

# Technology in Education: Barriers, Solutions, and New Best Practices

Back in 1986, Ohio educator and school administrator [Howard Merriman](#) bemoaned “the challenges brought by the incursion of technology into the schools.” He was talking about electric typewriters and programmable televisions, but, 40 years later, the problem for schools remains the same, even if today’s technology is vastly different. Current educators should find Merriman’s impulse familiar as they ask themselves, *when choosing to adopt a technology, how can schools ensure holistic integration across all grades, subjects, and teachers?*

## What is Technology Integration?

It’s more than teachers and students using computers, or simply putting course materials online. But it doesn’t mean having students on computers all the time, either.

Researchers in *Educational Technology Research and Development* (2007) define *technology integration* as “the use of computing devices, such as desktop computers, laptops, handheld computers, software, or internet in K-12 schools for instructional purposes.” Moving the definition further into pedagogy, education researcher [Nicola Yelland](#) (2006) offers this definition: “creating contexts for authentic learning that use new technologies in integrated and meaningful ways to enhance the production of knowledge and the communication and dissemination of ideas.”

Yelland’s definition, in particular, emphasizes that technology is one tool for learning, and one part of students’ learning experience—that overall learning experience is still something teachers must still curate with their expertise, experience, personal relationship with students and parents, emotional attunement, and focus on outcomes.

## Common Barriers to Technology in Schools

One simple barrier to technology integration has nothing to do with technology itself, but with schools’ long histories of launching new reforms and initiatives, then failing to follow through or adequately equip teachers. Matt Collette [documented several reforms](#) at Queens’ Intermediate School 61, and cited “reform fatigue” as a major reason new initiatives fail. [Schools in Wisconsin](#) cite the same dynamic, calling it “initiative overload.”

More specific research leads to the landmark 2007 study by [Khe Foon Hew and Thomas Brush](#), published in *Educational Technology Research and Development*. The authors identify six main categories of barriers to technology integration:

- **Lack of resources**, including time, access to equipment, and technical support.
- **Lack of technology skills and knowledge**, specifically in pedagogy and classroom management.
- **Institutional barriers**, including leadership, class scheduling, and school planning.
- **Teachers' attitudes and beliefs** about technology's benefits and relevance.
- **Assessment pressures**, including high-stakes testing.
- **Subject culture**, including how technology fits with general attitudes and institutionalized practices of an area of study.

Similarly, [David Nagel](#) identifies six barriers to integrating technology in *The Journal*, many of which overlap with Hew and Brush:

- Lack of adequate, ongoing professional development.
- Resistance to change.
- Competition from new models for schooling.
- Few opportunities for informal learning.
- Failures in personalized learning.
- Assessment gaps in implementing new practices.

Clearly, barriers exist in multiple forms, and at multiple levels of the school structure. The next section will give examples of what can go wrong when educators and administrators neither face these barriers nor work to remove them before attempting to integrate technology in a school or district.

## Lessons from Attempted Technology Integrations

Past failures can be instructive, and offer useful warnings for how not to rush, how to ensure full cooperation from all stakeholders, and how to formulate a solid integration plan before moving to adopt technology.

Sometimes it's unclear why technology integration fails, and what exactly failure means. A 2011 [New York Times profile](#) of the Kyrene school district in Chandler, AZ explores how a district that invested over \$33 million in technology over 6 years, still sees stagnant test scores across its schools. Kyrene asked residents to pay for its laptops, projectors, and other technology with an increase in property taxes. The district, writes Matt Richtel, "banked its future and reputation on technology." Then, unforeseen budget shortfalls meant less money for classroom supplies like paper and hand sanitizer, while also raising class sizes. Ultimately, dynamic and appealing technology in every classroom did not lead to measurable results the state expected, and it remains unclear whether the Kyrene district followed a formal implementation plan.

[Another report](#), on the 2015 conference for the Consortium for School Networking, noted that federally subsidized technology for schools and libraries was expected to reach \$1.5 billion that

year. Along with summarizing successes and best practices, the conference also offered several examples of difficult, stalled, or problematic technology integrations.

The report's first example is the Houston Independent School District, which tried to offer every student their own computer. District leaders said a common mistake is simply asking "how" technology adoption was being done, and not "why."

Another unforeseen inconsistency popped up in the District of Columbia Public Schools, which began using [Globaloria](#) to allow "students build their own computer games." What educators didn't predict was that "students with high test scores in core academic subjects did not always create the best games...The scores don't measure creativity or persistence." There was no other plan in place to evaluate the benefits or student gains from the technology adoption.

Finally, in Baltimore County Public Schools, inequality across the district meant that schools "with active PTAs, for instance, often had so much technology that they couldn't use it all, while schools from poorer areas didn't have the basics." There could be no coherent technology integration plan while these inequalities remained unaddressed.

## Overcoming Barriers: Emerging New Best Practices

The same authors, Hew and Brush, who offered the daunting list of barriers to technology integration, also shed light on several ways schools can remove, or at least address these barriers, to pursue a comprehensive and achievable technology integration.

### Involve Teachers in Decision-Making

First, the authors advise having a **shared vision and technology integration plan** in order to overcome the Leadership barrier. "Probably the most important issue to consider when formulating a shared vision regarding technology integration," they write, "is to address the specific relationship between technology and particular curriculum content areas because a commitment to the curriculum is a critical scaffold for technology integration" (234). Notably, they recommend that "the vision should not be created by just the school leaders; teachers, in particular should be involved in the decision-making because teacher participation has been found to be one of the ingredients for successful wide-scale integration of technology in a school district" (234).

### Strategic Placement of Resources

To overcome a scarcity of resources, Hew and Brush suggest some very practical steps. First, "introduce technology into one or two subject areas at a time to ensure that teachers and students in those areas have adequate technology." Additionally, use laptops instead of desktop computers. The authors found that "teachers who have five to eight computers in their classroom were twice as likely to give students frequent computer experience during class as their counterparts whose classes used computers in a shared location" (Hew and Brush, 236).

## Changing Attitudes and Beliefs

One clear benefit to teachers is a school leader who provides **ongoing professional development**, encourages experimentation and improvement, and grants freedom to take risks and make mistakes (Hew and Brush). It is “more important to focus on the *features* of professional development rather than its *types*.”

The authors review of research shows that “effective professional development related to technology integration” does the following:

- Focuses on content (e.g., technology knowledge and skills, technology-supported pedagogy knowledge and skills, technology-related classroom management knowledge and skills)
- Gives teachers opportunities for “hands on work”
- Is highly consistent with teachers’ needs (Hew and Brush, 239).

## A New Vision of Assessment

Finally, the authors advocate a balance between “considering how technology can be used to meet the current demands of standards-based accountability” and altogether reconsidering assessment approaches once technology is integrated into the curriculum.

## A Mentoring Approach

Apart from the major study by Hew and Brush, several other authors offer strategies for integrating technology smoothly and successfully. [Theodore J. Kopcha](#) advocates for “a model that is robust to the many barriers that teachers face as they learn to use technology and align their beliefs with new instructional practices,” and offers “a system-based model of technology integration that uses **mentoring and communities of practice** to support teachers as they develop skills, pedagogy, and beliefs needed to integrate technology in a student-centered manner.”

Mentoring, Kopcha argues, “has been found to overcome many of the common barriers to technology integration.” Namely, “mentors provide teachers with just-in-time support while they integrate technology into lessons they are actually teaching” (177). Mentoring must begin with assessing teachers’ needs, and school-wide collaboration to set goals. It must then continue throughout the four stages of technology integration (Setup; Teacher Preparation; Curricular Focus; and Community of Practice). Teacher input is also vital at the stage of assessment and review (Kopcha).

## Technology as Part of School Policy

Veteran teachers [Nancy Frey and Douglas Fisher](#) integrated technology into language arts classes, then began creating a Technology Policy to monitor its uses. Soon, the authors realized that most “technology policies focused on prohibition” rather than teaching students to use it constructively. So, they created a school-wide Courtesy Policy, that included expectations of technology courtesy, thereby fully integrating technology expectations into the whole school’s standards of behavior.

## Conclusion

For as many barriers as schools face when integrating technology, there are equally numerous, as well as creative, solutions. All require deep collaboration, clear planning, and ongoing professional development and assessment. Technology integration is never quick or easy, but it can be successfully planned and implemented.

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