Challenges of Technological Use in Teaching among Late-Career Teachers: A Case Study in Cambodia." *Discover Education* 3, no. 1 (2024): 211. https://doi.org/10.1007/s44217-024-00265-w.

Salmela-Aro, Katariina, and Jari Lavonen. "The Switch to Distance Teaching and Learning in Finland During the COVID-19 Pandemic (2020–2022) Went Technically Well but Was Emotionally Challenging BT - Schools and Society During the COVID-19 Pandemic: How Education Systems Changed and the Road Ahead." edited by Fernando M Reimers, 63–83. Cham: Springer Nature Switzerland, 2024. https://doi.org/10.1007/978-3-031-42671-1_4.

Sangeeta and Urvashi Tandon. "Factors Influencing Adoption of Online Teaching by School Teachers: A Study during the COVID-19 Pandemic." *Journal of Public Affairs* 21, no. 4 (November 14, 2021). https://doi.org/10.1002/pa.2503.

Sugiyono, D. *Metode Penelitian Kuantitatif, Kualitatif, Dan Tindakan*, 2013.

Voogt, J, G Knezek, M Cox, D Knezek, and A ten Brummelhuis. "Under Which Conditions Does ICT Have a Positive Effect on Teaching and Learning?" *Journal of Computer Assisted Learning* 34, no. 5 (2018): 515–29.

Wohlfart, Olivia, and Ingo Wagner. "Teachers' Role in Digitalizing Education: An Umbrella Review." *Educational Technology Research and Development* 71, no. 2 (2023): 339–65. https://doi.org/10.1007/s11423-022-10166-0.

Zhang, W, and C Zhu. "Smart Education in China: Teachers' Motivation and the Integration of Digital Technology." *British Journal of Educational Technology* 52, no. 1 (2021): 65–84.

Zhu, Zhi-Ting, Ming-Hua Yu, and Peter Riezebos. "A Research Framework of Smart Education." *Smart Learning Environments* 3, no. 1 (2016): 4. https://doi.org/10.1186/s40561-016-0026-2.