Technology's Impact in Teaching and Learning:

Environment, Assessment, Collaboration, & Individualization

Kathleen M. Marleneanu

University of Arkansas at Little Rock

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Though ever-evolving, technology consistently serves as an avenue to improve learning by aiding teachers and supporting and engaging students. Roblyer and Doering (2013) define educational technology as "a combination of the processes and tools involved in addressing educational needs and problems, with an emphasis on applying the most current digital and information tools" (p. 6), and explain that instructional technology is "the subset of educational technology that deals directly with teaching and learning applications" (p. 6). Instructional technology has positively impacted teaching and learning in areas such as class environment, assessment techniques, collaboration possibilities, and individualization methods; and if current trends remain, will continue to shape education in these and other areas in the future (Brand, Favazza, & Dalton, 2012; Clarke-Midura & Dede, 2010; Roblyer & Doering, 2013; Sams & Bergmann, 2013; Szewkis et al., 2011).

Teaching

Various forms of technology have given teachers assistance and opportunities to improve instruction and increase productivity, which consequently helps enhance student learning. Some examples of this include expanding the classroom environment with distance learning, and improving the effectiveness and efficiency of assessment.

Environment

Technology has offered alternatives to teaching in the traditional classroom setting. Now, with tools such as the Internet and mobile devices, a teacher does not even have to be face-to-face with students to instruct. Roblyer and Doering (2013) explain: "With wireless communications and portable devices, now the lab comes to the students, and learning environments can be

located beyond the walls of classrooms and schools" (p. 28). Teachers can choose the level of distance learning they would like to incorporate, from using online materials to supplement in-class instruction, to structuring a curriculum lesson using website resources, to teaching virtual courses that are completely online (Roblyer & Doering, 2013). Sams and Bergmann (2013) suggest that traditional classroom teachers consider using video technology to "flip" their classroom in order to make the most out of face-to-face instructional time. "Flipping" means that "[i]nstead of coming to class to watch the teacher lecture and then going home to practice what they learned…students watch the lecture at home and then come to class to practice what they've learned" (Sams & Bergmann, 2013, p. 16). This allows time for teachers to deliver targeted instruction to students during class to meet their individualized needs. Flipped classrooms and other distance learning activities involving videoconferencing, podcasts, and countless Internet resources, were once rare in education, especially for K-12, but have "become a mainstream alternative to and supplement for face-to-face learning" (Roblyer & Doering, 2013, p. 207).

Assessment

In addition to giving teachers options for type of class environment, technology has also impacted teachers' options for assessment. Clarke-Midura and Dede (2010) discuss the disadvantages of traditional paper-and-pencil tests, stating that they "are barely adequate to measure the minimum competencies required for low-level roles in industrial settings and fall woefully short of providing measures of the sophisticated knowledge and skills students need for 21st-century work and citizenship" (p. 312). Because of this view, they researched the impact of immersive technologies and mediated performance on assessment, and state that "[t]he type of observations and evidence of learning that technology-based assessments allow is unparalleled" (p. 311). Roblyer and Doering (2013) also discuss the new assessment options that technology

presents, especially the use of "handheld devices to make monitoring students' progress more immediate and continuous" (p. 28). Additionally, the growing popularity and ease of creating podcasts and other types of digital recordings gives educators (such as foreign language and speech teachers) the option to gather and assess oral language samples from students (Roblyer & Doering, 2013). Advances in both audio and video recording also offer an efficient means for self-assessment of performance by students and teachers alike.

Learning

Technology's impact on teaching, as seen in the growing number of assessment options and class environment alternatives, subsequently supports student achievement. Other ways in which technology has positively impacted learning include increases in opportunities for both student collaboration and individualized instruction.

Collaboration

Technology has enhanced student collaboration, and the communication that is an essential part of that collaboration. According to Roblyer and Doering (2013), "[t]he ubiquity of computer power has made possible an ever-expanding number of avenues for expressing opinions and sharing information" (p. 28), and "the most powerful uses of Internet tools are for social networking and collaborating with others in many different locations" (p. 223). With the use of technology, collaboration can occur in locations that range from within the same physical classroom to the other side of the world, synchronously and asynchronously, and through means such as text, audio, and/or video. Szewkis et al. (2011) studied a computer-supported collaborative approach that used Single Display Groupware and of Multiple Mice to encourage synchronous "silent collaboration" within large classroom groups, and state that "initial findings would suggest that we achieved the goals of learning and collaboration" (p. 573). On the other

hand, Roblyer and Doering discuss technology tools that promote learning by allowing for communication and collaboration outside of the classroom walls, both synchronously and asynchronously. These tools include: email, tweets, bulletin boards, blogs, chatrooms, instant messaging, text messaging, videoconferencing, avatar spaces, wikis, podcasts, e-Portfolios, video and photo sharing communities, and social networking communities. Teachers have found that virtual collaboration can be effective in motivating students, as well as providing students with opportunities to "work with students of other cultures to provide authentic writing and research experiences" (Roblyer & Doering, 2013, p. 297).

Individualization

As technology has promoted collaboration methods among students, it has also promoted methods that recognize and assist students on an individual basis. While this is beneficial for all students, Roblyer and Doering (2013) state that "[n]ew technologies continue to make the most dramatic advances in opportunities for people with disabilities" (p. 29), and discuss assistive technologies that are available to help adapt for cognitive disabilities (e.g. reading software and alternative keyboards), physical disabilities (e.g. joysticks and switches), and sensory disabilities (e.g. screen readers and FM amplification systems). Edyburn discusses the important implications for classroom technology use in regard to the Universal Design for Learning (UDL) framework, which upholds the idea that "instructional design that is deliberately created for individuals with disabilities often provides significant benefit to all students" (as cited in Roblyer & Doering, 2013, p. 55). To improve learning results for children, UDL emphasizes the significance of educational services to address individual differences, customized access to curriculum, and the setting and assessment of individualized goals (Brand, Favazza, & Dalton, 2012). Brand, Favazza, and Dalton (2012), explain that "UDL does not necessarily require the

purchase of the latest technology and equipment" as "[r]esourceful teachers enlist a variety of materials and learning experiences that involve all learners in meaningful ways" (pp. 134-135). Examples of UDL technologies include visual displays such as PowerPoint presentations, SMART Boards, storyboards, flip charts, interactive graphic organizers, and video clips; self-monitoring tools such as charts, audio and video recorders, checklists, and models; and assessment formats that include computers, text-to-speech and speech-to-text, and the presence of visual aids (Brand, Favazza, & Dalton, 2012).

Future Impact and Conclusion

As the tools and processes of educational technology continue to evolve, the potential for positive impact on learning and achievement continues to grow, too. In regard to environment and assessment, Robyler and Doering (2013) predict that "distance learning for K-12 students eventually will have the same degree of impact on reshaping schools as it has had on redefining higher education" (p. 28), and state that "[n]ew technologies are already having an impact on how educators assess students, and more changes seem likely in the future" (p. 28). As for technology's contribution to collaboration, Robyler and Doering believe that there is a growing need to learn skills for online communication; and in regard to individualization, they predict that there will be an increase in school investments for assistive technologies "[b]ecause all students, including those with disabilities, must meet high standards of achievement" (p. 29). Whether higher standards of achievement are mandated or not, improving learning by supporting teachers and students is vital to education today and in the future; and technology will continue to help lead the way for improvement. Already, it has positively impacted teaching by offering distance learning environments and improved assessment techniques, and has enhanced student learning by providing numerous opportunities for collaboration and individualization.

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