

Adapting Technology to Your Subject Area

Instructional Technology and Social Studies

Research shows that thoughtful technology integration can positively impact student learning outcomes in social studies (Journell, 2009), especially in promoting students' critical-thinking skills and problem-solving skills (Açikalin, 2010). One study finds Internet use and accessing information from the web are the most common uses of computers in social studies (Açikalin, 2010). Dennis Beck and Jenni Eno (2012) also find that the most frequently used technology tool in a social studies classroom is website access and creation.

Virtual field trips offer an almost authentic experience for students to interact with certain artifacts, locations, and historical characters (Crawford, Hicks, & Doherty, 2009). Games and simulations also provide an immersive environment (Berson & Berson, 2007; Devlin-Scherer & Sardone, 2010). Teachers can use technology tools to publish students' historical narratives, including wikis, blogs, podcasts, and vodcasts (Beck & Eno, 2012).

In order to achieve the ultimate objective of developing students' civic competence, social studies educators must move away from transmission-oriented teaching (Torrez, 2010) and, instead, use student-centered instruction, focusing on skills in historical literacy, historical empathy, and constructing historical narratives (Levstik & Barton, 2005). The Internet offers digitized primary sources (Tally & Goldenberg, 2005), current facts on politics and events, and multiple perspectives, especially on cultural differences (Journell, 2009). However, interpreting primary sources is a difficult process for students (Friedman & Heafner, 2008), and website information alone does not teach students to become responsible citizens. Instead, teachers must guide students in evaluating, interpreting, and synthesizing information.

Instructional Technology and Language Arts

Research indicates that instructional technology has a positive impact on literacy (Balanskat, Blamire, & Kefala, 2006). For example, one study finds that the use of digital tools in instruction can help middle school students achieve significantly better reading performance (Pearson, Ferdig, Blomeyer, & Moran, 2005). Students who use text-based online discussion also improve their critical argument and debating skills (Walker & Pilkington, 2005). Word processing has proven to have a significant positive impact on student writing. In addition, collaborative writing using emails can motivate students to write together and be more reflective on their writing (Harrison et al., 2002).

In a meta-analysis examining the effects of computers on student writing, Amie Goldberg, Michael Russell, and Abigail Cook (2003) find that students who use computers in learning to write are not only more engaged and motivated in their writing but also produce work that is of greater length and higher quality, especially at the secondary level. Furthermore, Binbin Zheng, Mark Warschauer, and George Farkas (2013) find instantaneous computer-based scoring and feedback and online learning communities (where teachers and students post blogs, comments, files, podcasts, presentations, and other media) are beneficial in improving writing outcomes.

However, not all researchers have reached similar positive conclusions. For example, Carole Torgerson and Diana Elbourne (2002) and Richard Andrews (2004) find computer-based teaching has no measurable or very slight positive effects on improving spelling.

Instructional Technology and Science

The four emphasized strands of science learning are: (1) understanding scientific explanation, (2) generating scientific evidence, (3) reflecting on scientific knowledge, and (4) participating productively in science (Campbell & Abd-Hamid, 2013). Appropriate use of digital technology has proven to increase students' content knowledge (Lei & Zhao, 2007; Park et al., 2009) and engage students in scientific inquiry (Ebenezer, Kaya, & Ebenezer, 2011; Hug, Krajcik, & Marx, 2005). Specifically, the applications of technology "provide tools that allow students to visualize complex concepts, perform complicated procedures, use the tools of scientists, employ scientific databases with current information, and research matters of scientific and technological concern" (Gabric et al., 2006, p. 80).

Problem-based learning supported by visual stimulation, virtual labs, and advanced digital tools make learning efficient, more interesting, and empowering. Students are more likely to be aware of what they are learning, acquire the needed information to solve authentic problems, and discover how science can be intriguing and useful (Gupta & Fisher, 2012; Guzey & Roehrig, 2012).

Data from the National Assessment of Educational Progress (NAEP) demonstrate that fourth-, eighth-, and twelfth-grade students whose teachers indicate that they integrate computers into their instruction achieve higher science scores than those students whose teachers do not (O'Sullivan, Lauko, Grigg, Qian, & Zhang, 2003). Webb (2005) summarizes four main areas in science learning that a technology-rich environment affects: cognitive development, real-world experience, self-management, and data collection and presentation. However, in order to integrate technology to facilitate students' inquiring minds, teachers must not only be proficient in both hardware and software involved in the process but also organized in advance planning to secure computer labs or laptop carts (Gabric et al., 2006).

Instructional Technology and Mathematics

Research reports positive relationships between the use of instructional technology and students' mathematics learning (Hamilton, 2007; Li & Ma, 2010). For example, technology integration can help close the achievement gap and promote higher-order thinking skills (Rosen & Beck-Hill, 2012). Technology appears to have more significant effects on the mathematics achievement of students with special needs as compared with general education students. The positive effect is more significant when the technology is used with a constructivist approach to teaching than with a traditional approach. One study finds that teachers who use computers, calculators, and other technological devices in their mathematics instruction can improve students' basic skills in fourth, fifth, sixth, and ninth grades (Hudson, Kadan, Lavin, & Vasquez, 2010).

Additionally, research finds online sites, such as class websites, blogs, or wikis, to be effective platforms for communication among students, teachers, and parents who can discuss mathematics standards, assignments, and projects. Through these online sites, teachers also can provide extra resources to help students explore and solve mathematics problems (Tuttle, 2008). However, research also finds particular technology software or programs do not improve student's mathematics learning (for example, Dynarski et al., 2007). Thus, factors related to specific technology software and programs and their implementation are crucial to their success in the classroom.

Reflections

1. What are your strengths in integrating technology into your instruction?
2. What can you improve in integrating technology into your instruction?
3. What content and skills in your subject could be enhanced by technology?
4. What technologies best fit into your extant instructional strategies? Consider the following seven categories of technology (Pitler, Hubbell, Kuhn, & Malenoski, 2007).
 - Word-processing applications
 - Organizing and brainstorming software
 - Multimedia
 - Data-collection tools
 - Web resources
 - Spreadsheet software
 - Communication software

Why?

5. What technologies do you think might enhance student learning but also require you to restructure your instructional model?

Sources: Açikalin, M. (2010, October). Exemplary social studies teachers use of computer-supported instruction in the classroom. *The Turkish Online Journal of Educational Technology*, 9(4), 66–82; Andrews, R. (Ed.). (2004). *The impact of ICT on literacy education*. New York: RoutledgeFalmer; Balanskat, A., Blamire, R., & Kefala, S. (2006, December). *The ICT impact report: A review of studies of ICT impact on schools in Europe*. Brussels, Belgium: European Schoolnet; Beck, D., & Eno, J. (2012). *Signature pedagogy: A literature review of social studies and technology research*. *Computers in the Schools*, 29(1–2), 70–94; Berson, I. R., & Berson,

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