Zone It! A mobile application for practice- and place-based learning

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Keywords: STEM learning, practice-based, place-based, simulations

Abstract
Education leaders have called for STEM education that is more practice-based and better prepares learners for college and STEM careers (NRC, 2012); however, a survey of 12 industrialized countries (Hoffman, 2011) found that U.S. learners spend the least amount of time learning in a professional context. Moreover, education researchers contend that young people learn complex thinking best when they act in a realistic setting and that *place* is an important part of this learning. In this demo, we will describe how we built a place- and practice-based virtual learning environment that grounds students in their own geographic contexts in order to explore the social and environmental complexities of zoning, development, and land use.

Research has shown that when students engage in place-based curricula they show higher increases in knowledge, interest, and pro-environmental behaviors when compared to students in a traditional curriculum (Powers, 2004; Sobel, 2004). However, similar to practice-based learning, it is also difficult to provide consistent and scalable experiences and exploration for all students in real-world learning environments. Virtual internships such as *Land Science* provide young people with authentic STEM learning experiences at scale and allow them to engage in realistic STEM activities using any computer or tablet with Internet access (Chesler et al, 2015).

Participation in *Land Science*, an urban planning simulation, has been demonstrated to (a) help learners develop skills and knowledge in environmental science and learn authentic STEM practices; and (b) increase learners' feelings of civic engagement and interest in the relationship between cities and the environment (Beckett & Shaffer, 2005; Bagley & Shaffer, 2009). Critically, however, science learning and civic engagement outcomes are significantly better when the simulated activities in *Land Science* take place in the learners' local context (Siebert-Evenstone & Shaffer, 2019).

This presents a problem for the current system, because the original version of *Land Science* only allows learners to interact with a place-based model of Lowell, MA, and thus with a limited set of environmental issues and learning objectives. Instead of simply creating and recreating new settings, we developed a local environmental modeling technology, called *Zone It!,* that allows users to independently customize *Land Science* to their local contexts and address their community's population, environmental and socioeconomic complexities, and educational or outreach objectives.

Zone It! uses real-world data to generate zoned parcels that are scaled to user-identified map regions. We will discuss how we built *Zone It!* and how we generated gameplay by coregistering data sets to create realistic simulations of land-use decisions on real-world socio-environmental indicators localized to the user's mapped area. Further, this demo addresses the conference theme about "Contexts, Complexity, and Communities" by providing an opportunity to discuss the interaction between virtual and real-world contexts.

Our research using *Zone It!* will provide insight into how people think about land-use problems, provide data and information about the complexity of eco-social problems and the strategies that

people use to solve them, provide a platform to vary virtual context and test user experience of locality, and inform the design of curricula to teach students about the complexity of land-use decisions.

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