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Teaching American migrations with GIS census webmaps: A modified "backwards design" approach in middle-school and college classrooms ☆

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ABSTRACT

Learning to use new technologies often involves significant challenges for teachers and learners. This study follows Tally's ((2007). Digital technology and the end of social studies education. *Theory & Research in Social Education, 35*(2), 305–321) challenge to put the "why" of social studies education first, and then "tinker" with technologies to discover how they can address learning goals. Using a modified "backward design" approach (Wiggins & McTighe (2005). *Understanding by design*. ASCD), a design team of middle school teachers, researchers, and disciplinary experts designed, enacted, and studied historical inquiry projects in middle school and college classrooms. Students used online, interactive, historical census data GIS "webmaps" (Baker (2005). Internet-Based GIS Mapping in Support of K-12 Education. *The Professional Geographer, 57*(1), 44–50) to investigate African American and Latino migrations. The study presents findings detailing three emergent learning objectives, highlighting how students' presentations with GIS maps evidenced three modes of reasoning with webmaps: (1) making observations with data; (2) drawing inferences from data; and (3) explaining the limitations of data for inquiry.

Introduction

It seems that whenever a new technological tool appears, a chorus of voices proclaims that it should transform the ways we teach and learn – despite a long history of technologies that have had relatively minor impacts on teaching and learning (Collins & Halverson, 2009; Cuban, 2001; Tally, 2007). Some technologies are meant to scaffold learners' thinking toward the habits of mind of particular disciplines (Edelson & Gordin, 1998; Hicks & Doolittle, 2008; Saye & Brush, 2006). Yet learning to use such tools often requires a great deal of scaffolding in itself, creating significant challenges for teachers, and making many of these high expectations appear unrealistic (National Research Council, 2006; Tally, 2007).

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In response to Postman's (2000) critique of our society's recurring technology fixation, Tally (2007) suggests that we must develop a more nuanced and realistic approach to integrating novel technologies into the classroom. For Tally, such an approach begins with "the *why* of social studies education" (p. 317): grounding our teaching in the disciplinary habits of mind we believe are essential, and then "tinkering" carefully with technologies to find ways they can align with these fundamental purposes.

The present study offers an effort in this direction, taking a careful and critical look at how the affordances of a particular technology align with specific pedagogical purposes of social studies education. The focus is on one class of tools: online, public-use geographic information systems (GIS) data maps that provide access to historical census data. Unlike professional-grade GIS software, these "webmaps" (Baker, 2005) offer minimal functions for spatial or statistical manipulation of data. Instead they are intended as accessible, easy-to-use browsers for querying and examining historical census data (Radinsky, 2008a). While some software learning environments are designed to teach specific skills, concepts, or information, webmaps are general-use data access and visualization tools that can be incorporated into instruction in a wide variety of ways (Baker, 2005). The present analysis focuses on three learning objectives: (1) learning to make clear and accurate observations from data, (2) learning to draw relevant and generative inferences from data, and (3) learning to identify and explain limitations of data for an inquiry.

These broad reasoning skills, which align with the "comprehension," "analysis," and "evaluation" levels of Bloom's taxonomy (Bloom, 1956), are often taught in social studies using a wide range of materials. For example, "document based questions" (DBQs) are often used for teaching or assessing these abilities, among others, using primary-source historical documents as the historical content (Wilson & WIneburg, 1993). The focus in the present study is on the ways these learning objectives can be realized using the unique affordances of interactive, map-based data query tools, rather than more familiar documents or static maps, for examining historical contexts, actors, and events, and constructing understandings of historical contexts as they change over time. While these tools can be seen as providing opportunities to teach "information literacy" (Warschauer & Matuchniak, 2010), they also afford the teaching and learning of specific historical thinking and inquiry skills. The present study aims to explore these affordances of census data webmaps.

Modified "backward design"

The present study followed a modified "backward design" approach to exploring the affordances of census data webmaps for teaching and learning social studies. Backward design (Wiggins & McTighe, 2005) is a strategy for developing assessments, curriculum, and instruction based on a clear articulation of learning goals. Starting with learning goals, desired outcomes are specified; assessments are then developed based on a clear picture of the desired performances; and instructional strategies and materials are designed last, to prepare students to succeed on the assessments,. In practice the process is iterative, not strictly linear, but the intention is for desired learning outcomes to drive design decisions.

However, the "backward design" process is not ideally suited for investigating novel technologies, because these tools enable unfamiliar kinds of interactions for teachers and learners. We cannot map backward from known learning goals to unknown technologies if we do not yet know what those technologies might be good for, or the range of possibilities for using them. We therefore present here a "modified backward design" approach, in which a design team of teachers, researchers, and disciplinary experts collaborated to design, implement, and study curriculum units in middle school and undergraduate classrooms.

The curriculum focus was on teaching and learning about migrations of African American and Latino populations in United States history.[1] The design team began by articulating learning goals for understanding these migrations, as per backward design. The modification was an *a priori* commitment to using census data webmaps in the classrooms studying these migrations. Through iterative cycles of design, classroom research, and revision, the design team is refining a set of learning objectives, assessments, curriculum materials, and customized GIS webmaps. This design-based research approach (Brown, 1992; Design-Based Research Collective, 2003; Schoenfeld, 2006) matches well with Tally's (2007) suggestion to maintain a primary focus on the "why" of social studies education, and to methodically "tinker" with a technology to find ways it can align with fundamental pedagogical goals.

The present study shares results from the first cycle of the research process, focusing on three learning objectives, which are a subset of those generated and refined by the design team during the first year of the project. We present a summary of the team's rationale for each learning objective, followed by a qualitative analysis of students' work with the census data webmaps from the first round of classroom enactments. This analysis serves to refine and nuance the focal learning objectives, and to illustrate the ways the use of the tool afforded and constrained students' opportunities to learn each of the focal objectives.

Literature review and theoretical framework

The research potential of GIS tools has received a great amount of attention in recent years (e.g., National Research Council, 2006; Hammond & Bodzin, 2009; Kerski, 2008; Sui, 1995). Simple GIS have proliferated online (Baker, 2005;

[1] The study presented here is part of the *ANONYMIZED* Project, a 5-year research project funded by National Science Foundation Grants # *ANONYMIZED* and *ANONYMIZED*. Information about the project can be found at http://ANONYMIZED.

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