# Preparing Students with 21st Century ICT Literacy in Math and Science Education

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A decade into the 21$^{st}$ century there are exciting advances in the preparation of students in their content knowledge and technology skills, challenging them to prepare for global citizenship and successful futures (Smaldino, Lowther, & Russell, 2012). Using a framework designed around core content, career skills, learning and innovation skills, and information and communication technology (ICT), the Partnership for 21$^{st}$ Century Skills views teaching and learning as support for students to master the multidimensional aspects they will encounter as they move forward in school and career (Partnership for 21$^{st}$ Century Skills, 2004). They advocate that the education systems must adjust to ensure student success in a global economy.

Clearly, as educators, we recognize the issues associated with shifts in the nature of technological expectations for preservice and inservice PreK-12 teachers as well as those in teacher education. It is critical that we reconsider the idea of technology integration as separate, instead making it an integral part of our design for instruction. We must continue to examine those aspects of the design and implementation of digital learning environments and gather data on the success of our efforts to improve the education of teachers and teacher candidates in the integration of technology into learning experiences.

With the emphasis on Science, Technology, Engineering, and Mathematics (STEM), the focus within this issue is on the means by which education is embracing technology to support learning at all levels. In Dede's (2011) article, "Reconceptualizing Technology Integration to Meet the Necessity of Transformation", he addresses the issues of technology integration as a vehicle for educational transformation. He provides us with a strong argument that as educators we need to redefine integration beyond "computerizing" a traditional design of instruction. He encourages us to look at education differently and capitalize on ways technology can not only engage students in learning content, but also provide them with powerful tools to extend their learning experiences. Dede also emphasizes that as educators we need to not only be innovative in our design, but also to consider our inquiry process for comprehensive analysis of learning using these power tools.

As we look more in depth at the articles contained in this issue, there is a consistent message across them. When research-based instructional strategies are

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combined with appropriate and innovative technology applications, learning happens (Kelly & Kennedy-Shaffer, 2011, Kurz, 2011, Puckett, Shea, & Hansen, 2011). Each of these studies has examined the impact on student learning in mathematics and science when a focus on implementation of innovative instructional opportunities exists. As you will read in these articles they began with the identification of the need to improve specific science or mathematic knowledge among young people. There was also the identified need to work with classroom teachers to advance classroom practice and integrate technology tools (Cady, Aydenis, & Rearden, 2011; Hagevick & Stubbs, 2011).

It is refreshing to note that educators recognize the need for enhancing STEM learning opportunities, as well as including technologies that are traditionally not viewed as educational in a traditional classroom setting. The use of GPS (Hagevick & Stubbs, 2011), iPods, and podcasting (Puckett, Shea, & Hansen, 2011) is expanding into daily classroom use. To see these tools used to expand student learning in specific mathematics and science content demonstrates the interest in designing and developing innovative digital learning experiences for all students. It recognizes the value that ICT adds to the learning process.

It has been a pleasure to work with the editors and staff of the *Journal of Curriculum and Instruction* throughout the process for selection and preparation of this special issue of the journal. I have enjoyed my conversations, albeit asynchronous, with Chris Dede in the preparation of his piece for the journal. I am delighted to see the scope of work in science and math education and the inclusion of ICT resources. I applaud the efforts of the journal leadership to focus on critical issues in education today. I encourage you to read these articles and then consider options they present as ways in which you can advance your own professional engagement in promoting quality innovative learning experiences for all learners.

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## About the Author

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