

On the Purpose and Promise of Technology in the Science Classroom

by Joshua A. Ellis, Florida International University

Over the past 18 months, teachers, parents, and students across the world have been thinking about the role of technology in education more than ever before. The rapid shift to digitize and virtualize all aspects of learning in response to the global pandemic has illustrated both the opportunities and the limitations of leveraging technology within (and beyond) the K–12 classroom. Many science educators are accustomed to thinking about the role of technology in their classrooms because the practices and products associated with science and technology are often inseparable, advancing each other in a symbiotic relationship (Ihde, 2009). Over 30 years ago, the American Association for the Advancement of Science (AAAS) defined technology not as a product but as a technical and social process that involves “the application of knowledge, tools, and skills to solve practical problems and extend human capabilities” (Johnson, 1989, p. 1) and exhorted educators to provide students with opportunities to experience technology in their K–12 classrooms. Science educators and policymakers responded to this call by codifying the role of technology within the K–12 science classroom through standards documents such as the *Benchmarks for Scientific Literacy* (AAAS, 1993), the *National Science Education Standards* (National Research Council, 1996), and today’s *Next Generation Science Standards* (NGSS Lead States, 2013). As a former K–12 science teacher and a current science teacher educator, I remind my pre- and in-service teachers that “One cannot truly experience science without experiencing its technological dimension” (Oliveira et al., 2019, p. 149).

However, not all science teacher educators and researchers share this perspective. Across our K–12 school districts and teacher preparation programs, technology is too often relegated to a minor role when supporting preservice and inservice science educators. Technology has received less emphasis than the other disciplines represented in the STEM acronym (Akerson et al., 2018), and some researchers have chosen to ignore the role of technology completely (Herschbach, 2011). This neglect has led to the conceptual dilution, misapplication, and trivialization of educational technology in the classroom (Bull et al., 2019), resulting in the popularization of generic instructional technologies and approaches that may replace traditional pen-and-paper activities but fail to amplify or transform the student learning experience (Hughes et al., 2006). In some K–12 schools, a focus on technology may be found in specific learning environments such as shop classes or makerspaces, and a science teacher at one of these schools might believe that they are thereby absolved of the responsibility of educating their students about the role of technology. However, I believe that this would be a mistake. Obviously, not all K–12 schools have access to facilities like shop classes or makerspaces, and those that do usually offer

associated learning experiences as electives. Moreover, the majority of eighth-grade students report learning about technology and engineering within the context of their science classroom (National Assessment of Educational Progress, 2018). This is especially true for groups of students that have been historically excluded from careers in science, technology, engineering, and mathematics: 55% of Black female students and 61% of Hispanic female students in the eighth grade report that they have never taken a technology or engineering course, whereas the same is true for only 41% of their White male peers (Change the Equation, 2016). If we as science teacher educators wish to increase opportunities for all students to not only succeed in science but also develop the skills and practices that will prepare them to explore a career in science or the STEM fields, we need to stop neglecting the role of technology in our discipline and start crafting experiences that leverage the symbiotic relationship between science and technology in ways that support student learning.

Thankfully, there are many science teacher educators from the Association of Science Teacher Education (ASTE) and the Society for Information Technology and Teacher Education (SITE) that have taken up this charge. Over the past 10 years, I have been privileged to learn with these scholars and explore these topics in ways that have directly impacted not only how I engage with technology in scientific contexts, but also how my pre- and inservice teachers integrate technology into their science teaching in ways that amplify and transform how their students experience science. If you wish to join the conversation, there are many great avenues for doing so. At the ASTE International Conference, you will find innovative and thought-provoking presentations in the Educational Technology conference thread. Additionally, you can participate in the Technology Forum, which supports both the ASTE membership and the board in articulating how to thoughtfully integrate technology in science teacher education. At the SITE conference, the Science Education Special Interest Group serves a similar function, facilitating cross-organization conversations about the relationship between science and technology and their roles respective to one another. It is my sincere hope that you will consider joining us in exploring the purpose of technology in the science classroom and the promise that it holds for our students and educators.

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