



## Still Polishing the Diamond: School Library Research over the Last Decade

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### Abstract

*In 2003 Delia Neuman wrote “Research in School Library Media for the Next Decade: Polishing the Diamond.” One of the most influential pieces on school library research written in the last twenty years, the article provided a map for school library research by defining areas of concern and importance. Neuman developed questions grounded in the research and scholarship of the field at that time. These questions served as a charge for researchers to address in the next ten years. Neuman called on researchers to “polish the diamond and make it shine more brightly in its own right and sparkle more valuably in the larger field of education” (2003, 504). This study uses Neuman’s model of the diamond to examine school library research and scholarship from 2004 through 2014. Following Neuman’s guiding questions through a systematic review of the literature from the past ten years, this study finds that there is still much “polishing” to be done by school library researchers, and like Neuman, defines new “facets” that provide future direction to “move forward both the field’s research agenda and its effective practice” (Neuman 2003, 505).*

### Introduction

In the spring of 2003, the journal *Library Trends* published an article by Delia Neuman: “Research in School Library Media for the Next Decade: Polishing the Diamond.” This article, now regarded as a seminal piece of scholarship in the field of school library research, provided a map for researchers to pursue in the next decade by defining areas of concern and importance for the field. Neuman introduced this map as a diamond, a “visual metaphor for the next decade’s most important research for the school library media field” (2003, 503). She used this model to represent the research gap she found by taking a comprehensive look at the scholarship of the time: “Picture a simple graphic—the shape of the diamond that you would see in a deck of cards. Now think of this shape as a visual metaphor for the next decade’s most important research for the school library media field” (2003, 503). With this simple sentence, Neuman charged researchers moving into the new decade with the responsibility to connect and “draw their luster

from the centrality of student learning to the library media field” (2003, 504). The four questions defined by Neuman represent the four corners of her diamond:

1. What are the contributions of library media programs to student achievement?
2. What are the roles of the library media specialist in today’s schools?
3. How do students use electronic information resources for learning?
4. What has been the impact of the “Information Literacy Skills for Student Learning” [in *Information Power: Building Partnerships for Learning* (AASL and AECT 1998)] on library media programs? (2003, 504)

Neuman eloquently stated, “At the center of the diamond, illuminating each of the questions and reflecting the light from the answers, is the issue that has always been at the center of education: student learning” (2003, 504). In the ten years following the publication of her article, many changes have occurred in school libraries, school librarianship, and education overall. However, connecting school libraries and school librarians to student learning still remains a crucial priority. Neuman’s diamond, grounded in the field’s then existing body of scholarship, provides the conceptual framework for this study, a lens through which to examine the scholarship that has been conducted in the ten years (2004–2014) following the publication of Neuman’s article.

## Research Purpose

The overall goal of this study was to examine empirical research in the field of school librarianship conducted in the ten years after the publication of Neuman’s article, framed in the context of Neuman’s diamond model. The objective of this study was two-fold: first, to review published refereed research articles in the four areas defined by Neuman for the purpose of understanding the current state of the research, and second, to analyze and identify gaps in that research for the purpose of informing the direction of future work. Therefore, the following research questions were developed:

Research Question 1: What empirical research studies, related to the four areas defined by Neuman’s diamond model, have been conducted in the decade following publication of her seminal article?

Research Question 2: Based upon an examination of the empirical studies conducted in the decade 2004–2014, what are the gaps in the field of school library research related to the four areas defined by Neuman?

## Method

### Systematic Literature Review

Systematic literature review was the method chosen to identify and synthesize research conducted in relation to school libraries and librarianship, according to the four questions defined by Neuman (2003). A systematic literature review is an established methodology for “a means of evaluating and interpreting all available research relevant to a particular research question or topic area or phenomenon of interest” (Kitchenham 2004, iv). Systematic literature reviews, although underutilized in library and information science, are widely conducted in medicine,

psychology, and education to categorize, summarize, and synthesize existing literature on an issue or specific research topic, as well as to identify gaps and suggest areas for future research (Gough, Oliver, and Thomas 2012; Grant and Booth 2009; Kitchenham et al. 2010; Kitchenham and Charters 2007; Pettigrew and Roberts 2006; Tranfield, Denyer, and Smart 2003).

Systematic literature reviews differ from traditional literature reviews because of the systematic approach in searching for the research to be included. In fact, the word *systematic* means that the review is performed according to an explicit plan. In a systematic review, the researchers pre-plan and document a review protocol before the review even begins. This systematic review protocol (the explicit plan previously mentioned) ensures that the review is conducted with the same rigor expected of all research methodologies (EPPI Centre 2007; Gough, Oliver, and Thomas 2012; Kitchenham and Charters 2007; Kitchenham et al. 2010). Systematic review offers a model for summarizing and critiquing the literature of a discipline to improve future practice, possibly encouraging higher levels of research.

Although there is no single established systematic review protocol or single method for conducting a systematic literature review, there is a widely employed common core procedural method that includes three main phases: planning, conducting, and reporting (for example, Gough, Oliver, and Thomas 2012; Grant and Booth 2009; Kitchenham et al. 2010). The present study followed the common core procedural method.

## Planning Phase

As previously mentioned, the planning phase of the systematic literature review is what distinguishes it from a traditional literature review. In this phase, a comprehensive search strategy is developed and documented prior to any search (Grant and Booth 2009). The first step in any systematic review is to define and state the objective and reasons for conducting a systematic review: the research questions. Research questions for a systematic review are most often about identifying, selecting, or synthesizing available literature relating to the areas of research of interest (Gough, Oliver, and Thomas 2012).

## Search Strategy

The next step within the planning phase is to develop the search strategy. The search strategy comes from the review's research questions and conceptual framework. It targets the following questions: What to search for? Where to search? How to minimize bias? Which studies to consider? What will the extent of the search be? (Kugley et al. 2010). During this step, the researchers define search terms. For the purposes of this systematic review, the conceptual framework of Neuman's four areas provided the search terms:

1. What are the contributions of library media programs to student achievement?
2. What are the roles of the library media specialist in today's schools?
3. How do students use electronic information resources for learning?
4. What has been the impact of the "Information Literacy Skills for Student Learning" on library media programs? (2003, 504)

We first extracted keywords directly from the four questions such as "library media programs," "student achievement," "roles of the school library media specialist," "library media specialist,"

“electronic information resources,” “learning,” “Information Literacy Skills for Student Learning.” However, Neuman’s article contained some terminology that had to be updated such as the change from “media specialist” to “school librarian” (AASL 2010a) and the inclusion of the roles from *Empowering Learners* (AASL 2009): teacher, instructional partner, leader, information specialist, and administrator. “Information Literacy Skills for Student Learning” (AASL and AECT 1998) was also updated to “AASL Standards for the 21st-Century Learner” (AASL 2007b). “Student achievement” evolved to “learning outcomes,” “student outcomes,” and “academic achievement.” Of course, “electronic information resources” greatly expanded in the ten years after 2003 to include such terms as “technology,” “technologies,” “digital resources,” “Web 2.0 tools,” etc. We also used Boolean operators “and” and “or” to define relationships between search terms. In addition, we used truncated terms, that is, a root word followed by a search engine’s “wildcard” special character (example: technolog\*) where appropriate.

The definition of sources to be searched is an essential step in formulating an appropriate search strategy to ensure that the sources comprehensively address the areas of interest, thus increasing the chance that all relevant studies are located, while minimizing bias (Sheble 2016). We were interested in published research from refereed journals because of the extensive review process these articles undergo to be accepted and published. Therefore, we narrowed sources to be searched to fifteen refereed journals known for empirical content strongly related to the research objectives and questions, including instructional technology journals in which school library researchers publish. These were:

*Educational Technology Research and Development*  
*Information Processing and Management*  
*Information Research*  
*Journal of Education for Library and Information Science*  
*Journal of Research on Technology in Education* (formerly *Journal of Research on Computing in Education*)  
*Journal of the Association for Information Science and Technology*  
*Journal of the Learning Sciences*  
*Journal of Technology and Teacher Education*  
*Knowledge Quest*  
*Library and Information Science Research*  
*Library Trends*  
*Reference Librarian*  
*School Libraries Worldwide*  
*School Library Research* (formerly *School Library Media Research*)  
*TechTrends*

## Selection Criteria

To determine which studies are included or excluded from a systematic literature review, selection criteria are necessary and are defined during the planning phase (Gough, Oliver, and Thomas 2012). The first inclusion criterion we used was the topic/subject of the research: Was the study related to one of the four questions defined by Neuman? Then, because this review focused on the research conducted after Neuman’s 2003 article, we defined an inclusion criterion based on date of publication as 2004–2014. Next, only articles with data collection processes,

regardless of the method, and with either education professionals or students as subjects of investigation, were included. For the purpose of this study, we also chose to include only research conducted in the United States, aligning with Neuman's 2003 baseline of research conducted in the United States. The search protocol excluded editorials, prefaces, literature reviews, reviews of previous research, and discussion pieces in refereed journals. While these reviews, expert editorials, and opinion pieces have great value and highly influence the research being conducted, such works were not the topic of the present study. Studies with insufficient focus on areas of interest or studies without empirical data were also excluded. Finally, if research results of the same data were reported in multiple journals/multiple articles, only one instance of the research was included (Brunton and Thomas 2012; EPPI Center 2007).

## Conducting Phase

Once the search strategy has been defined, the next step in systematic review is to conduct the systematic search to identify all studies that meet the eligibility criteria. It is here that the search strategy and the selection criteria are combined and applied (Impellizzeri and Bizzini 2012). First, we researchers met with our graduate assistants to define and explain the inclusion and exclusion criteria. Following the search strategy developed in the planning phase, we and our graduate assistants first accessed the defined refereed journals through database providers such as Academic OneFile, EBSCO, H. W. Wilson, JSTOR, ProQuest, Science Direct, and SpringerLink. Then, implementing the date limitation criterion, articles in the selected journals published outside our decade of interest (2004–2014) were filtered from the results. Next, every article in the selected journals published from 2004–2014 was briefly examined by scanning the title and abstract for the keyword search terms defined in the planning phase. The goal of this quick-scan screening process was to 1) identify the subject, 2) determine if it potentially related to any of the topic areas from the conceptual framework, and 3) establish the article's relevance for the review based on the inclusion and exclusion criteria.

Upon concluding the initial review, the databases, the journal archives by year, and Google Scholar digital libraries were also searched using keywords and search strings from and related to the questions as described previously (for example, "information literacy," "school librarian," "media specialist," "school library media," "student achievement," "electronic," "learning outcome," "technology," "information resources," "student outcomes") to account for any applicable studies that may have been missed during the preliminary search. The lists of works cited in the studies our group of researchers identified were also reviewed to identify any additional studies missed during the previous searches.

All relevant articles and references found during the searches were downloaded and saved into a shared folder on Google Drive for an in-depth analysis. Articles that fell outside the scope of this review (for example, international research) were also saved in a separate shared folder for possible use in a future study.

The systematic searches took place over a period of sixteen months and were replicated by four graduate assistants and the two of us. The results of the searches and screening process yielded 174 refereed articles reporting empirical research. After the potential studies had been identified, each was analyzed in depth, that is, read thoroughly for deeper understanding and to ensure inclusion and exclusion criteria were met. We made sure the criteria of the review protocol were met (see above) and excluded studies that did not meet the criteria. Also eliminated were duplicate reports of collected data. We then coded each of the articles based on Neuman's

diamond model by determining which of her four questions the research in the article attempted to answer.

To strive for reliability of inclusion and categorization decisions, we each independently assessed every article. We then compared our assessments. If we disagreed about the question that a study fell under, we discussed these disagreements. To resolve them, we referred back to the selection protocol/criteria. Our final list of articles to analyze contained 110 articles (see Appendix A). Articles were then read again in their entirety by both of us to review the coding (question category) of each article for the purpose of ensuring appropriate categorization based on the findings presented in each article. If an article seemed to fall into two or more categories, the article was categorized by its main focus. Any questions on differences of coding were again discussed until full agreement was reached. The resulting categorization is illustrated in Appendix B.

## Synthesis and Results

Data synthesis in a systematic review involves organizing and summarizing the results of the selected primary studies (EPPI Center 2007). This report includes a narrative thematic synthesis, in which the results are summarized according to theme or category (Barnett-Page and Thomas 2009; EPPI Center 2007). Thematic synthesis proposes a very structured approach to extracting, organizing, and analyzing data based on a conceptual framework built *a priori* (in advance of gathering the data). In the case of this research the model is that of Neuman's diamond. The next section presents a thorough qualitative summarization and synthesis of the research results from the 110 studies reviewed, describing the current state of school library research and identifying research patterns. Table 1 illustrates the quantity of articles reviewed as categorized by Neuman's questions represented by her diamond model.

**Table 1. Articles reviewed categorized by Neuman's diamond model.**

Research Area	Quantity of Articles
Research related to contributions of school library programs to student achievement	13
Research related to the roles of the school librarian (teacher, instructional partner, leader, information specialist, program administrator)	52
Research related to how students use electronic information resources for learning	28
Research related to impact of the 2007 AASL Standards on school library programs	17

## Narrative Synthesis

### Neuman's Question 1: What Are the Contributions of Library Media Programs to Student Achievement?

Neuman identified the relationship between school library programs and student achievement as “an area of singular importance to the field” (2003, 505). The importance of this relationship has come to the forefront in the present era of accountability in education. Going back as far as Mary Virginia Gaver (1963), school library researchers have documented their interest in the impact of school libraries on student learning. Neuman cited work conducted by Keith Curry Lance and his colleagues in the “Colorado” studies during the 1990s and early 2000s, calling for more states to replicate these types of foundational studies. While several studies had, in fact, replicated Lance’s efforts to establish a connection between school libraries and student academic achievement, dissemination through the refereed journals of the field was still limited at the time Neuman was writing her seminal article (Francis and Lance 2011).

#### Evidence-Based Approach

As legislative movements like No Child Left Behind continued to fuel high-stakes testing, contributions of school library programs to academic achievement remained a central focus. However, the research conducted in the decade after 2003 moved beyond looking at statistics and test scores to an evidence-based approach revolving around the question “What differences do our school library and its learning initiatives make in student learning?” and researchers gathered evidence on contributions to learning outcomes (Todd 2012, 15).

Studies that took an evidence-based approach to practice examined how school libraries and librarians were instrumental in the success of students in school libraries. This gathering of evidence was accomplished by asking the students how the school library helped them succeed (Todd 2006, 2012; Todd and Kuhlthau 2005a, 2005b). Findings showed that effective school libraries helped students with their learning in many ways across the various grade levels, and that students valued instruction from the school librarian. Students said that instruction from the school librarian enabled learners to become good researchers, and many learners acknowledged that this instruction had a positive effect on their grades.

Teachers also expressed that they valued the school library and viewed it as playing an important role in student learning (Todd and Kuhlthau 2005a, 2005b). Researchers concluded that a fundamental shift in the instruction provided by school librarians was needed, one that not only helped students find information but also developed students’ abilities to interact with, and learn from, information, engaging with it in critical ways (Todd 2006, 2012).

Research conducted in the state of New York further bolstered the connection between student achievement and school libraries, by finding that library programs, services, and resources had an impact on students’ achievement and motivation, especially for students with disabilities (Small and Snyder 2009; Small, Shanahan, and Stasak 2010; Small, Snyder, and Parker 2009).

## Evidence of Value of School Libraries and Librarians

Over the period 2004 through 2014, the elimination of school librarians or reduction in the hours spent at one school became a prevalent professional concern. Consequently, studies were conducted to demonstrate the value of having a full-time school librarian to support students' learning (for example, Farmer and Safer 2010). Results demonstrated that the presence or the absence of a school librarian influenced the rate at which students met annual yearly progress goals for proficiency. These studies concluded that schools with at least one full-time school librarian might achieve higher reading proficiency, higher scores in critical literacies such as the ethical use of information, and higher scores in English language arts and in science. Even so, findings indicated that more than just the presence of a certified full-time school librarian was necessary. The improvements in students' learning was fostered by the activities the school librarians undertook, especially activities related to collaboration with classroom teachers (see, for example, Dow, Lakin, and Court 2012; Knapp 2013; Mardis 2007; Small and Snyder 2009; Small, Shanahan, and Stasak 2010; Small, Snyder, and Parker 2009).

## Minimal Impact on Funding Decisions

Despite an additional decade of research in the years 2004 through 2014 that demonstrated the connection between school libraries and student academic achievement, studies have had a "minimal effect on decisions and legislation related to the support of school library media programs and personnel" (Kaplan 2010, 55). Allison G. Kaplan called for a concerted effort to communicate study results to important stakeholders and decision makers. However, Marcia J. Mardis pointed out that while state-style "studies report significant, positive correlations to advocate for the support for school libraries... Correlational studies do not offer readers causal relationships; researchers' interpretations of the results of these studies are often subjective and not absolute" (2007, 25). Ross J. Todd reiterated the urgency of further causal research by expressing a "need for school librarians to be able to state with greater precision the learning outcomes and impacts of school library initiatives" (2012, 24).

## Neuman's Question 2: What Are the Roles of the Library Media Specialist in Today's Schools?

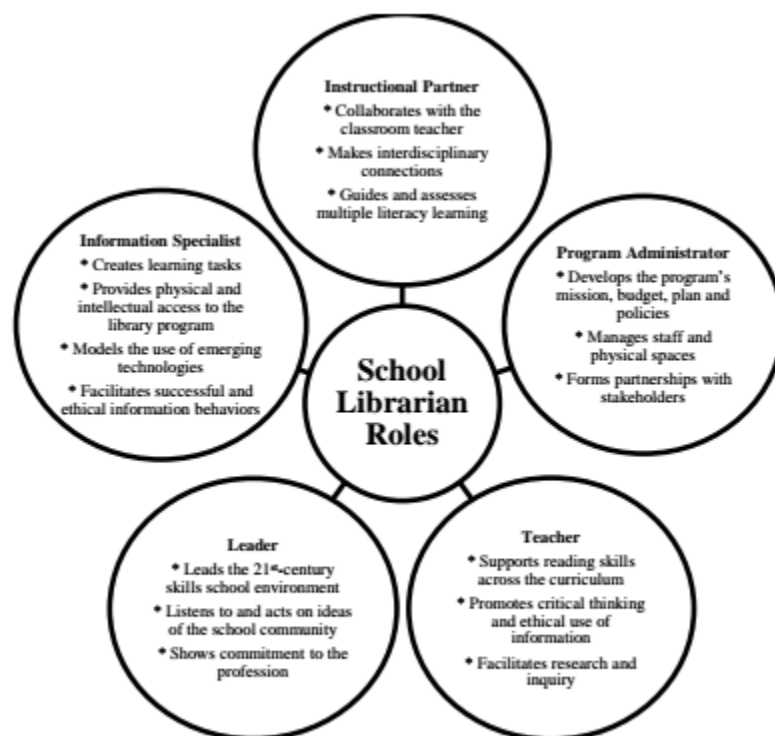
In the second facet of her research, Neuman posed the question "What are the roles of the library media specialist in today's schools?" The key phrase here is "today's schools." Neuman examined research on the various roles of the school librarian through the lens of *Information Power* (1998). In the years since Neuman's article, the roles of the school librarian adapted and evolved, and were the subjects of continued debate.

This evolution can be traced in the standards and guidelines that define and guide practice for school librarians. Guidelines from the American Association of School Librarians (2009), the *ALA/AASL Standards for Initial Preparation of School Librarians (2010b)*, and the National Board for Professional Teaching Standards (2010), all define the roles which school librarians are expected to fulfill in practice. Neuman found that the majority of research focused solely on describing particular facets of the school librarian's role. She maintained research in the following decade should provide evidence for value and importance through "systematic research related to the nature, uses, and successful implementation of each role" (2003, 508).



## Roles Redefined

The 2009 guidelines from the American Association of School Librarians, *Empowering Learners: Guidelines for School Library Programs*, identified the roles of the school librarian as: instructional partner, information specialist, teacher, program administrator. These are the same roles listed in *Information Power* (1998), but *Empowering Learners* added a fifth: leader (see figure 1). Also, increased emphasis was placed on working with teachers as instructional partners. Since the release of the 2009 guidelines, researchers have examined each role in terms of the definition of roles, the implementation of roles, and the impact of each role on student academic achievement.



**Figure 1. Roles of school librarians.**

**Figure 1. Roles of school librarians (Subramaniam et al. 2013).**

In the time of Neuman's article, *Information Power: Building Partnerships for Learning* (AASL and AECT 1998) directed school librarians to function as a collaborative instructional partner by planning, teaching, and evaluating with fellow educators. The school librarian was also to function as a teacher of information-literacy skills, teaching students to access, evaluate, and use information in the context of content-area curriculum. AASL's *Standards for the 21st-Century Learner*, introduced in 2007, provided a framework for designing instruction, expanding information literacy to contain "multiple literacies, including digital, visual, textual, and technological" literacies (AASL 2007b, 3). This expansion led to a stronger focus on the role of school librarians in the formative education process, indicating a fundamental shift in instruction by moving beyond helping students find information, to helping them engage with it in critical ways (Todd 2008).

AASL's *Empowering Learners* continued encouraging an active instructional role for school librarians as teachers and instructional partners. The school librarian as a teacher "empowers students to become critical thinkers, enthusiastic readers, skillful researchers, and ethical users of information" (2009, 18). As an instructional partner a school librarian "understands the curriculum of the school thoroughly" and "collaborates with classroom teachers to develop assignments that are matched to academic standards and that include key critical thinking skills, technology and information literacy skills, and core social skills and cultural competencies" (2009, 17).

### **Focus on Instructional Roles**

In an age of accountability that focused on academic achievement and student learning outcomes, the instructional roles (instructional partner and teacher) became research topics of great interest and were examined from a number of perspectives, including those of teachers, students, principals, and superintendents (for example, Church 2008, 2010; Green et al. 2013; Harada 2005; Kelsey 2006; Morellion, Cahill, McKee 2012; Moreillon, Kimmel, and Gavigan 2014; O'Neal 2004; Van Tuyle and Watkins 2012).

### **Focus on Collaboration**

Research also examined an important aspect of implementing these two instructional roles: collaboration. Studies in the decade after 2003 studied collaboration both as an overall concept and as collaborative partnerships in specific content areas (for example, Green et al. 2013; Immroth and Lukenbill 2007; Kimmel 2011; Latham, Gross, and Witte 2013; Mardis and Hoffman 2007; Montiel-Overall 2008, 2009, 2010; Montiel-Overall and Hernandez 2012; Montiel-Overall and Grimes 2013; Moreillon 2008, 2013; Robins and Antrim 2012; Roux 2008; Schultz-Jones 2009; Schultz-Jones and Ledbetter 2009; Subramaniam et al. 2013).

Patricia Montiel-Overall asserted that "there is a need to understand what collaboration is before studying its impact on student learning" (2008, 145). Extensive research by Montiel-Overall (2008, 2009, 2010; Montiel-Overall and Hernandez 2012) proposed a theoretical model of collaboration that depicted collaborative interaction between teachers and librarians along a continuum. The model identified four types of collaborative practices that are involved in teacher and librarian collaboration. As a related topic, researchers also began to question the influence of factors such as school culture and scheduling on the enactment of collaboration necessary for effective school library programs (Howard 2010; McGregor 2006).

### **School Principals' Perspectives on Librarians' Instructional Roles**

Due to the overarching influence a school principal can have on all aspects of a school library program, several studies investigated the perspective of the school principal on the instructional roles of the school librarian (Church 2008, 2010; Morris and Packard 2007; Shannon 2009). Audrey Church (2008, 2010) and Donna M. Shannon (2009) found that principals supported and valued the school librarian as a teacher of information-literacy skills and as an instructional partner who proactively worked with teachers.

Principals set the tone and establish the learning environment within their schools. For full implementation of the library media program to occur, principals must establish a

culture of collaboration and set the expectation with teachers that the library will make an active contribution to instruction. (Church 2008, 6)

This body of research indicated it was the principal who established a culture of collaboration and was critical in providing the support necessary to successfully implement the instructional roles of instructional partner and teacher (Church 2008). These conclusions contrasted with earlier findings where principals rated “managerial skill, technology know-how and application, and sociability” as the most valued characteristics of a school librarian (Roys and Brown 2004, 9), as well as studies that logged administration’s limited view of the school librarian and school library program in the educational mission of the school. Perhaps Church’s and Shannon’s findings indicated a shift in educational leadership thought between the time of *Information Power* (AASL and AECT 1998) and the implementation of AASL’s *Standards for the 21st-Century Learner* (2007).

### **Teachers’ Perspectives on Librarians’ Instructional Roles**

Research examined for Question 2 also investigated teachers’ and pre-service teachers’ perspectives of school librarians’ instructional roles. Limited research into teachers’ perspective on collaboration determined that teachers valued planning with a school librarian and found it beneficial to themselves and their students in relation to academic achievement (Immroth and Lukenbill 2007; Kimmel 2011). The evidence-based practice approach emerged as a way for school librarians to present evidence of the benefits of collaboration and advocate for their programs (Ewbank 2011). Despite these findings, common themes of misconception (for example, a lack of understanding of the instructional roles of the school librarian) were consistently found throughout the research in this area (for example, Krueger 2009; Moreillon 2008; O’Neal 2004; Roux 2008).

These misunderstandings led to the call for teacher education programs to address the benefits of the instructional roles of the school librarian, and for proactive advocacy on the part of the school librarian in articulating the instructional roles. Patricia Montiel-Overall and Anthony C. R. Hernandez (2012) found that providing professional development could change teachers’ perceptions about collaborating with school librarians. These same sentiments were echoed by several studies that indicated preparation programs for school librarians needed to provide future school librarians with learning experiences that required collaboration, emphasizing candidate preparation for the instructional roles (for example, Church 2008; Everhart and Dresang 2007; Latham, Gross, and Witte 2013; Mardis 2013; Meyers 2007; Meyers, Nathan, and Saxton 2007; Moreillon 2008; Moreillon, Cahill, and McKee 2012; Moreillon, Kimmel, and Gavigan 2014; Shannon 2004).

### **Librarians’ Perspectives on Their Own Instructional Roles**

Studies also examined the perception school librarians themselves had of the two instructional roles: instructional partner and teacher. After the release of *Empowering Learners*, researchers began to investigate the professional dispositions of school librarians and the value school librarians placed on these dispositions (Bush and Jones 2010; Kimmel, Dickinson, and Doll 2012). School librarians most frequently identified “teacher” and “collaborator” as essential professional dispositions (Bush and Jones 2010). Indeed, school librarians perceived themselves

as teachers who enabled student learning, claiming that factors, such as state-mandated standards, were beneficial and led to an increase in collaboration, as well as the potential enactment of librarians' instructional roles (Kelsey 2006). However, factors such as a lack of collaboration with classroom teachers kept these perceptions from becoming a professional reality (Meyers, Nathan, and Saxton 2007).

### **Leadership Role Added**

One of the major changes from *Information Power* to *Empowering Learners* was the creation of the leadership role. In 2009 AASL's *Empowering Learners* served as a directive for school librarians to move beyond their supporting and partnering roles to becoming educational leaders. *Information Power* stated that instructional leadership is demonstrated when "information literacy is integrated across subject across all subjects and grades" (AASL and AECT 1998, 52). However, *Empowering Learners* proposed a greater variety of paths for leadership, such as instructional leader, leader in technology integration, and leader of learning through development and provision of professional development for other educators.

### **Leadership Role Limited in Practice**

In the years following the release of *Empowering Learners*, researchers began to investigate and describe what this leadership looked like in practice. Gail Bush and Jami L. Jones found that leadership was frequently identified as a key professional disposition for school librarians (2010). Yet, school librarians still tended to exert influence in their immediate contexts only, failing to realize their leadership potential. While school librarians recognized their impact on student learning, their understanding of how to leverage that impact through leadership remained limited (Everhart, Mardis, and Johnston 2011; Mardis and Everhart 2014).

### **Instructional Leaders**

Some studies investigated school librarians as instructional leaders, an area where principals still commonly held traditional views of school librarians as program administrators only (Shannon 2009). A group of studies found school librarians acted as informal instructional leaders when collaborating with teachers on inquiry approaches to learning, and when providing in-house staff development (Harada 2005; Hunt and Luetkehans 2013; Hughes-Hassell, Brasfield, and Dupree 2012; Mardis 2013). Even so, while instructional partnerships could lead to being an instructional leader, Judi Moreillon explained that future school librarians must be educated on how to first develop instructional partnerships before parlaying these into leadership opportunities (2013).

### **Technology Leadership**

With the increased presence of technology in education, it is no surprise that a great deal of the research reviewed for Question 2 also focused on technology leadership, examining the technology leadership activities of successful school librarian leaders and identifying factors that enabled or served as barriers in enacting these leadership activities (Everhart, Mardis, and Johnston 2011; Johnston 2012). Other forms of technology leadership, such as leadership in the use of assistive technologies, were also investigated, with a call for school librarians to become

more actively involved to meet the needs of all learners (for example, Ennis-Cole and Smith 2011; Everhart, Mardis, and Johnston 2011; Perrault 2011; Robins and Antrim 2012; Subramaniam, Oxley, and Kodama 2013).

### **Limited Education for Leadership**

Until recently, graduate-level programs in library and information science invested little time or training in helping future school librarians learn to be leaders (Moreillon, Kimmel, and Gavigan 2014). As the need for leadership skills in school librarianship grew, several research studies zeroed in on preparation programs to determine if these were changing to meet the increased demand (for example, Dotson and Jones 2011; Everhart and Dresang 2007; Hanson-Bauldauf and Hughes-Hassell 2008; Hughes-Hassell and Hanson-Bauldauf 2008; Johnston 2012; Johnston et al. 2012; Mardis 2013; Moreillon 2013; Moreillon, Kimmel, and Gavigan 2014; Smith 2011). Results of these studies indicated that practicing school librarians did not believe that their coursework and internship prepared them for leadership roles.

School librarians reported being involved in a variety of leadership activities in their schools but not moving beyond traditional leadership activities, such as building-level leadership teams (Dotson and Jones 2011; Everhart, Mardis, and Johnston 2011; Johnston et al. 2012).

Research further determined that if school librarians were expected to lead 21st-century skills instruction supported by effective technology integration, then they needed hands-on experiences with technology integration during their preparation programs (for example, Everhart and Dresang 2007; Everhart, Mardis, and Johnston 2011; Hanson-Bauldauf and Hughes-Hassell 2008; Hughes-Hassell and Hanson-Bauldauf 2008; Johnston 2012; Johnston et al. 2012).

### **Developing Emergent Leaders**

All of the studies on preparation programs for school librarians asserted that these programs were the place for developing emergent leaders. Programs should provide coursework that addresses core principles of leadership with strategies to enact these leadership roles, instilling a leader mindset in its candidates. Mardis (2013) and Moreillon (2013) further encouraged preparation programs for school librarians to have a plan in place for helping graduates transfer leadership skills and knowledge acquired during preparation into actual practice. As illustrated by Daniella Smith's research, school librarians educated in library information science programs that included a purposeful focus on transformational leadership, especially in regards to embracing the role of technology integration and information specialists, were more likely to see themselves as leaders (2011).

### **Neuman's Question 3: How Do Students Use Electronic Information Resources for Learning?**

In her overview of the decade preceding 2003, Neuman highlighted the theoretical groundwork laid by researchers such as Carol C. Kuhlthau and Ross J. Todd, and the information-seeking models identified by Mike Eisenberg and Bob Berkowitz and by Marilyn Joyce and Julie Tallman. This foundation provided a "theoretical support for a research focus on learning with electronic information resources" (Neuman 2003, 511).

## Impact of Resources' Designs

One particular focus identified in the decade since Neuman's writing centered on how the design of electronic resources impacted students' information-seeking behavior. Several studies found that students struggled to use "child-friendly" search engines, despite the age-appropriate label, because the way children organized and visualized concepts, building knowledge structures with distinct gaps, did not match the topic organizational structure of the search engines themselves (Bilal and Wang 2005; Bilal 2012). In 2007 Hillary Browne Hutchinson, Allison Druin, and Benjamin B. Bederson further substantiated this finding by demonstrating that young elementary-aged children were able to develop Boolean queries using a flat interface and large visual cues, despite not being able to define Boolean queries as a concept.

Another focus identified in the research on information-seeking seems to have grown out of the body of work conducted by Andrew Large and his colleagues 1994 through 2000, and identified by Neuman as an "extensive look at information use and learning in electronic environments" (2003, 512). While Large mapped K–12 students' information-seeking behavior from the beginning of a search to the completion of an assignment, research of the past decade has reflected a shift toward examination of student motivation for information-seeking and student relationships with electronic information resources, specifically Google.

## Students' Motivation for Using Electronic Resources

Joanne Silverstein (2005) determined that after eighth grade, a sharp decline in students' informal information-seeking based on curiosity fostered by school work was observable. After eighth grade, students were instead more likely to use digital reference sources to pursue information related to personal issues and concerns. In contrast, late elementary and middle school students experienced a shift from extrinsic to intrinsic curiosity "most deeply influenced by school curricula," establishing a window of opportunity for school librarians to introduce digital reference tools and seeking strategies.

## Students' Roles as Searchers

Jannica Heinström found that secondary students, when seeking information for a school project, generally fell into three roles: surface searchers, deep searchers, and strategic searchers. Surface searchers selected topics they felt were well-known, with easy-to-find resources. Deep searchers strove for engagement, personal connection with, and ownership of their selected topics, and strategic searchers approached information-seeking as a practical activity, the goal being completion of the assignment (2006). Jin Soo Chung and Delia Neuman further observed that regardless of the category of searcher a secondary student fell into, he or she was most likely to begin researching on the Internet with the expectation that a large amount of information would be found. Like the elementary students observed by Dania Bilal (2012), high school students used a free-text keyword search or a natural-language search even when using electronic databases (2007).

## Technology-Enabled Learning

The focus of another group of studies under the umbrella of Question 3, technology-enabled learning, was described by Neuman as "relatively new for the library media field" with

“discussions of learning with [electronic information sources having] received close and direct research attention in the library media area for less than a decade” (2003, 512). Neuman found that research focused on student learning with electronic information sources—rather than focused on student efficacy retrieving information with these tools—was still severely lacking. She claimed school library researchers should conduct “a wide range of studies that explicitly examine the link between student learning and the electronic resources that have become a staple of library media programs” (2003, 512). However, this description of technology-enabled learning and the subsequent studies highlighted by Neuman as examples of a new line of inquiry reflected a continued emphasis on information-seeking in a Web 1.0 world in which the great majority of Web 1.0 users merely consume accessed content (Cormode and Krishnamurthy 2008).

Since the explosion of Web 2.0, with its ability to encourage user-generated content, this earlier limited emphasis on consuming content is not surprising. While the focus on information-seeking in digital environments continues to form a cornerstone of school library research (as discussed previously), studies on technology-enabled learning conducted in the past decade examined technology-enabled learning through the perspective of technology use as influenced by teacher belief, technology-enabled learning for academic comprehension (for example, visual aids, modeling), and technology use as a cognitive skill development aid (for example, problem-solving, inquiry, design).

### **Influences on Technology Use**

Of the 110 of articles reviewed for this study, only four directly addressed technology use as influenced by teacher belief and school culture. All four papers pursued this topic by identifying teachers’ technology use as a gateway for the establishment of collaborative relationships with the school librarian. Teresa D. Williams, Bonnie J. Grimble, and Marilyn Irwin found that teachers who described themselves as more comfortable with technology tended to be more familiar with electronic databases, as well as more frequent users of these resources. Unexpectedly, this relationship did not play out amongst English teachers who preferred online databases over the Internet regardless of the teachers’ comfort with technology (2004). It may be surmised their preference stemmed from a closer working relationship with the school librarian, thus indicating instructional partnerships with school librarians helped mitigate teachers’ hesitation and anxiety about tech adoption.

Technology as a gateway for collaboration was a finding echoed by Kevin Clark who determined that “peer-to-peer sharing among teacher leaders is the preferred mode of knowledge acquisition regarding technology use” (2006, 492) and that resources and school schedules should be structured and allocated so as to support these types of relationships. It was also supported by Ji Hei Kang and Nancy Everhart (2014) who determined school librarians’ openness and comfort with digital textbooks might open up potential relationships with classroom teachers who struggled to integrate these types of resources. Karla B. Collins and Carol A. Doll (2012) added that school librarians who forgo collaborative relationships for a support-when-available model may find themselves struggling against a school culture that promotes a find-it-myself mentality.

## Technology as Cognitive Comprehension Aids

From 2005 to 2012 several studies conducted through partnerships between school library and instructional technology researchers investigated technologies as academic comprehension aids. These partnerships were actually encouraged by Neuman, who suggested school library researchers refer to David H. Jonassen, Kyle L. Peck, and Brent Gayle Wilson's 1999 description of technologies as "engagers and facilitators of thinking and knowledge construction" (2003, 13).

Research on technologies as academic comprehension aids determined that these tools not only impacted student self-efficacy in tackling complex material such as scientific articles (Gegner, Makey, and Mayer 2009), but also increased student motivation overall, making the exploration of academic material "more fun than listening to a lecture or reading the textbook" (Wang and Reeves 2006, 613). Min Liu and Stephen Bera (2005) found that once students were able to conceptualize a problem, they shifted from using online comprehension aids that supported cognitive processing (for example visualizations) to online tools that facilitated "collecting new data, interpreting data, organizing data, and building a rationale" (2005, 17).

However, in a subsequent study, Ya-Ling Lu and Carol Gordon determined that a student's decision to engage with technology for academic comprehension (such as participation in an online reading enrichment program) was severely hindered by lack of access to these resources from home. Moreover, a student's effort to use the technology aid was directly correlated with his or her reading level: the higher the reading level, the higher the engagement rate with the online program. The study also found that students' reading performance did not necessarily increase as a result of use of the online program (2007).

These findings were consistent across all studies examined in this category. Fengfeng Ke found no significant difference in math achievement between students who drilled with pen and paper, and students who drilled using computer games (2008). Brett Shelton and Jon Scoresby further determined that students approached educational computer games with an attitude of trial and error, applying skills they acquired playing other games (2011). In an investigation of the use of audiobooks with struggling readers, Jeff Whittingham et al. found no significant increases in reading engagement or achievement as a result of the inclusion of this technology (2012). Instead, both Ke and Whittingham et al. identified formal structure and clear alignment between technology use and instructional goals, under instructional supervision, as important features for successful technology-enabled learning activities, concluding "the key issue concerning educational computer games is not 'whether or not to use computer games,' but 'how to better design an educational computer game' or 'how to better apply game-based classroom instructional strategies'" (Ke 2008, 554).

## Students' Views of Themselves as Learners and of Tech Tools

The presence of technology tools also affected the way students viewed themselves as learners, as well as the way they defined learning settings as existing beyond the walls of the library or classroom. Students organically engaged with content-sharing communities to master online tools (for example Vimeo) or software (for example Windows Movie Maker) for help with techniques and troubleshooting (Harlan, Bruce, and Lupton 2012). Students downloaded mobile applications to help with personal productivity and time management, accessed podcasts and video tutorials, and connected with experts online (Smith and Evans 2010).



Studies in the latter half of the decade pointed to students' use of online comprehension aids and other tech productivity supports for untethered learning, prioritizing online resources first (Lanning and Turner 2010). Ruth V. Small found that in contrast to books, students perceived online resources as "more efficient, faster, and more convenient alternative sources of quality information" (2014, 17). Despite the popularity of online comprehension aids and tools amongst students and teachers, researchers warned that students needed help evaluating and processing this material, noting that while students were able to locate scientific articles, or information on a particular invention, they struggled to appropriately evaluate resources for legitimacy and quality (Gegner, Mackey, and Mayer 2009; Small 2014).

### **Influence of Instructional Design and Educational Psychology**

The final group of studies tackling Neuman's Question 3 reflected the influence of instructional design and educational psychology research on the questions (and research partnerships) formulated by school library researchers. In 2011 Ahmet Baytak and Susan M. Land, as well as Rebecca Reynolds and Idit Harel Caperton, examined the dynamics and learning conditions present when students designed their own video games on social studies and science concepts. In both instances, students exhibited high levels of engagement that translated into concrete gains in mastery of academic content. This engagement was evidenced through students' pursuit of in-depth and precise history and science knowledge beyond the course curriculum to increase fidelity in their game designs. Additionally, students instinctively formed knowledge-building communities, sharing ideas, concepts, and problem-solving strategies, "facilitated by teachers, who directed students towards multiple resources, tools, or peers as a means to solve design problems" (Baytak and Land 2011, 779).

The cyclical process of design and the self-directed nature of this type of work established technology tools such as game-design and digital storytelling software as objects to think *with* (Papert 1993). Rebecca Morris (2013) found students conducted works-in-progress performances of their digital stories for themselves and for peers without having had any requirements imposed by teachers. Students used these formative assessments of their own products to critique and refine story development and video editing from the perspective of performer (storyteller) and the perspective of viewer (audience). This phenomenon was also observed by Lucy Santos Green, Fethi A. Inan, and Nancy J. Maushak who concluded that students used mini-performances and peer feedback to "develop fuller characters and detailed speaking parts, becoming increasingly concerned with quality as they completed each vidcast [digital storytelling] cycle" (2014, 319).

### **Impact of Tech Design Tasks on Problem-Solving and Systems Thinking**

Through narrow investigations of the impact of technological design tasks on students' complex problem-solving and systems thinking, Michelle Hoda Wilkerson-Jerde (2014) and Mete Akcaoglu (2014) uncovered a direct relationship between specific school library makerspace activities and growth in students' cognitive skills necessary for success in STEM (science, technology, engineering, math) fields. Like the other studies reviewed for Neuman's Question 3, maximum student learning and cognitive skill development occurred when connections between the design process and academic content were made explicit by the school librarian or classroom teacher. While game design effectively improved students' ability to design and analyze complex systems (Akcaoglu 2014), engaging students in deeper mathematical and scientific explorations

required tying systems investigations, problem-solving, and design to authentic, real-world challenges present in those disciplines (Green, Inan, and Maushak 2014).

## **Neuman’s Question 4: What Has Been the Impact of the “Information Literacy Skills for Student Learning” on Library Media Programs?**

At the time Neuman wrote her seminal article in 2003, the “Information Literacy Skills for Student Learning” articulated in *Information Power: Building Partnerships for Learning* (AASL and AECT 1998) were the current library learning standards. However, in 2007 AASL published a new set of learning standards, *Standards for the 21st-Century Learner*, to “offer vision for teaching and learning to both guide and beckon our profession as education leaders...[to] shape the library program and serve as a tool for school librarians to use to shape the learning of students in the school” (AASL 2007a). The standards were based on a set of common beliefs that served as preconditions for the learning standards: reading, inquiry-based learning, explicitly taught ethical behavior, technology skills, equitable access, expanding information demands, social context of learning, making the connection that “school libraries are essential to the development of learning skills” (AASL 2007b, 3).

Research in the decade after Neuman’s article mirrored the 2007 AASL standards’ shift from assessment of skills to student-centered learning, tackled student-perceived competence and dispositions, and navigated the tension between the ability to locate information, and the ability to evaluate it effectively. Interestingly, after a detailed analysis of the “Information Literacy Skills for Student Learning” and the preceding decade of research on information literacy, Neuman concluded with two studies that foreshadowed the subsequent research examined for this paper: James O. Carey (1998) on ensuring higher-order outcomes in information literacy, and Mary Ann Fitzgerald (1999) who alluded to students’ struggles in selecting and evaluating information sources.

### **Higher-Order Thinking**

In studies conducted during the school library profession’s shift from assessing information skills to helping students engage in higher-order thinking processes, Terrance S. Newell (2004) and Zorana Ercegovac (2012) explained that school librarians should be deeply embedded in the process of designing, co-teaching, and assessing student research projects, though Newell and Ercegovac had different reasons for their recommendation. Newell (2004) found classroom teachers focused exclusively on location skills, even though information-literacy standards clearly outlined information seeking, access, evaluation, use, and communication (2004). In contrast, Ercegovac argued that aligning student projects with information-literacy units would lead to consistent and improved student performance on higher-order thinking tasks (2012). Karen Gavigan suggested school librarians also include targeted instruction on visual literacy, using graphic novels to “engage students’ interest in a subject” and “make curriculum relevant to the lives of students” (2014, 98).

### **Information Problem-Solving**

In a later study, Newell (2008) investigated the differences in students’ learning gains when an instructional unit using cybrarians (pre-programmed computer-generated librarians) was

contrasted with an instructional unit co-taught by a classroom teacher and a school librarian. The cybrarians were “designed to assist live educators in sharing the range of knowledge and practices required to solve problems within and across contexts” (2008, 14). Students engaging with the cybrarian scored lower on information-literacy skill development and on academic content knowledge. Due to a lack of modeling of information problem-solving, these students spent more time developing processes to address information problem solving than on developing an actual project/product (Newell 2008).

In the same year, paralleling Newell’s findings, Wendy Stephens’s exploratory analysis of students’ project journaling revealed that student-centered learning enabled students to meet “tangible learning objectives that had not been covered elsewhere in the curriculum” (2008, 48). However, targeted instruction on information problem solving (applied information literacy) might have affected student growth in this area.

### **Pre-Service and In-Service Librarians’ Perceptions of the 2007 Standards**

In spite of initial professional buy-in, two studies reviewed for Question 4 highlighted a discrepancy between pre-service school librarians’ and in-service school librarians’ perceptions of 2007 standards, student-centered learning, and the development of information literacy.

In-service school librarians perceived the move away from standardized requirements for information literacy to be hurtful for the profession. They described how, despite ample evidence that students struggled with information literacy, “teachers and administrators frequently did not recognize either that the problem existed or that [school librarians] were the professionals who could handle this deficit” (Harris 2009, 8). These in-service school librarians claimed the 2007 AASL standards were not specific enough and were difficult to explain to other education professionals.

In contrast, pre-service school librarians approved of the new language of the standards, believing “their focus on learner responsibility would present a mindset that would appeal to administrators, teachers, parents, and students” (Mardis and Dickinson 2009, 12). Marcia Mardis and Gail Dickinson indicated that school librarians who successfully implement the new standards “facilitate learner-centered, interdisciplinary atmospheres that reflect student interests in school and personal topics” (2009, 13).

### **Students’ Self-Perceived Competence and Learning Dispositions**

Don Latham and Melissa Gross (2008) and Marilyn P. Arnone, Rebecca Reynolds, and Todd Marshall (2009) began investigating the relationships between students’ self-perceived competence of information-literacy skills, and student dispositions, “the learning behaviors, attitudes, and habits of mind, that transform a learner from one who is able to learn to one who actually does learn” (AASL 2007a). Both studies found students were incapable of accurately assessing their own information-literacy competence. This factor was especially detrimental to low-performing students who not only wildly overestimated their own abilities but also did not recognize they needed help to improve. Framed by the constructs of self-determination theory and built on data collected from thousands of students across twenty states, these studies provided empirical evidence “that school librarians play a key role in building students’ confidence in information skills and intrinsic motivation to engage in research” (Arnone, Reynolds, and Marshall 2009, 128).

These two studies also concluded that intrinsic motivation must be fostered if a student is to engage in meaningful research and lifelong learning. Latham and Gross called for “effective motivational strategies” (2008, 13) to be included in information-literacy instruction, with Arnone, Reynolds, and Marshall claiming “school librarians who address motivation as they plan lessons and experiences for students in their libraries may be creating a primary way to impact achievement” (2009, 128).

### **Students’ Motivations for Information Seeking and Improving Skills**

Other studies attempted to identify factors that intrinsically motivated students to pursue self-improvement in information literacy. Elizabeth Foss et al. (2012) mapped a change in focus from home-based interests in younger children to school-based searches in upper elementary grades, identifying a need for multi-step scaffolding and the breaking apart of long search tasks for younger students. Randell K. Schmidt, Virginia Kowalski, and Lorraine Nevins (2010) found middle school students gravitated toward questions and topics that connected with them personally and emotionally—whether it be a topic of personal interest to satisfy curiosity, or a topic tied to a societal issue the student felt needed solving.

Sherry R. Crow warned “educators may not easily recognize children who are intrinsically motivated for information-seeking in their classrooms and libraries” (2011, 25)—a dangerous oversight because “research and library-related experiences contribute to intrinsic motivation for information-seeking for many types of students, both within and outside of what might be considered the norm” (2011, 25). The study determined that while student choice in selecting a research topic could foster intrinsic motivation for information seeking, the inclusion of creative activities, built on students’ curiosity and interest, would boost student engagement and motivation for information skill development even higher.

Arnone and Reynolds further cemented the partnership between students’ intrinsic motivation and their competence in information literacy when the researchers found “stimulating and having opportunities to act on curiosity are essential to building perceived and actual competence” (2009, 20).

### **Students’ Abilities to Locate and Evaluate Resources**

In a parallel line of inquiry, researchers explored the tension between student ability to locate resources and the resulting challenges students faced once they were required to evaluate and critically examine those resources. Carol C. Kuhlthau, Jannica Heinström, and Ross J. Todd found students were easily satisfied by the first piece of information they found. Students invariably shortcut the information-seeking process by skipping “a point of focus formulation...without building background knowledge and formulating essential questions” (2008, para. 9). However, students who participated in a structured inquiry process, modeled and supported by the school librarian, “came to realize that information seeking is a demanding process which requires reflection and analytical decisions” (2008, para. 9). Both Kuhlthau, Heinström, and Todd (2008) and Cindy Kovalik, Susan Yutzey, and Laura Piazza (2013) found that students rarely, if ever, collected information from multiple resources to analyze and help them formulate independent conclusions. Kovalik, Yutzey, and Piazza (2013) also supported Kuhlthau, Heinström, and Todd’s assertion that students needed help “sifting through materials...determining what is important” (2008, 17).

Karla Steege Krueger and Jean Donham also found elementary students were better at describing the process for finding information than they were at evaluating the information located. Once students developed new inquiry questions with the aid of the school librarian, however, a majority generated meaningful investigations that went beyond fact-finding (2013).

The inability to analyze and evaluate information was not an issue confined to lower grades. Jana Varlejs, Eileen Stec, and Hannah Kwon observed the same issues with Advanced Placement (AP) students in secondary schools. When interviewing school librarians who worked with AP students, researchers frequently noted that the higher the student's course grades, "the poorer the student's competency level in the opinion of the librarian" (2014, 13). In this particular study, librarians attributed many of the challenges students faced in evaluating information to limited exposure and interaction with school librarians, lack of access to targeted information-literacy instruction, and minimal involvement of school librarians in assessment of students' research projects.

## Discussion and Implications

The purpose in examining the empirical research from the ten years following Neuman's call for research was not only to map the research landscape of the field of school librarianship by answering our Research Question 1: What empirical research studies, related to the four areas defined by Neuman's diamond model, have been conducted in the past decade? We also wanted to determine gaps and identify areas for future research by answering our Research Question 2: Based upon an examination of the empirical studies conducted in the past decade (2004–2014), what are the gaps in the field of school library research related to the four areas defined by Neuman? These gaps are identified in the discussion below.

### Neuman's Question 1: What Are the Contributions of Library Media Programs to Student Achievement?

Neuman stated that the identification of school library program contributions to student achievement was "an area of singular importance to the field" (2003, 505). Pointing to a large body of work completed in the previous decade (particularly replication of the Colorado studies in Alaska, Oregon, Pennsylvania, and Texas), Neuman emphasized the need for researchers in the next decade to highlight these contributions using measurable outcomes. Such study, she argued, is required of reflective practitioners who "examine [themselves] and [their] programs continuously to ensure they are useful and effective" (2003, 505), especially given school librarianship's frequent financial reliance on outside stakeholders such as politicians and school administrators.

### What We Found

Unfortunately, though Neuman called for systematic research in this area to avoid the marginalization of school libraries, only 13 out of 110 (11 percent) of the published works reviewed for this study fell under Neuman's Question 1.

The elimination or reduction of school librarians did, indeed, become a prevalent professional concern in the decade following publication of Neuman's article in 2003, and research studies

reviewed for Question 1 sought to identify connections between school library funding, staffing, and resources, and contributions to student achievement (Dow, Lakin, and Court 2012; Francis and Lance 2011). However, most of these studies focused on a sense of the school library program's overall "value" to students, and how students perceived the program to be academically helpful (Small and Snyder 2009; Todd 2006; Todd and Kuhlthau 2005a, 2005b), rather than the measurable outcomes called for by Neuman. Though there has been some progress in research using an evidence-based practice approach to examine school library programs' contributions to student academic achievement (Todd 2008), only a few of these studies exist.

## Looking Ahead

Because the evidence-based practice approach has potential for identifying measurable outcomes for further investigation, moving forward, researchers should consider partnering with practitioners to examine real-world practices. Combining a rigorous research process with practical knowledge could provide additional evidence-based results sorely needed for further grounding research for the profession.

Studies completed in the decade reviewed for Question 1 laid a methodological foundation for continued examination of school library programs' contributions to student learning (for example, Small, Snyder, and Parker 2009; Todd 2006; Todd and Kuhlthau 2005a, 2005b). With implementation of the *Common Core State Standards*, as well as other national initiatives such as increased focus on STEM education, school librarians have unique opportunities to work with teachers to directly address students' learning outcomes, providing researchers with multiple ways of documenting and collecting evidence of student learning. In the future, investigating Neuman's still-relevant question: "What are the contributions of library media programs to student achievement" (2003, 505) must become a priority for researchers in the field.

Neuman also urged researchers to pursue subthemes related to student learning (for example, access, equity, staffing, school culture, learning environment). While progress in addressing these areas was made on a limited basis during the decade reviewed for this study (Small, Snyder, and Parker 2009), much work remains to be done. In the years since the publication of Neuman's article, learning environments have become a subject of greater interest to educational researchers. These researchers have been prompted by rapid advancement in the availability of digital resources, by documented disparities in digital access (known as the digital divide), and by social justice movements highlighting inequity in school library resources. Considering the impact such factors in schools' cultures can have on school libraries, these aspects deserve further examination by school library professionals (Howard 2010).

Neuman concluded her examination of this facet of the diamond by explaining that research documenting "the most useful of the [program] options," outlining "details about their effective implementation" would richly contribute to the "discussion of achievement and the role of the library media program in it" (2003, 507). It is imperative that the profession of school librarianship to be able to demonstrate its worth and contributions to student learning. We urge school library researchers in the next decade to collect empirical data (or other evidence) of school library programs' impact on student learning, disseminating this evidence beyond the field to a broader audience.

## Neuman's Question 2: What Are the Roles of the Library Media Specialist in Today's Schools?

Since Neuman's review of research into four roles of the school librarian (instructional partner, information specialist, teacher, program administrator) listed in *Information Power* (AASL and AECT 1998), the 2009 release of *Empowering Learners*, with its addition of a fifth role (leader), spurred new research into defining what each of the roles looked like in best practice. Neuman reminded her readers that each of the five school librarian roles "takes on new dimensions each time education shifts its perspective and priorities" (2003, 508).

### What We Found

An overwhelming 52 (48 percent) of the published articles reviewed for this study examined one of the roles of the school librarian. Due to the more-explicit connection between student learning and the roles of instructional partner and teacher, these two roles were the subject of the majority of the research reviewed for Neuman's Question 2, with emphasis placed on the collaborative relationships necessary for enacting these roles (for example, Church 2008; Kelsey 2006; Montiel-Overall 2012; Moreillon 2008).

The addition of the role of leader in *Empowering Learners* (2009) inspired later investigation into how this role was defined, where leadership opportunities existed for school librarians, and how school library leadership could be enacted in practice (for example, Dotson and Jones 2011; Everhart, Mardis, and Johnston 2011; Johnston 2012). As an additional reflection of the increased presence of technology in educational settings, leadership in technology integration garnered the bulk of research attention given to this role. In contrast, leadership through school librarian-led professional development receiving little to no attention.

### Looking Ahead

Even though research on the five roles comprises the bulk of the articles reviewed for this study, continued investigations are needed for guiding practitioners and post-graduate preparation programs in school librarianship in the fleshing out of each role. Even so, research on the five roles cannot simply reside in a definition or description of each role's components. Research must build on these definitions, identifying and collecting empirical evidence that the enactment of these roles does, in fact, influence students' academic achievement: "the field must replace rationales and calls to action with systematic research related to the nature, uses, and successful implementation of each...The key questions, once again, revolve around the contribution of each role to student learning" (Neuman 2003, 508).

Also, although the roles of the school librarian have been investigated from various perspectives (including those of the principal, the teacher, and the student), teachers and administrators still demonstrate a lack of understanding of the school librarian's five roles, signifying a need for better dissemination of the results of this school library research strand to the broader field of education.

## Neuman's Question 3: How Do Students Use Electronic Information Resources for Learning?

Neuman's assertion that "new developments—political as well as technological—have changed the components of the questions and the nature of the answers" (2003, 504) is especially applicable to her Question 3. Since this question was first posited in 2003 the new developments to which Neuman referred have arrived at a dizzying pace.

### What We Found

Unfortunately, if the studies related to this question and conducted in the decade 2004 through 2014 are any indication, "research that explores students' learning with the emerging—and still not fully understood—electronic resources that will provide the richest venue for their learning throughout their lives" did not become a "central focus for the field" (2003, 510). Instead, research splintered into two distinct categories represented by a quarter of the studies reviewed for this article: 1) a continuation of the investigations of students' searching and retrieval patterns when using electronic resources, as well as the struggles students faced during this process; and 2) explorations of technology-enabled learning, with technology used as either a conduit or as a tool for creation.

Not until school library researchers partnered with colleagues in the fields of educational technology and educational psychology did studies begin to reflect a shift in emphasis from media comparison study structures, deplored by researchers for decades as consistently resulting in no significant effect (Clark 1994), to examinations of technology as a cognitive-skill development aid. In these later studies (Akcaoglu 2014; Baytak and Land 2011; Green, Inan, and Maushak 2014; Morris 2013; Reynolds and Caperton 2011; Wilkerson-Jerde and Hoda 2014), technology became a vehicle for student-centered, and engaging design tasks, such as digital storytelling or game design, tasks that nurtured cognitive skills including critical and creative thinking, visual literacy, computational thinking, complex problem solving, and systems thinking.

### Looking Ahead

It is, perhaps, in the presence of these later studies on technology for problem-solving, inquiry, and design that Neuman's Question 3 most dates itself; it is a question written before the current maker movement, and development and wide-spread availability of web-based tools that have made students' creation of content and tools a ubiquitous educational reality.

Technology, whether it is seen by educators as beneficial or detrimental to student learning, is now a standard component in K–12 schools in the United States. Technology's presence modifies every physical learning space, including the school library. Judging by articles in practitioner journals, increased school librarian presence at conferences such as the one sponsored by the International Society for Technology Education, and anecdotal feedback on technology challenges shared through online discussion lists for librarians and within Facebook groups, there has been a sharp increase in the use of the school library space for computer labs, technology-rich learning activities, and an increased desire on the part of K–12 students to use the library as a physical spot for interacting with their own devices.



While the role of the school librarian in developing student literacy is well established in the literature reviewed for Questions 1 and 4 of this paper, the role of school librarians in technology-enabled learning seems limited to digital literacy (an extension of the original literacy role) or as a participant in technology lessons and activities. According to the studies reviewed for Question 3, only 6 out of 110 (5 percent) examined technology-enabled learning occurring in the school library space for evidence of its impact on student learning—more specifically, on students’ cognitive skill development applicable across multiple disciplinary domains. The makerspace movement, wealth of STEM initiatives, and programs such as Libraries Ready to Code provide an excellent and much-needed opportunity for school library researchers to investigate technology-enabled learning activities in a quantifiable way.

Richard Clark argued vehemently that “media” (his term for technologies) would never influence learning. Instead, he maintained research on technologies in learning settings should focus on *method* instead of *media*. Method, he explained, is “the inclusion of one of a number of possible representations of a cognitive process or strategy that is necessary for learning but which students cannot or will not provide for themselves” (1994, 26). He further stated that all methods necessary for learning could be presented through a range of media (or technology tools). It is the *method* and not the *media* is the “active independent variable that may or may not be delivered by the medium to influence learning” (Clark 1994, 26).

In the next decade, research on technology-enabled learning conducted by school library researchers should be careful to measure methods over media, discovering what pedagogical components or learning structures supported by technology are best suited to foster student learning and, consequently, are most worthy of school librarians’ efforts and program investment.

## **Neuman’s Question 4: What Has Been the Impact of the “Information Literacy Skills for Student Learning” on Library Media Programs?**

In 1998 the American Library Association and the Association for Educational Communications and Technology released the nine “Information Literacy Skills for Student Learning” in *Information Power: Building Partnerships for Learning*. The objective was to thread information skills through the curriculum of all academic subjects. Neuman posited that tracing the dissemination of the “Information Literacy Skills for Student Learning” into state standards would be a “comparatively straightforward task” (2003, 514). She called for research over the next decade to “delineate the ways in which these national statements [were] modified and implemented to meet local needs” (2003, 515).

### **What We Found**

The publication in 2007 of AASL’s *Standards for the 21st-Century Learner*, along with the 2009 *Common Core State Standards Initiative* and the development in 2012 of the *Next Generation Science Standards*, invariably complicated a researcher’s ability to heed Neuman’s call to answer her Question 4. This situation may be why only 17 of 110 (15 percent) published works reviewed for this study addressed Question 4. More research answering Question 4 is urgently needed as school librarians and school libraries are inadequately funded and sometimes eliminated.

Two of the more-recent studies (Kovalick, Yutzey, and Pazza 2013; Krueger and Donham 2013) we identified as attempts to answer Question 4 noted an important relationship between the information-seeking strategies traditionally taught by school librarians and student information seeking: Students were not daunted by the process of locating information online. They overwhelmingly stated locating information online did not require mental effort and expressed a belief that, with so much information at their fingertips, locating a relevant source was just a matter of time. Instead, students explained that organizing and analyzing the information they found was far more challenging.

## Looking Ahead

The key finding that students found organizing and analyzing information far more challenging than finding information is a call for research on information seeking to switch from identification of the best information-seeking strategies and resources available to identification of the best pedagogical practices for teaching media and information literacy, as well as best practices (and tools) for critically examining and curating resources when faced with an overwhelming number of online sources.

In addition, emerging social issues, particularly the presence and influence of online news media, make research into best practices for teaching information literacy, data literacy, and the critical examination/curation of online sources pressing and crucial concerns. Well over 67 percent of Americans get a portion of their news information from various social media outlets (Shearer and Gottfried 2017). Even more alarming is the erroneous self-perception people in the United States have of their own ability to critically evaluate information resources. According to the Pew Research Center, 84 percent of Americans are confident in their own ability to spot fake news stories on the Web (Barthel, Mitchell, and Holcomb 2016). However, an analysis of the final months of the most recent U.S. presidential campaign found “20 top-performing false election stories from hoax sites and hyperpartisan blogs” generated more shares on Facebook than the “20 best-performing election stories from 19 major news websites” (Silverman 2016, para. 2).

## Conclusion

It is important to remember that recommendations for research we have shared are based on the research reviewed for this study. These recommendations do not reflect or consider studies published after 2014. However, a brief look at the questions percolating amongst school library researchers over the past three years suggest this study’s recommendations are still timely. In 2014 AASL held the Causality: School Libraries and Student Success (CLASS) Research Summit in Washington, DC. This summit was part of an “AASL initiative to move the national school library research agenda toward the causal analyses underlying the differences school librarians can make for students from diverse backgrounds, poverty and special needs” (Habley 2015, para. 2). Doctoral students and professors from across the U.S. applied to be invited to participate in the CLASS II initiative. As preparation for this summit, the forty-four participants each submitted 750-word prospectus of a current research project, an idea for a possible research agenda, or a research thought. To gauge the applicability of our study’s findings, we used the Neuman framework of questions to analyze and code these prospectuses. The results are in table 2.

**Table 2. Comparison between studies we examined and AASL CLASS II proposals.**

Neuman's Questions	Studies from 2004–2014	AASL CLASS Proposals
Question 1	11%	20%
Question 2	48%	40%
Question 3	25%	20%
Question 4	15%	11%
Emergent	0%	9%

Based on the comparison figures presented in table 2, the AASL CLASS II proposals aligned with favored research questions of the past ten years, with the majority of proposals submitted focusing on the roles of the school librarian (40 percent). While there seemed to be an increase in proposals for examining the contributions of school library programs to student achievement (from 11 percent to 20 percent), it is still not an area of major focus for the CLASS researchers. The most surprising finding from this admittedly brief and limited comparison is that, despite the increase in digital technologies for teaching and learning, scholars still indicated very little inclination to conduct research in this area. Finally, with the new AASL standards released in the fall of 2017, it is expected that research investigating the impact of the 2017 standards on school library programs will increase.

Throughout the process of examining the last decade of school library research, we discovered our professional field cannot be represented by a two-dimensional figure. Rather, our “polishing” revealed Neuman’s diamond to be three-dimensional and multi-faceted, representing other areas and questions such as the impact of school library programs on student learning; the roles of the school librarian in an ever changing educational landscape; the school library’s role in social justice and community activism; technology-enabled learning; technology as a cognitive development tool; information literacy including critical evaluation and curation; and the link between the new 2017 AASL Standards introduced in 2017, school library programs, and student learning. The findings of this systematic review demonstrate there is still a need to “polish the diamond” in order to “shed light on the relationship of the field to learning...and make it shine more brightly in its own right and sparkle more valuably in the larger field of education” (Neuman, 2003, 504).

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