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Constructing the Role of School Librarians in the 21st Century Workforce: Implications of NSF-Funded DataONE for K-12 Librarianship

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Abstract

This study will: 1. Uncover the characteristics of the emerging 21st Century workforce reflected in the literature associated with an NSF data infrastructure project (DataOne). 2. Compare those characteristics to the roles and responsibilities of school librarians articulated by their professional associations. 3. Compare those characteristics to the roles and responsibilities of school librarians articulated by education guidelines generally. This study contributes to the body of knowledge on the role of school librarianship in STEM education, particularly project-based learning, as well as to the broader scientific apparatus. It provides insight about how developments in K-12 education relate to scientific data infrastructure development. As knowledge workers, school librarians can play pivotal roles in STEM teaching and learning in ways that connect educational developments with the expectations of a science-based workforce (Subramaniam, Ahn, Fleishmann, and Druin 2012).

1   Introduction

This work examines the extent to which standards associated with the roles and responsibilities of school librarians and education in general align with characteristics of the workforce emerging in the 21st Century. This poster presents research that culls scholarly literature associated with NSF-funded DataONE to identify characteristics of this workforce. Publications in this literature are appropriate representatives of the workforce because of DataONE's capacity to diffuse particular values and encourage particular practices related to data intensive, computational science. DataONE is both a sociocultural and technical infrastructure that enables science by allowing scientists to manage their data, share their data, and access other scientists' data (Michener, et.al., 2012).

This research begins the exploration of "new" roles for school librarians by comparing related professional standards to the characteristics of a future-ready workforce. Numerous practical and theoretical frameworks have identified K-12 educational institutions as critical feeders of human resources into the information, science, and technology-driven global economy. However, little is known about how the professional standards that guide K-12 school librarians align with these characteristics. Also, while school librarians' roles and responsibilities in STEM education in general are well-articulated in standards for librarianship, this same clarity is not found among the general standards and guidelines for K-12 education (e.g., YALSA 2013; *Nextgenscience.org*). The roles played by school librarians' counterparts in higher education who are involved in the DataONE Project, for example, suggest that school librarians can be particularly useful in teaching and mentoring data curation (Tenopir, Birch, and Allard 2012). Librarians' filling these leadership roles would help meet the demand for scientific inquiry through project-based learning opportunities (*Nextgensicence.org*).

Science and technology have been projected to be the engines that drive American innovation and productivity in the future (Carroll and Kandish 2010). Science is becoming increasingly computational and

data intensive (Horvitz and Willia 2009). Thus, the ability to interface with data at various points in the data life cycle is becoming a highly marketable skill (Michener, et.al.2012; Halbert 2013) that can be developed most effectively and efficiently by school librarians (Subramaniam, Ahn, Fleishmann, and Druin 2012). The data skills that librarians can impart would leverage the value of public education. Simultaneously, it would leverage the value of publicly-funded scientific data as students use real world data to think about complex problems and as experiences with these data during their formative years contribute to long-term, marketable skills (Gavigan, 2012).

1.1   Research Questions

1. What is the nature of the 21st Century Workforce reflected in the literature associated with the NSF data infrastructure DataONE?
    1.1.   Is this nature reflected in standards for school librarians?
2. Are the K-12 standards associated with the roles and responsibilities of school librarians in the 21st Century represented in the DataONE literature?

2   Methods

The pilot study employed a content analysis research method using *QDA Miner Software* to analyze the abstracts and articles related to the NSF-DataNet:DataONE Project. *QDA Miner* is a qualitative tool that allows researchers to identify concepts and categories for analysis and generate relationships between terms (e.g., proximity and occurrence and clusters).

Data Corpus. The data corpus at the time of this study consisted of 67 journal articles (December 4, 2014) that were downloaded from "publications" on the *DataONE.org* website. Our pilot study examined and analyzed 25% of this corpus (additional data are being analyzed).

Future work will involve refining the initial list of terms based upon the utility of these terms, based upon common terms identified during further analysis of the DataONE publications, and based upon terms extracted from standards of school librarianship. Also, we will map this list to relevant K-12 standards for school librarians. In addition, we will contextualize the results of this study using quotes related to these school and library standards and to scientific data infrastructure practices (Yang and Wildemuth 2009).

3   Results and Analysis

Terms extracted from the DataONE published literature on scientific data infrastructures were used for the initial analysis. We identified the following list of terms : "data management," "data curation," "education," "STEM," "K-12," "schools," "media specialists," "school librarians," "resources," "materials," "educational," "tools," "citizen science," and "teachers," among other terms. While infrastructure-oriented terms such as data curation and data management appear frequently in the results of the content analysis, terms related to K-12 education exist in small quantities. However, phrases such as citizen science, which provide conceptual links between scientific data infrastructures and K-12 education, appear frequently.

Preliminary content analysis of the DataONE publications reveals the following top frequencies: "data" (9907 instances), "research" (2993), "science" (1875), "management" (1792), and "information" (1660). Two and three-word phrases appear in the following frequencies: "data management" (1164), "research data" (564), "data sharing" (496), "data sets" (288), and "research data management" (214). Education-related terms appear far down the list, in the single digits.

We searched for these terms and phrases within documents that promulgate professional standards for school librarians (AASL 2010, AASL 2012a, AASL 2012b, YALSA 2013). "STEM" (182 instances, .7 percent) is the most common term in these documents. Among the terms and phrases identified as the most frequent in the DataONE publications, only "research" (27, less than one percent) and variations of the

word "dataset" (6, percent not available – leftover term) appear among the school library/librarian standards.

4　Conclusions

This analysis resulted in a preliminary list of workforce characteristics as determined from the DataONE literature. These characteristics were mapped to relevant professional standards identified through professional associations related to school librarianship. Preliminarily, this mapping does not suggest an explicit integration between the characteristics of the emerging workforce and school librarians' roles and responsibilities.

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