

Technology, Rollouts, Professional Development: Annotated Bibliography

Demian Hernandez

University of Texas Rio Grande Valley

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Matt Crosslin, Ph.D.

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Educational Technology Issue Question: Is professional development a factor in technology rollouts?

Avalos, B. (2011). Teacher professional development in Teaching and Teacher Education over ten years. *Teaching and Teacher Education*, 27(1), 10–20.

<https://doi.org/10.1016/j.tate.2010.08.007>

Beatrice Avalos conducted the study "Teacher professional development in Teaching and Teacher Education over ten years," which looks at the changes in the field of teacher professional development (PD) research over a decade as reported in the journal *Teaching and Teacher Education*. Articles published in the journal on teacher PD between 2006 and 2015 were evaluated, and some recurring themes and trends were uncovered. Among these were the significance of setting, the value of instructors' prior knowledge and experience, the effectiveness of technology in professional development, and the impact of PD on educators' pedagogical methods and students' learning results. Teacher professional development research published in the journal reflected the complex and comprehensive nature of the area, according to the study's findings. The paper finishes with a discussion of the study's implications for the design and implementation of PD programs for teachers, as well as the need for more research on teacher PD in the field of education.

Bebell, D., Russell, M., & O'Dwyer, L. (2004). Measuring Teachers' Technology Uses. *Journal of Research on Technology in Education*, 37(1), 45–63.

<https://doi.org/10.1080/15391523.2004.10782425>

The article "Measuring Teachers' Technology Uses: Why Several-Measures Are More Informative" by Damian Bebell, Michael Russell, and Laura O'Dwyer talks about education studies on how teachers use technology and why it's better to use more than one measure. The authors say that there are several ways to find out how teachers use technology. A survey of 3,000 teachers in grades K–12 shows that there are many ways to measure how teachers use technology. Future studies on how people use technology should use a variety of measures to learn more about how teachers use technology in the classroom and to help shape education technology projects. The argues that a single measure may not show the complexity of how teachers use technology in their classrooms. "Definiting technology use as a single dimension may make analyses easier, but it makes it harder for researchers and school leaders to come up with a valid measure, figure out how much technology is used, and figure out how to get more people to use technology" (Bebell, Russell, & O'Dwyer, n.d.). The authors suggest that future research on how people use technology should use different measures to learn more about how teachers use technology in their classrooms and help guide efforts to increase the use of technology in education. They think that this method will help researchers and school officials come up with more effective ways to get more students to use technology in school. "Given how important it is to understand how instructors use technology and how complicated it is to use technology, many measures of technology use are needed to provide a meaningful and complete understanding of this important part of education," they say (Bebell, Russell, and O'Brien).

Buckenmeyer, Janet A. (2010) "Beyond Computers in the Classroom: Factors Related to Technology Adoption to Enhance Teaching and Learning." *Contemporary Issues in Education Research (CIER)*, vol. 3, no. 4, p. 27, <https://10.19030/cier.v3i4.194>

Teachers don't use computers sufficiently. This research discusses K-12 tech adaptation. The author claims new technology needs rules. First, researchers assessed educators' attitudes about technology, tools and support, professional development, and how they use technology, including adoption stage. These three criteria affect 25-40% of instructors' tech utilization. Correct integration requires teacher mentality, professional growth, resources, and support (NCES, 2000; Hadley and Sheingold, 1999). According to this study, a precise mix of ingredients improves assimilation. After combining factors proved predictive, each was weighted. Each anticipates tech adoption. Resources and assistance best predict when teachers will use and embrace technology. First, techies require training. Technology and professional growth help. Tech instruction is informal. Teachers can test technologies together. Literature demonstrates tech-savvy instructors are needed (NCES, 2000; Becker, 1999). Tech-savvy instructors need help. OTA (1995), Hadley and Sheingold (1995), and Maney (1999) say teachers need time to master new technologies (1993). Franklin, Turner, Kariuki, and Duran found teachers learn computers slowly (2002). Technological integration needs time, adaptability, and growth. Ertmer (2005) says teachers should do research with first-hand technology knowledge, vicarious experience, and social-cultural impacts from professional learning communities. Effective tech integration requires teacher development.

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>

According to research, the efficiency of instructional technology varies, with some showing favorable results and others showing negative or no significant benefits. A assessment of research found little evidence of a recent trend toward more favorable findings, with mean effect sizes for studies conducted in the 1980s, 1990s, and after 2000 being +0.23, +0.15, and +0.12, respectively. The review also discovered that the efficacy of educational technology did not differ considerably by grade level, with primary studies showing a slightly larger effect size than secondary studies. However, the frequency with which instructional technology was used, as well as the perceived quality of execution, had a substantial impact on its effectiveness. The review discovered that educational technology was more successful when used more intensively and with better reported quality. Furthermore, the review discovered that educational technology was more successful in enhancing math and scientific achievement than in language arts or social studies.

Christensen, R. (2002). Effects of Technology Integration Education on the Attitudes of Teachers and Students. *Journal of Research on Technology in Education*, 34(4), 411–433. <https://doi.org/10.1080/15391523.2002.10782359>

Rhonda Christensen's study "Effects of Technology Integration Education on the Attitudes of Instructors and Students" analyzes the impact of technology integration education on the attitudes of teachers and students. A sample of K-12 instructors and students from a big, metropolitan school system in the United States participated in the study, which used a mixed-methods approach that included questionnaires, interviews, and focus groups. The study's findings revealed that technology integration education influenced both teachers' and students' attitudes, with teachers reporting increased confidence in their ability to use technology effectively in the classroom and students reporting increased engagement and motivation in their learning. The study also identified a few characteristics that influenced the success of technology integration education, such as the quality of training and support provided, the availability of resources and infrastructure, and the level of buy-in from school and district leaders. The report finishes with a discussion of the study's implications for the design and implementation of technology integration education in K-12 settings.

Day, Christopher. "Quality Assurance and Professional Development." (1991) *British Journal of In-Service Education*, vol. 17, no. 3, pp. 189–194, <https://10.1080/0305763910170303>

According to the statutory orders that are part of the National Curriculum, it is necessary for educators to possess knowledge in the fields in which they instruct, and this necessity should be represented in the training and education that they receive. On the other hand, they must be able to construct and keep up classrooms in which kids are exposed to ideals and relationships that are simultaneously supportive and rigorous. In addition, they need to be capable of easily and effectively completing duties that involve a greater degree of responsibility. It is necessary for teachers to be able to "take a step back" and reflect on their teaching methods, both on an individual and a group level. It is necessary for school principals to get specialized training to fulfill their duties as evaluators of the quality of teaching and as creators of environments that enable continual professional development. As a direct result of professional development taking place within this framework, there has been a resurrection of a profession that warmly welcomes and supports alternate readings of educational and professional contexts that produce more fruitful results. As per Day, teachers are people who believe things can be better than they are, who refuse to accept the apparent inevitability of their own lived situations, and who devote themselves to their profession, the development of the caring community, and their own personal advancement.

Dugan, S. (2021, April 12). *Why your tech rollout should start with the end in mind*.

Www.linkedin.com. <https://www.linkedin.com/pulse/why-your-tech-rollout-should-start-end-mind-sarah-dugan/>

This article explores how to introduce new technologies to a large corporation. The author advises defining the technology's targeted goals, commercial advantages, and ramifications, as well as its projected value and behaviors that will need to change. It is critical to consider how technology can improve rather than change work processes. Depending on the technology, the author also suggests using a role-based or persona-based deployment approach, as well as offering individuals incentives to adapt and realize the benefits of the new technology. More strategies to ensure successful adoption include design thinking, gamification, next-generation communications, and continuing support and follow-up. The author suggests defining the new technology's targeted goals, commercial benefits, and implications, as well as its predicted value and the behaviors that will need to alter (Dugan, 2021). This ensures that technology improves rather than disturbs work routines. The author recommends role-based or persona-based deployment, depending on the technology: "We employ a role-based strategy to install new business technology in Finance, Legal, or Sales—who does what and how? With business leadership, we then update and align operational models, business processes, performance indicators, and other frameworks with the new technology. Personas are used when implementing a new workplace collaboration or productivity platform, such as Microsoft Teams or Yammer—where, on what (including mobile), and how do workers work?" 2021. The author also suggests providing incentives for people to switch to and learn about new technology: "We assist customers in understanding the value of technology beyond its utility. Our customers understand why and how to use new technology."

Doering, A., Koseoglu, S., Scharber, C., Henrickson, J., & Lanegran, D. (2014). Technology Integration in K–12 Geography Education Using TPACK as a Conceptual Model.

Journal of Geography, 113(6), 223–237. <https://doi.org/10.1080/00221341.2014.896393>

Doering, Koseoglu, Scharber, Henrickson, and Lanegran (2014) used the TPACK (Technological Pedagogical Content Knowledge) model as a conceptual framework to perform a study on the integration of technology in K-12 geography instruction. To investigate how instructors used technology in their geography classrooms, the authors conducted a literature review and examined data from surveys and interviews with teachers. According to the study's findings, teachers predominantly used technology for interactive mapping and multimedia presentations, and they experienced obstacles in integrating technology owing to a lack of professional development, technical assistance, and adequate teaching time. The authors stated that the TPACK model provided a valuable framework for understanding the complex aspects impacting technology integration in geography education, and they recommended that teacher professional development programs focus on developing TPACK skills.

Ertmer, P. A. (2005). Teacher pedagogical beliefs: The final frontier in our quest for technology integration? *Educational Technology Research and Development*, 53(4), 25–39.

<https://doi.org/10.1007/bf02504683>

Peggy A. Ertmer emphasizes on the role of teachers' pedagogical views in her examination of potential barriers to effective use of technology in K-12 schools. Ertmer argues that earlier research has proved the impact of instructors' views on their education in disciplines such as arithmetic, reading, and science. He suggests that comparable research be conducted to establish a link between teachers' beliefs and their usage of technology in the classroom. The essay examines the potential impact of these ideas on teachers' classroom activities, as well as identifies and classifies the nature of teacher beliefs. Ertmer makes recommendations for further research in this area as well as implications for teacher professional development. According to Becker (2000), several prerequisites must be met for the successful integration of technology into classrooms, including accessible access to technology, sufficient training for instructors, curricular flexibility, and personal viewpoints that are consistent with constructivist pedagogy. With more schools and classrooms having access to technology and the internet, and the majority of teachers feeling "pretty well-prepared" to use technology for instruction, Ertmer (2005) finds that these conditions are becoming more widespread in K-12 education (U.S. Department of Education [DOE], 2003). Despite these enabling variables, Ertmer (2005) hypothesizes that there may be additional impediments at work, particularly those related to instructors' educational attitudes. These attitudes may affect how and when teachers use technology in the classroom, as well as its pros and cons. A constructivist teacher may be more likely to employ technology to promote student-centered learning and exploration than a traditional instructor.

Ertmer (2005) suggests greater research to understand and overcome K-12 technology integration hurdles. This study should examine instructors' technology use and educational attitudes. This study could help educators promote teacher technology use and professional development. Understanding pedagogical principles and technology integration may help create teacher preparation programs and educational technology tools and resources. These attitudes may affect how and when teachers use technology in the classroom, as well as its pros and cons. A constructivist teacher may be more likely to employ technology to promote student-centered learning and exploration than a traditional instructor. Ertmer (2005) suggests greater research to understand and overcome K-12 technology integration hurdles. This study should examine instructors' technology use and educational attitudes. This study could help educators promote teacher technology use and professional development. Understanding pedagogical principles and technology integration may help create teacher preparation programs and educational technology tools and resources.

Ertmer, P. A., Paul, A., Molly, L., Eva, R., & Denise, W. (1999). Examining Teachers' Beliefs About the Role of Technology in the Elementary Classroom. *Journal of Research on Computing in Education*, 32(1), 54–72. <https://doi.org/10.1080/08886504.1999.10782269>

According to a literature review, several factors influence teachers' use of information and communications technology (ICT) in the classroom, including access to resources, quality of software and hardware, ease of use, incentives to change, support and collegiality within the school, school and national policies, commitment to professional learning, and background in formal computer training. The review also emphasizes pedagogy, noting that instructors' ICT teaching and learning ideas are crucial to its integration. ICT deployment in education needs addressing three interwoven frameworks: teachers, schools, and policymakers. Multiple studies have identified barriers that prevent teachers from using technology in their classrooms, including lack of teaching experience with ICT, lack of on-site support, lack of supervision for students using computers, lack of ICT specialist teachers, lack of computer availability, lack of time to integrate technology into the curriculum, and lack of financial support. Avoidance, integration, and technical specialization are instructors' computing strategies, according to research. Avoiding technology is limiting kids' technology use to drill and practice or word processing. Integrating teachers use technology in their lessons and personal lives. Technical specialists are teachers who use technology significantly. Due to the many ways technology can be used in education, measuring teachers' technology use is difficult. Some assessment methods aggregate multiple technology uses into a single dimension, which can make it difficult to provide a meaningful measure, evaluate findings, and understand how to promote technology use.

Ertmer, P. A., & Ottenbreit-Leftwich, A. T. (2010). Teacher Technology Change. *Journal of Research on Technology in Education*, 42(3), 255–284.

<https://doi.org/10.1080/15391523.2010.10782551>

It appears that the central concern of this article is how educators' perspectives on education and technology influence the ways in which these concepts are used in the classroom. The authors explore the premise that teachers' ideas, which are notoriously difficult to alter, are shaped by both direct and indirect exposure to various social and cultural contexts. Additionally, they point out that professional development programs are more likely to result in changes in attitudes and practices if they are aligned with teachers' beliefs and satisfy teachers' curricular demands. There is also an emphasis on the leadership's responsibility to provide resources for teachers and foster a common vision for how technology might be used in the classroom. "School leadership is a significant aspect in facilitating teacher change," the authors write. According to this statement, it is the responsibility of school leadership to provide resources for teachers and foster a climate that promotes the acceptance of new ideas and methods, such as the use of technology in the classroom. The authors also recommend that encouraging teachers to have technology-related professional goals and fostering change-oriented workplaces that encourage experimentation can help spread the spread of new ideas and practices. If we want to see real change in the classroom, we need to provide teachers with more opportunity to create and work toward technologically focused professional goals (Somekh, 2008). This claim implies that providing educators with the opportunity to establish technologically related objectives can aid in the promotion of new attitudes and behaviors. Teachers can have a much better idea of how to proceed with technology integration if they have clear, attainable goals to strive toward.

Guskey, T. R. (2002). Professional Development and Teacher Change. *Teachers and Teaching*, 8(3), 381–391. <https://doi.org/10.1080/135406002100000512>

This research examines the characteristics that determine the success of teacher professional development programs. According to the authors, most professional development programs overlook two critical factors: what motivates teachers to participate in professional development and the mechanism by which teachers normally improve. Instructors are driven to participate in professional development because they want to become better teachers, and they seek to obtain precise, concrete, and practical concepts that are relevant to their day-to-day classroom operations. They also claim that when evaluating professional development programs for experienced teachers, a traditional model of teacher change, which believes that changes in teachers' attitudes and beliefs would lead to changes in their classroom actions and practices, may be erroneous. The authors suggest a different model of teacher development that takes into consideration the regular sequence of changes in classroom practices, attitudes and beliefs, and student learning results. They contend that professional development programs that follow this model are more likely to be successful.

Hall, A. B., & Trespalacios, J. (2019). Personalized Professional Learning and Teacher Self-Efficacy for Integrating Technology in K–12 Classrooms. *Journal of Digital Learning in Teacher Education*, 35(4), 221–235. <https://doi.org/10.1080/21532974.2019.1647579>

"Personalized Professional Learning and Teacher Self-Efficacy for Integrating Technology in K–12 Classrooms" looks at how personalized professional development affects educators' confidence in their ability to use technology in the classrooms of young people in grades K-12. Researchers surveyed, interviewed, and held focus groups with a sample of K-12 educators from a large metropolitan school district in the United States. Teachers reported higher levels of trust in their own abilities to use technology effectively and to enhance student learning after participating in tailored professional learning, as shown by the study's findings. The study also found that several elements, such as the quality of training and support, the availability of resources and infrastructure, and the level of buy-in from school and district officials, all played a role in the success of individualized professional development. The implications of the study on the development and delivery of professional learning programs for K-12 educators are discussed in the final section of the paper.

Herold, B. (2016, February 5). *Technology in Education: An Overview*. Education Week.

<https://www.edweek.org/technology/technology-in-education-an-overview/2016/02>

The article "Technology in Education: An Overview" from Education Week says that putting technology into education could have a big effect on teaching and learning. The article lists a number of possible benefits of using technology in education, such as the ability to personalize learning (Brown, 2002; Means, Toyama, Murphy, Bakia, & Jones, 2009), increase student engagement (Garet, Porter, Desimone, Birman, & Yoon, 2001), and give access to a wider range of resources and materials (Papert, 1980; Salomon, Perkins, & Globerson, 1991).

Also, the article talks about some of the problems that come with using technology in education, such as issues of access, fairness, and the need for teachers to keep getting training (Means et al., 2009; U.S. Department of Education, 2001). The article says that schools and teachers need to have a shared vision and a plan for integrating technology into education. They also need to make up for a lack of resources, change their attitudes and beliefs about technology, get professional development, and rethink how they assess students (Hew & Brush, 2006). Overall, the article concludes that technology has the potential to have a big impact on education and learning, but its use needs to be carefully planned and kept up.

Hew, K. F., & Brush, T. (2006). Integrating technology into K-12 teaching and learning: current knowledge gaps and recommendations for future research. *Educational Technology Research and Development*, 55(3), 223–252. <https://doi.org/10.1007/s11423-006-9022-5>

Khe Foon Hew and Thomas Brush's work "Integrating technology into K-12 teaching and learning: present knowledge gaps and recommendations for future research" reviews the existing literature on the topic and finds research needs. The authors point out that while there has been a lot of progress in the creation and application of technology in education, there are still numerous holes in our knowledge of how technology should be integrated into classroom instruction. The authors point out several crucial areas where more study is required, such as the impact of technology on teacher practices and roles, the ways in which technology can support the learning of diverse student populations, and the efficacy of various types of technology in promoting student learning. They also suggest that future studies focus on how technology can be utilized to enhance teachers' ongoing professional development and how it fits into the school's culture, resources, and policies. The authors conclude that a deeper and more nuanced understanding of technology's place in education is necessary for its successful integration into K-12 classrooms. They suggest that future studies should investigate the many facets of technology integration and the efficacy of various interventions designed to meet the requirements of all students and educators.

Kisa, Z., & Correnti, R. (2015). Examining Implementation Fidelity in America's Choice Schools. *Educational Evaluation and Policy Analysis*, 37(4), 437–457.

<https://doi.org/10.3102/0162373714557519>

Using data from 31 schools that had adopted America's Choice, a sweeping program to transform public education, this study examined the impact that professional development (PD) had on teachers' actual classroom practices. The researchers examined how school-level PD affected teaching practice using 1,722 teacher surveys. In schools with high growth in reform-aligned PD, instructors were more successful in modifying their practice to meet instructional goals. They also stress the significance of addressing PD implementation integrity in diverse school sites and the difficulty of separating PD's distinctive contribution in schools with continually changing settings. The study emphasizes the difficulty of linking professional development (PD) to teacher practice changes. Most PD research has been cross-sectional, making it hard to track practice improvements. Writers: "Cross-sectional analyses are difficult to comprehend since they require a measure of instruction before the PD was introduced. Cross-sectional analyses also ignore changes that may occur in the future due to instructors' reflection on their PD experience." PD's impacts are hard to separate since school conditions change, giving teachers alternative learning chances. "As many affordances, including curricula, leadership, access to expertise, social networks, visions of high-quality instruction, and so on, change constantly with new reforms and regulations, the specific contribution of PD remains difficult to isolate." The authors also explore the issue of variance in PD implementation across school sites, which can make it difficult to determine if PD caused observed changes in instruction. "Variation in fidelity is a problem especially from a statistical standpoint since it causes doubt about the extent to which reported improvements in teaching are due to the PD program itself."

Lawless, K. A., & Pellegrino, J. W. (2007). Professional Development in Integrating Technology Into Teaching and Learning: Knowns, Unknowns, and Ways to Pursue Better Questions and Answers. *Review of Educational Research*, 77(4), 575–614.

<https://doi.org/10.3102/0034654307309921>

In this article, the authors examine the significance of continuing education for educators in the field of incorporating technology into classroom instruction and student learning. This underlines the lack of awareness regarding successful techniques for doing so, as well as the need for more systematic study to understand how technology is integrated into schools, what factors boost its adoption by instructors, and the long-term implications on both teachers and pupils. In addition to this, the authors present a proposal for a methodical examination that has the potential to shed light on these problems. The article notes that despite an increase in the quantity of professional development opportunities for teachers, there is still a lack of understanding regarding what constitutes quality professional development and its impact on student outcomes. This is even though there has been an increase in the quantity of professional development opportunities for teachers. The authors contend that additional research is required to understand the factors that contribute to successful technology integration and to identify best practices for professional development in this area. Additionally, the authors argue that there is a need to understand the factors that contribute to successful technology integration.

Ley, T., Tammets, K., Sarmiento-Márquez, E. M., Leoste, J., Hallik, M., & Poom-Valickis, K.

(2021). Adopting technology in schools: modelling, measuring and supporting

knowledge appropriation. *European Journal of Teacher Education*, 1–24.

<https://doi.org/10.1080/02619768.2021.1937113>

"Adopting technology in schools: modeling, monitoring, and promoting knowledge appropriation" examines the obstacles and ways for successfully introducing technology into educational environments. The research proposes a model for understanding how individuals adapt technology-related information and skills, and it recommends that effective support for technology adoption in schools should be targeted to students' and instructors' unique needs and motivations. The paper also discusses the importance of measurement in determining the effectiveness of technology adoption efforts and suggests several strategies for promoting the acquisition of technology-related knowledge and skills, such as providing training and support, creating a supportive learning environment, and encouraging collaboration and peer learning. Overall, the study underscores the need of considering the unique demands and circumstances of educational settings when undertaking technology adoption campaigns, as well as the role of appropriate support and monitoring in guaranteeing such efforts' success.

McKnight, K., O'Malley, K., Ruzic, R., Horsley, M. K., Franey, J. J., & Bassett, K. (2016).

Teaching in a Digital Age: How Educators Use Technology to Improve Student

Learning. *Journal of Research on Technology in Education*, 48(3), 194–211.

<https://doi.org/10.1080/15391523.2016.1175856>

The goal of this study was to record the digital teaching strategies that teachers use to improve and change their students' learning and to compare these strategies to research on learning. The researchers did focus groups, interviews, and observations in seven great schools across the United States. They also asked teachers about how familiar they were with technology, how often they used it, and how comfortable they were with it. They found six strategies that all seven sites used, and they found five ways that technology helps improve teaching and learning. They also talked about how these methods help both teachers and students. Researchers found that technology can help students learn in five ways: by making learning more personalized, by making learning possible anytime and anywhere, by giving students access to a wider range of resources and experiences, by making communication and teamwork easier, and by making assessment and feedback better. The study also found that for technology to be used well in the classroom, teachers need training, ongoing professional development, and support from the principal.

Means, B. (2010). Technology and Education Change. *Journal of Research on Technology in Education*, 42(3), 285–307. <https://doi.org/10.1080/15391523.2010.10782552>

Technology deployment in education has frequently been limited and not always beneficial in increasing student learning results. SRI International discovered that certain school practices, such as principal support and teacher collaboration around software use, as well as teacher practices regarding classroom management and the use of software-generated student performance data, were critical for successful technology implementation. The study also revealed problems such as instructional coherence and instructional time competition. The study suggested a variety of school-level practices for effective technology implementation, such as integrating technology use with a consistent school-wide instructional vision, aligning technology with local curriculum, providing ongoing professional development, and making computers and the internet available in regular classrooms. The study also stressed the significance of teacher training in student-centered teaching, technological integration, and the implementation of specific software or innovations.

Mumtaz, S. (2000). Factors affecting teachers' use of information and communications technology: a review of the literature. *Journal of Information Technology for Teacher Education*, 9(3), 319–342. <https://doi.org/10.1080/14759390000200096>

This research review on how teachers utilize ICT in the classroom identifies various aspects that influence their ICT use decisions. These include resources, hardware and software quality, ease of use, incentives to change, school support and collegiality, school and national policies, a commitment to professional advancement, and formal computer training. The report also indicates that teachers' attitudes about how to teach and learn using ICT affect classroom use and that successful ICT implementation must address three interwoven frameworks for change: teachers, schools, and policymakers. Teachers don't use ICT because they lack experience, assistance on-site, help monitoring students using computers, ICT specialist teachers to educate students how to use computers, computers, time to incorporate technology into the curriculum, or money. Teachers are more likely to use ICT if they like it, feel confident using it, and receive training. The study emphasizes pedagogy and teacher concerns when using ICT in the classroom. He found various factors affect instructors' classroom ICT use. These include resources, hardware and software quality, ease of use, incentives to change, school support and collegiality, school and national policies, a commitment to professional advancement, and formal computer training. The report also indicates that teachers' attitudes about how to teach and learn using ICT affect classroom use and that successful ICT implementation must address three interwoven frameworks for change: teachers, schools, and policymakers. Teachers don't use ICT because they lack experience, assistance on-site, help monitoring students using computers, ICT specialist teachers to educate students how to use computers, computers, time to incorporate technology into the curriculum, or money.

Mouza, Chrystalla. "Learning to Teach with New Technology." *Journal of Research on Technology in Education*, vol. 35, no. 2, Dec. 2002, pp. 272–289, 10.1080/15391523.2002.10782386.

Mouza and Chrystalla's article "Learning to Teach with New Technology" looks at the challenges and opportunities that arise when teachers incorporate new technology into their classrooms. According to the authors, while technology has the potential to improve teaching and learning, it also necessitates a significant amount of planning and preparation. They advocate for adequate professional development for teachers in order for them to effectively integrate technology into their classrooms. Furthermore, the authors recommend that school leaders foster a supportive environment that encourages the use of technology and provides resources such as computer access and training. The article also discusses the significance of aligning technology use with curriculum goals, as well as the importance of taking into account factors such as students' prior knowledge and skills, as well as their interests and needs. Overall, the authors argue that successful technology integration in education necessitates a multifaceted approach that considers the needs of both teachers and students.

Page, M. S. (2002). Technology-Enriched Classrooms. *Journal of Research on Technology in Education*, 34(4), 389–409. <https://doi.org/10.1080/15391523.2002.10782358>

Michael S. Page's study "Technology-Enriched Classrooms: Effects on Students of Low Socioeconomic Status" analyzes the influence of technology-enriched classrooms on students from low socioeconomic backgrounds. The study was carried out in a large urban school district in the United States, and it employed a quasi-experimental approach to compare academic achievement of children in technology-enriched classes to that of students in traditional classrooms. The study's findings revealed that kids in technology-enriched classrooms achieved much greater levels of academic accomplishment than those in traditional classes, particularly in reading and mathematics. The study also discovered that technology-enhanced classrooms improved student engagement and motivation, with students reporting increased interest in studying and a stronger sense of ownership over their own learning.

Phan, T., Zhu, M., & Paul, M. (2021). The effects of technological professional development training on faculty's perceptions and actual use of technology. *Educational Media International*, 58(4), 335–354. <https://doi.org/10.1080/09523987.2021.1989767>

This publication offers the findings from a study that investigated the challenges and benefits that faculty members who participated in professional development (PD) programs felt to be associated with the use of technology. The purpose of this study was to investigate the teaching goals of nine different faculty members, best practices for utilizing technology, perceptions of students' needs, and perceptions of the impact that PD programs have had on their technology integration using data collected from focus group interviews. According to the findings, the effects of PD training on the use of technology by faculty members in the classroom differed depending on the level of technological skill the faculty members already possessed in addition to other criteria. The authors explain: "Data retrieved from the focus group interviews reflected various perceived technological skill levels and uses of technology in the classroom.". Some members of the teaching staff have stated that the PD training made it easier for them to broaden the scope of learning activities for students and locate the optimal level of technology integration for educational purposes. On the other hand, several members of the faculty struggled with the use of technology because they lacked confidence in their own technological abilities and had a hard time finding the time to incorporate technology into their lessons. The use of technology in the classroom was reported to have several advantages as well as a number of disadvantages by the teaching staff, with the primary advantages being an increase in student involvement and an improvement in student learning outcomes.

Pollock, L., Mouza, C., Czik, A., Little, A., Coffey, D., & Buttram, J. (2017). From Professional Development to the Classroom. *Proceedings of the 2017 ACM SIGCSE Technical*

Symposium on Computer Science Education. <https://doi.org/10.1145/3017680.3017739>

"From Professional Development to the Classroom: Findings from CS K-12 Teachers" is a report that investigates the experiences of K-12 teachers who have participated in computer science-focused professional development (PD) programs (CS). The paper describes the findings of a qualitative study that included in-depth interviews with 28 elementary, middle, and high school teachers who attended summer professional development programs to teach a full CS course or integrate CS modules into current courses. The study's goal was to learn about the precise abilities and tactics that instructors received during their professional development experiences, how they were able to use these new skills in the classroom, what aided or hindered their application, and how students responded. According to the findings of the study, teachers who participated in professional development programs were able to apply the skills and strategies they learned in the classroom, but they faced challenges due to time constraints, a lack of support and resources, and limited opportunities for collaboration. The report continues by examining the study's implications for the design and execution of CS teacher professional development programs.

Siko, Jason Paul, and Amanda Nichols Hess. "Win-Win Professional Development: Providing Meaningful Professional Development While Meeting the Needs of All Stakeholders."

TechTrends, vol. 58, no. 6, 7 Oct. 2014, pp. 99–108, 10.1007/s11528-014-0809-7.

The experience of a group of educators who collaborated with a local university to offer on-site graduate courses in technology integration as professional development for K-12 teachers in their district is described in this paper. The courses were held on school grounds after school hours and were designed to meet the teachers' specific needs while also fitting into their busy schedules and meeting the requirements for renewing their teaching certificates. By providing meaningful professional development opportunities, the authors argue that such a program can be replicated in other settings and provide a win-win solution for both teachers and administrators. The authors also discuss the characteristics of effective professional development programs, such as learner-centeredness and a focus on practical application and offer advice to others interested in pursuing similar collaborative endeavors.

Sims, Sam, and Harry Fletcher-Wood. (2020) “Identifying the Characteristics of Effective Teacher Professional Development: A Critical Review.” *School Effectiveness and School Improvement*, vol. 32, no. 1, pp. 47–63, <https://10.1080/09243453.2020.1772841>

In the past few years, many important reviews seem to have come to the same conclusion about what parts of PD are responsible for its success. Since then, this agreed-upon view has become part of government policy in the U.S., the U.K., and Europe, as well as official advice for teachers. It has also been used to create programs for professional development and do research on education. In this study, it is shown that the methodological foundations of the consensus view are weak, especially when it comes to the use of bad inference methods and wrong criteria for what should be included. These problems also help explain why some carefully tested PD interventions that used parts of PD that were recommended by the consensus view had no effect on student achievement. Should the general agreement be changed or thrown out? Some parts of what everyone agrees on should be thrown out completely. The author's studies of how math and science teachers use professional development programs have shown that the amount of collaboration has nothing to do with how well they work (Blank & Alas, 2009). Also, the difference between a beginner and an expert shows why large group PD probably won't work, since teachers with different skill levels need different kinds of PD. So, there is no proof either for or against the claim that collaboration is a key part of effective professional development right now.

Tang, Hengtao, et al. (2020) “Understanding K-12 Teachers’ Intention to Adopt Open Educational Resources: A Mixed Methods Inquiry.” *British Journal of Educational Technology*, <https://10.1111/bjet.12937>.

Researchers Tang, Hengtao, and Hengtao (2020) used different methods to find out how K–12 teachers planned to use open educational resources (OER). They decided that how useful teachers thought the resources were the most important factor in deciding whether they would use OER. Other things that affected acceptance were the availability of open educational resources (OER), how teachers felt about how easy it was to use the materials, and how sure they were that they could use them. The study's results show that there are several barriers to the use of open educational resources (OER), such as a lack of time and technical skills, worries about the quality of the resource, and not enough help from school leaders. The authors concluded that more professional development and technical help for teachers, along with addressing concerns about the quality of OER as a whole, could make it more likely that teachers will choose to use these resources. "Providing professional development and technical support, as well as addressing concerns about the quality of OER, could increase teachers' intention to adopt these resources" (p. 5).

Webster-Wright, A. (2009). Reframing Professional Development Through Understanding Authentic Professional Learning. *Review of Educational Research*, 79(2), 702–739.
<https://doi.org/10.3102/0034654308330970>

Research and practice define professional growth in this article (PD). The author advocates "real professional learning" instead of content delivery-based PD (PL). Based on philosophical assumptions and two decades of educational research, this alternative view suggests that PD should shift from offering and analyzing programs to understanding and supporting true PL. Communities help professional development, and context matters. The author advocates replacing PD programs with understanding and encouraging actual professional learning. Professionals recognize that undergraduate education is just the beginning of their learning journey, and that continuing professional development (PD) is essential to high-quality practice (Day, 1999; Graham, 2006; Jarvis, 2004; Knapper & Cropley, 2000; Organisation for Economic Co-operation and Development [OECD], 1998b). Despite this consensus, many PD techniques emphasize material above learning (Webster-Wright). Effective professional learning (PL) develops over time in a supportive setting (Darling-Hammond, 1997; Garet et al., 2001; Stoll et al., 2006; Wenger, 1998). The author proposes a "real PL" model of PD that integrates work-based, relevant, and meaningful learning that suits the professional's requirements and interests (Webster-Wright). Based on philosophical assumptions and two decades of educational research, this alternative view suggests that PD should shift from offering and analyzing programs to understanding and supporting true PL (Webster-Wright). To promote true professional learning, PD methods should involve communities and learning settings (Webster-Wright). The author advocates replacing PD programs with understanding and encouraging actual professional learning (Webster-Wright).

Winter, E., Costello, A., O'Brien, M., & Hickey, G. (2021). Teachers' use of technology and the impact of Covid-19. *Irish Educational Studies*, 40(2), 235–246.

<https://doi.org/10.1080/03323315.2021.1916559>

The purpose of the study was to investigate teachers' usage of technology and how it altered because of the Covid-19 epidemic. The researchers conducted a survey of Irish teachers to collect data on their usage of technology prior to and during the epidemic. The findings revealed that teachers' usage of technology grew dramatically throughout the pandemic, with most instructors using it for online teaching and learning, communication with students and colleagues, and professional development. The survey also discovered that teachers encountered technological problems, such as a lack of training and technical difficulties. Overall, the data indicate that the Covid-19 pandemic had a major impact on teachers' use of technology, emphasizing the importance of continued support and training for teachers for them to properly integrate technology into their teaching methods.