Mapping an Agenda for Education Informatics in the K-12 Domain

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Abstract

In the United States, primary and secondary (i.e., K-12) schools are rapidly changing their technology infrastructures to comply with sweeping federal mandates for enhanced data utilization and digital learning. These changes provide information science researchers with a unique opportunity to apply informatics constructs to the study of K-12 organizations. In honor of the 2014 iConference theme, this poster breaks down disciplinary walls in a map of K-12 education informatics elements in which the researcher 1) took inventory of the research- derived knowledge of technology use in the K-12 environment; 2) reviewed major empirical approaches to technology infusion in K-12; and 3) proposed a model for K-12 education informatics that may be useful for future research and professional learning. This depiction of information, information systems, and information technology research (i.e., core elements of informatics) is intended to foster empirical model development, inspire future research, and provide considerations for professional learning.

Keywords: educational systems, informatics, schooling, K-12, primary schooling, secondary schooling

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1 Introduction

The goal of the United States' National Education Technology Plan's goal is to "enable engaging individual learners' personal interests by connecting web learning resources to learning standards, providing options for adjusting the challenge level of learning tasks to avoid boredom or frustration, and bridging informal and formal learning in and outside of school" (Office of Educational Technology, 2010, p.17). While the Plan's objectives are timely and important, less clear is how to bring these myriad forces together and how to use this confluence as a springboard for research and knowledge building. The poster uses a conceptual exploration of K-12 education informatics to illustrate and begin to define and connect its components to the values and work of the iSchool community.

2 Defining and Exploring K-12 Education Informatics

Benyon-Davies (Benyon-Davies, 2007) defined informatics as "a convenient umbrella term to stand for the overlapping disciplinary areas of information systems, information management and information technology" (p.306) and later refined these core components to "information, information systems and information technology" (Benyon-Davies, 2009, p.92). With these ideas in mind, this poster will depart from Beyon-Davies' conclusion that informatics serves to "support of coherent decision-making and action," to examine that notion in the context of K-12 (i.e., primary and secondary schooling) educational organizations.

The term "education informatics" is used to describe different aspects of information technology as applied to, practiced in, or recommended for future implementation in education, teaching, and learning. The origin of the need for this sub-discipline likely was one of two events:

1. In 2005, librarians associated with the top 50 schools of education in the United States convened with the goal to discuss ways to provide better access to education information. They concluded

that the discipline of education lacked, but needed, a formalized informatics program, similar to that found in fields such as health, to focus on the use of technology to solve education information problems. This group advocated for the field to be interdisciplinary with participants from information science, education, computer science, and other fields (Carr, Collins, O'Brien, Weiner, & Wright, 2010; Collins & Weiner, 2010) and for its researchers and practitioners to understand how federal, state, and local policy drives the interplay between technology and education (Carr & O'Brien, 2010);

2. A U.K. research team led Nigel Ford called for researchers to move beyond the concept of technology integration, a notion that inherently assumes technology as external to the processes it enables, to education informatics (Ford, 2004), a "[s]tudy of the development and application of digital technologies in relation to the analysis, storage, manipulation, retrieval and use of information selected from multiple independent information sources, in relation to learning" (Ford, 2005, p.362). According to Ford (2008, p.ix), education informatics is the study of "the development, use, and evaluation of digital systems that use pedagogical knowledge to engage in or facilitate resource discovery in order to support learning." While education informatics at the tertiary education level is a rapidly growing area for information science, none of the aforementioned originators have comfortably placed the learners into working definitions or determined how their definitions create an agenda for the study of complex K-12 environments.

Given their extensive ranges of influences, structures, and functions, K-12 schools are considered highly complex organizations (Etzioni, 1975). When technology is considered in the context of educational organizations, its value emerges in its relationship to organizational activity mediated through information systems.

2 Current Significance of Education Informatics

Recent forces have dramatically changed the internal structure and function of information and technology K-12 organizations in the United States, thus creating a unique impetus for developing a research agenda for education informatics: the Department of Education's Race to the Top (RT3) funding; and the Common Standards Movement that includes the Common Core State Standards (CCSS), the Next Generation Science Standards (NGSS), and the college and career readiness standards movements (Evans, 2012).

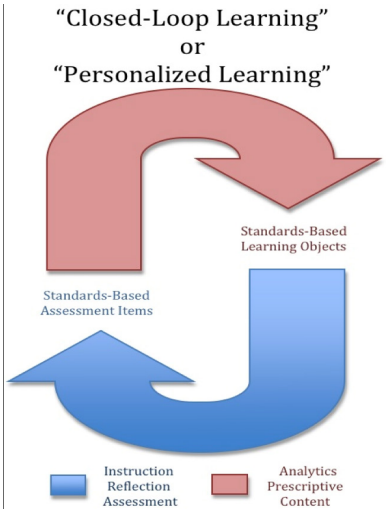

Figure 1: Closed loop learning components

RT3 applications require state and local education agencies to establish instructional improvement systems (IIS) through which student data, teacher profiles, learning resources, and assessment results are integrated to generate rapid, personalized feedback that allows teachers to individualize and differentiate instruction (Saldivar, 2012). These IIS data points create a closed loop among teaching and learning resources, instruction, and assessment that allows teachers to personalize learning for each student (Manderson, 2013).

Fundamental to this process are a repository of vetted common standards-linked learning and assessment resources upon which to base instruction (U.S. Department of Education, 2013) and IIS data, instructional technology, virtual learning platform, digital textbook, and other learning systems interoperability. Unfortunately, there is little research on the extent to which K-12 schools will be able to incorporate data and tools to affect real change and realize common standards (Evans, 2012).

3 Mapping K-12 Education Informatics

Concept maps are highly effective graphical tools for representing new knowledge through the depiction on two dimensional node links that visually illustrate the relationships between concepts (Novak & Cañas, 2008). To create a concept map, a researcher begins with a focus question, which in this poster was "What are the components of K-12 education informatics." This question guides data collection; illustration and linking; and model proposition.

To compile data for the poster, I explored the interrelationships between information, information systems, and information technology by taking inventory of the research-derived knowledge and major empirical concepts or findings relating to technology infusion in educational organizations. Sources included sociocultural, sociotechnical, and technical research articles, legislation, and reports published between 1993 and 2013. I reviewed the sources and identified the major findings or themes in each source. Then, the themes were sorted into three broad concept categories: information, information systems, and information technology. I then mapped each concept category and created links within and across categories.

Using the CMap Tools software from the Florida Institute for Human and Machine Cognition[1], I created and linked circles for each concept. Linking words or linking phrases were placed on a link line to specify the relationship between the concepts. The completed concept map is a proposed model for K-12 education informatics useful for future research and professional learning.

4 Conclusion

To recognize the value and impact of technology to the educational system and to the learning process, leaders of educational organizations must ensure that their infrastructure accommodates the information needs of participants; education informatics may provide a framework for discernment. Many seminal informatics studies will also be interesting to replicate in a K-12 context. A greater understanding of K-12 education informatics allows researchers to pursue rich research questions such as:

- Who are the actors in a K-12 information environment? How do their contributions interrelate to produce knowledge?
- What does a K-12 information ecosystem look like? What situational factors influence the success of various components and how can this success be maximized?
- To what extent and in what ways is personalized learning in K-12 dependent upon affordances such as technology and bandwidth access, professional skill, organizational policies, community norms, and personal motivation? How do these affordances interrelate?

An exploration of the concepts undergirding K-12 education informatics can have profound implications for the initial and continuing education of information professionals in the iSchools. The obvious place in which K-12 education informatics fits is in a reassessment of the traditional school librarian preparation curriculum. All too often, school librarian programs are relegated to less highly regarded roles in many iSchools, despite the fact that most iSchools have them (Mardis, 2009). Enrollments in these programs are declining (Wallace & Naidoo, 2010) as professional school librarians' positions are increasingly slated for elimination (Ellerson, 2009, 2010, 2012). With an improved understanding of the many disciplines to which K-12 education informatics are connected, iSchools faculty may be able to see ways in which to not only evolve their school librarian preparation programs to programs that train education informaticists, but also transform them into programs that fit naturally into the iSchools research agenda as complements to coursework in social, health, community, and other areas of informatics education.

Understanding the relationship between who we teach (learners), what we teach (curriculum/instruction), what we teach with (instructional resources), how well students are learning

[1] http://cmap.ihmc.us/

(assessment), and who is teaching (staff) is essential if our schools are to benefit from technology. Federal policymakers' push for better learning and teaching through IIS has been forward thinking but is largely uninformed by the research heritage of informatics. By using the literature in areas such as educational technology integration, personalized learning, resource curation, and educational applications of broadband, the goal of this work is to move beyond the idea of technology integration to a framework from which scholarly research and professional learning can respond to this urgent and timely issue.

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