ABSTRACT

With the continued growth of digital tools and practices, the manner in which instruction is planned and delivered within a middle-level classroom will need to evolve. Science educators have often been in the forefront of technology inclusion. With the current expectations of three-dimensional learning promoted within the Next Generation Science Standards, teachers have additional opportunities for students to utilize digital tools and practices during their instructional process. Through the utilization of carefully selected digital tools and practices, science teachers can engage learners and better assist them in constructing meaning through three-dimensional learning. The authors focus on the intersection of three areas: how middle school students make sense of content and develop understanding, the utilization of strategies for designing and creating a middle school classroom around digital practices, and the challenges and opportunities that this instructional shift encounters.
INTRODUCTION

Technological innovation and design often move at unbelievable speeds. For example, new models for phones are available every year, business and commerce areas send transactions at speeds that hit milliseconds, and professionals in cyber security will never be jobless due to the constant need to fend off risks. This is the reality we live in and the premise for the reality of our students’ future.

Technology is a word that often evokes differing reactions based on the situation or field of the person being asked to utilize it. Educational technology has long been considered one of the ways to transform education, level the playing field, and provide overall equitable opportunities for students while providing the skills necessary for students to enter the workforce (Baynard, 2010; National Science Board, 2018). The caveat to change that this transformational product can bring is twofold: first, the students must have access to the technology and second, teachers must know how to best utilize the technology in a learning environment.

Many of the educators entering today’s classroom grew up during the explosion of technology and know no other world (Wang, Hsu, Campbell, Coster, & Longhurst, 2014). They are the digital natives as named by Prensky (2001) and some are further defined by Helsper and Eynon (2010) as second-generation digital natives having been born after 2000. In order to take the digital native and turn them into a digital educator, old fashioned instructional techniques of modeling and scaffolding still need to be utilized even though they may be around the integration of digital practices.

This chapter will focus on the unique aspects of integrating digital tools and practices within the middle-level science classroom in order to provide:

- Foundational perspectives of how this level of learner is impacted by and engaged with technology;
- Explicit details for instructional practices for this age and curricular design, as well as, for how the use of innovative digital practices are supported by the standards;
- Strategies for designing and creating a middle school classroom around digital practices; and
- Overall opportunities to integrate technology and digital practices, challenges that teachers may encounter, and summary recommendations from a practicing middle school science educator and higher education science education faculty member.

Each topic area will draw from the available literature in the field to build a framework and incorporate example strategies that highlight the research focus through either scenarios or excerpted narratives to illustrate the use of the digital practices.

BACKGROUND

Middle Level Learners and the Construction of Knowledge

Middle level learners are often considered to be at the nexus of various developmental stages. Harkening back to educational psychology, most prominent educational theorists had at least one view on how this age student learned and constructed knowledge. Two key theorists put forth views that support the manner in which students construct knowledge and how this construction moves their understanding forward.