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January 2013

Getting Better

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We traditionally greet a new year with resolutions that we know or believe will improve our lives. We set goals for our physical, emotional, and intellectual betterment. At their best, these annual objectives consider what worked and what failed in past years (getting an e-reader? waking up earlier? ditching a fad diet? committing to an overzealous exercise plan?) and apply those lessons learned to create smart, attainable ways to get better and do better in the coming year.

In a parallel to creating New Year’s resolutions that encourage us to get better, this first issue of Student Research Journal for 2013 offers six different takes on how we as librarians, as information professionals, as archivists—and yes, as people—can do better. Our authors cover several cutting-edge topics in library and information science, but all of the articles published in this issue, which were written by a San José State University School of Library and Information Science faculty contributor and five graduate LIS students from schools across the continent, help us understand ways we can improve, whether it be our communication, our collaboration, our preservation, or our service.

This issue’s invited contribution comes from Dr. Christine Hagar, Assistant Professor at SJSU SLIS. Conducting analysis through the framework of “crisis informatics,” Hagar (2013) evaluates whether social media is truly an effective tool for sharing information during a crisis, such as a hurricane, pandemic, or terrorist attack. Dr. Hagar explains that during crises, people generally communicate more often and in more complex ways, including via social media. Communicating “trusted information” is especially crucial in these situations, but disseminating information via social media may complicate what are already difficult information landscapes (p. 1, 3). She notes that social media crisis-time communication is, in many ways, a positive development—among other things, it “enhances citizen engagement,” empowers everyday people as “citizen journalists,” and vastly expands the information reach of relief and government agencies. In the same breath, however, Dr. Hagar calls our attention to the downsides of social media crisis communication—an increased risk of quickly spread misinformation, a potential for information overload, and the possibility of inciting panic. By forcing us to consider that social media may be a “mixed blessing in crisis response” (p. 4), Dr. Hagar encourages us to be smarter, more conscientious producers and consumers of crisis-time social media communications. Given the recent tragedy of Super Storm Sandy, and the knowledge that we will undoubtedly, unfortunately, endure many crises (both natural and man-made) to come, Dr. Hagar’s lesson in doing better should resonate with each of us as professionals and as people.

Samantha Godbey makes the case for getting better through collaboration. In her piece “Collaboration as an Essential Tool in Information Literacy Education 9-16: Context, Qualities and Implications,” Godbey persuasively argues that secondary school librarians could and would more effectively serve
their students by collaborating with academic librarians at higher-education institutions. After sharing several examples of existing library-based collaborative relationships, Godbey helpfully compiles a list of “essential elements of successful collaboration” (pp. 7-9), a roadmap for success that any librarian—school or academic—should read, consider, and internalize. Godbey concludes with encouragement to school librarians who may consider collaborating with academic librarians to improve the information literacy of their students in high school and beyond:

Through collaboration with academic librarians, school librarians can expand their resources and expertise. They can gain insight from another professional who has an idea of the skills students will need in grades 13 to 16, where the school librarian’s expertise fades. It is an ideal opportunity for collaboration, where each partner’s expertise complements the other (p. 11).

Godbey’s analysis of and justification for collaboration by librarians who serve students in grades 9-16 shows us an important way to create a better foundation for information literacy for a lifetime.

Building on the benefits of collaboration we understand more thoroughly after reading Godbey (2013), Stacey Nordlund’s work “Information Literacy Instruction for Upper-Year Undergraduate Students: A Stratified Course-Integrated Approach” posits a new use of an old tool to help college students undertake the research process. Nordlund (2013) identifies the benefits of collaboration between librarians and faculty and the challenges created by “the chasm separating the faculty member as ‘expert researcher’ from the student as ‘novice researcher’” (pp. 2, 5). She then introduces a method that applies collaboration to address this chasm: Leckie’s “stratified course-integrated approach.” This six-stage stratified approach to information literacy “integrates information-seeking and evaluative skills into the course content” but historically was developed only for first-year undergraduate students (pp. 1, 5). Nordlund convinces us of the merits of experimenting with this approach beyond its traditional application in the first year of higher education, in order to better prepare undergraduates at all levels to meet expected information literacy competencies. The author shares her first-hand observations from a large university’s junior-year information workshop, which employs the stages of stratification to prepare Materials Science students for a research project. These observations light the way toward a method of teaching research that may lead to more collaboration, better connections between students and libraries, and improved information literacy instruction for upper-division students.
In “Consider the Source: The Value of Source Code to Digital Preservation Strategies,” Michel Castagné documents the debate over “why and how software should be preserved” (p. 1), and explains several approaches for preserving software. Castagné (2013) carefully walks through five software “preservation strategies,” offering critique and insight into each. The author calls particular attention to the benefits of both source code and the open source community in preserving software. Castagné’s article also serves as a call to action for continued support of standards for open access to source code. He inspires us to get involved in preserving this critical piece of our digital history.

Becca Bastron also tackles the issue of preservation in her article “Preserving Film Preservation in the Digital Era.” Bastron (2013) introduces the importance of film preservation by sharing some astonishing statistics about the large percentage of films we have already lost. With that preservationist urgency in mind, Bastron surprises us again; rather than supporting the mode du jour of preservation—digital—in all instances, Bastron argues that digital preservation is only sometimes appropriate by tackling both its advantages and its disadvantages. In sum, Bastron encourages film preservationists to get better at their work by critically engaging the lure of the new and flashy and by respecting the tried and true. “[A]s tends to happen with many new technologies, imperfections [in digital film preservation] have been revealed over time which contrast with previous assumptions”; these “limitations cannot be ignored” (p. 11).

This issue’s final piece, Susan MW Aplin’s extensive literature review, “Using Technology to Connect Public Libraries and Teens,” collects and analyzes more than a decade’s worth of theories about ways to use technology to make public libraries more appealing, more approachable, and more useful for teen patrons. Aplin (2013) condenses a large volume of scholarly articles into best practices, split across several broad-strokes categories of ways to “connect”: in person, online, through library websites, on social networking sites, and through mobile devices and e-readers. Over these sections, Aplin amasses insights into the types of technologies that public libraries should consider for teens, the best ways to use these technologies, and the appropriate behaviors of a teen-focused librarian. By assembling and examining all of these important practices and tips, Aplin has created a useful repository of ideas for public libraries that want to do better by using technology to reach out to their teen patrons.

Getting better does not stop with these six ideas from these six authors. As Marcoux and Loertscher (2010) note in a “getting better”-themed editorial targeted to teacher librarians but applicable to all, no one scheme or one article will improve everything. Instead, “[t]he way to define what to do is to take a good and hard look at what is happening—at each and every action—against the bigger picture of how what you do contributes” (p. 6). Our authors met this challenge in their articles. Our Editorial Team met this challenge in its hard and
much appreciated work to get this issue to publication. And our hope is that everyone in our field continues to strive to and to encourage others to get better as well.

And finally, on a personal note, the SRJ Editorial Team is proud to have published articles by two of our alumnae. Samantha Godbey and Stacey Nordlund contributed tremendously to making SRJ better as members of our Editorial Team and we are so pleased that they have made their way to publication through our double blind review process.


Dr. Christine Hagar is an Assistant Professor at San Jose State University, School of Library and Information Science. Dr. Hagar holds a PhD in Library and Information Science from the University of Illinois at Urbana-Champaign.

Samantha Godbey graduated from San Jose State University with her teacher librarian credential and MLIS in May 2012. She also has a single subject teaching credential and M.A. in Education from UC Berkeley. Her research interests include information literacy instruction and reference in school and academic libraries. As of December 2012, she is Education Liaison Librarian at University of Nevada, Las Vegas.

Stacey Nordlund is a recent graduate of the MLIS program at San José State University and holds a BS in Psychology from the University of Toronto. She works as a reference librarian for the Toronto Public Library in Toronto, Ontario, and volunteers as a virtual reference librarian for Ask Ontario.

Michel Castagné is a Master of Library and Information Studies candidate at the University of British Columbia. He specializes in digital libraries and preservation in an academic setting, as well as designing effective information architecture and databases.

Becca Bastron is a library student at San Jose State University, and a passionate film history buff.

Susan Aplin has a Bachelor of Arts in English from Pomona College and a Master of Arts in Teaching English from the University of South Carolina. She is a National Board Certified English teacher at Dutch Fork High School in Irmo, SC, where she also serves as a Teacher Technology Leader.
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Crisis Informatics: Perspectives of Trust – Is Social Media a Mixed Blessing?

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Crisis Informatics: Perspectives of Trust – Is Social Media a Mixed Blessing?

The world has experienced a number of devastating natural disasters and seems to be facing crises on an unprecedented scale. Natural disasters over the last decade, including major earthquakes in Haiti, New Zealand, Chile, China, and Japan (and the resultant tsunami/nuclear crisis), and more recently Hurricane Sandy, have claimed thousands of lives. As well as coping with such natural disasters, the world has faced other types of crises: political disruption in North Africa and the Middle East, human-made crises such as terrorist attacks (9/11, Mumbai bombings), the spread of viral disease (H1N1), nuclear and chemical crises (Bhupal, Chernobyl), war, and many more. This paper highlights one of the key concerns in the emerging area of crisis informatics: issues of trusted information in crises/disasters and how the unregulated nature of social media affects information creation and dissemination.

Crisis informatics

Crisis informatics is an interdisciplinary area of study. The term was first coined by Hagar (2006) and is broadly defined as the interconnectedness of people, organizations, information, and technology during crises. It examines the intersecting trajectories of social, technical, and information matters in crises/disasters and explores the full life cycle of a crisis: preparation, response, and recovery. Crises usually precipitate an increase in communication and present complex information environments. Within this complex information environment, trusted information takes on greater significance during a crisis.

Trust

Trust is a central component of everyday life and a high level of trust is key to effective communication (Dodgson, 1993). It can improve the quality of dialogue and discussions that facilitate the sharing of knowledge (Ichijo, von Krogh, & Nonaka, 2000). Trust is at the heart of knowledge exchange (Davenport & Prusak, 1998), enabling exchanges among individuals, enhancing cooperation and coordination, and contributing to more effective social and organizational relationships. However, during a crisis, the saliency of trust (and estimating trustworthiness) is elevated to higher levels (Webb, 1995).

Definitions of trust focus on the role of uncertainty in shaping people’s experiences (Kollock, 1994). In a crisis situation when there is much uncertainty, trust influences the way people seek information. Bucher (2002) identifies knowledge uncertainty as a key element of crisis situations; those experiencing the crisis do not know enough to understand what is happening and lack knowledge about how to respond to the crisis.

Trust is an essential ingredient in social relationships (Brockner, Siegel, Daly, & Tyler, 1997) because it defines an individual’s expectations...
and behavior (Luhman, 1979). As dependency on other people in a crisis is greater (Webb, 1995), so social relationships become more important. McDowell (2002) argues that how much people trust other people or institutions affects the level of information they gain from them. Dependency on other people is often evident in crises when decisions are made about trustworthy sources of information and trustworthy people.

Two of the key questions explored are: What sources of information do people trust? Which information providers do people trust? The sources of information which are trusted are often influenced by existing relationships with the information provider. Deciding which sources of information to trust and which information providers to trust in crises are critical because acting upon trusted information can shape and influence the nature of the crisis profoundly. Lack of trust in crises/disasters leads to people making up stories, and rumors abound as elaborated below.

**Rumor**

Rumors tend to circulate rapidly and are underpinned by a desire for meaning to cope with uncertainties (Michelson & Mouly, 2004). When people do not acquire the information they need to deal with a crisis, they seek information in rumor and to try to create a narrative that makes sense and fills the gaps in knowledge. As information is spread via rumor it becomes exaggerated and is difficult to ignore as people seek information and explanations.

During the 2009 H1N1 pandemic, rumors were rife and people sought information on: who was infected?; where did the H1N1 virus originate?; how quickly did the virus spread?; how was the virus passed on?; how many people would get it?; what precautions to take?; who would be given priority for vaccination?; and, questions concerning government involvement, such as was swine flu just a big rumour to jumpstart the people, to spend money on the health industry and boost the global economy? Important questions to explore are: How do we distinguish between rumor and information? And how do we decide how trustworthy the information content is? How much information in rumor is true and how is that worked out and by whom?

**Social media**

In years gone by, rumors circulated by word-of-mouth and were slow to spread. With the increased use of social media tools, rumors spread at a greater pace, creating a major challenge for crisis information management. Social media is an important platform to disseminate information locally and globally during crises. Tools such as Facebook, Twitter, Google Person Finder, Google Crisis Response, Youtube, and Flickr are changing the face of managing information in crisis preparedness, response, and recovery. These tools are used to send personal messages, retrieve local information to communities, find missing people, coordinate relief efforts, fundraise, organize volunteer groups, and to mobilize. Vast amounts of information can be distributed easily to a large audience at great speed. As crises unfold, social
media enable events to be communicated around the world within minutes or even seconds of the crisis occurring. During the Haiti earthquake, social media became the new forum for collective intelligence, social convergence, and community activism (Keim & Noji, 2011). Similarly much of what people around the world learned about the 2011 Japan earthquake during the hours and days after the event was significantly shaped by social media (Slater, Keiko, & Kindstrand, 2012).

Social media enhances citizen engagement and allows citizens to become content generators and disseminators and to become “citizen journalists” to mobilize and spread their messages. During Hurricane Sandy, volumes of citizen-generated data was created using social media. Twitter registered 20 million Sandy-related tweets during the six-day period of the storm and the immediate aftermath. Facebook’s Instagram reported that 10 photos per second related to Sandy were being uploaded to its site.

Besides vast amounts of citizen generated information disseminated via social media, relief agencies, such as the Red Cross, and local, state, and federal emergency management organizations, are increasingly using social media as an alternative way to communicate with the public, and with each other (White, 2012). Official and unofficial sources of information are present and shared on the same social platforms. During Hurricane Sandy, for example, information was posted on Twitter by city departments, by public transit authorities, by news organizations, and by citizens conveying information about the state of their neighbourhoods, and exchanging information about the safety of family and friends.

The combination of a vast amount of official sources of information, and the citizen-generated content created and disseminated via social media, adds to information overload in crises. This increases uncertainty and the difficulty of making decisions about whom and what are trustworthy sources of information. When formal channels of information do not answer questions, informal channels fill the gap. In a crisis, informal channels of information become even more important as people seek information from people who they know and trust. One of the challenges for centralized authorities and for the emergency management community is how to coordinate and aggregate the unofficial citizen generated content into their official sites, and what to include. Crisis responders need to be able to filter and process volumes of crisis data and navigate through the “noise” on social media sites (Starbird et al., 2012).

Not only have social media tools the capacity and power to inform, to provide real-time information, facilitate recovery efforts, and save lives, but they also have the potential to spread misinformation and rumor, and to create panic. During Hurricane Sandy, rumors and fake images of the storm were virally shared, including a picture of a shark swimming in a front yard in Brigantine, New Jersey and a rumor claiming that the floor of the New York Stock exchange was three feet under water. “Retweets” allowed the further
spread of these rumors. In response to the multitude of rumors FEMA set up a “rumor control” section on its website (FEMA, 2012).

Deciding which information providers to trust and what sources of information to trust in crises is critical as acting upon trusted information can shape and influence the nature of the crisis. Social media is a powerful tool for sharing information during crises and can be used to improve emergency management capabilities. Some would argue that the promise of positive results merit further use of social media for emergencies and disasters (Lindsay, 2011), however, on the other hand, social media has the power to misinform and to hinder response efforts. Is it a mixed blessing in crisis response?

References


Collaboration as an Essential Tool in Information Literacy Education 9-16: Context, Qualities and Implications

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This article is brought to you by the open access Journals at SJSU ScholarWorks. It has been accepted for inclusion in SLIS Student Research Journal by an authorized administrator of SJSU ScholarWorks. For more information, please contact scholarworks@sjsu.edu.
The proliferation of electronic content and the development of new technologies are causing fundamental changes to the processes of reading and research, leaving many librarians curious and concerned about the future of the profession. In the midst of this transitional period, contemporary school librarians continue to face the challenges of limited funding and high expectations. Education and library funding continues to be cut, yet school librarians are tasked with coordinating efforts to educate children in information literacy so that they are educated consumers of information. Information literacy, the ability to “recognize when information is needed and have the ability to locate, evaluate, and use effectively the needed information,” (American Library Association, 1989) is among the highest priorities in education. This article addresses the research question of how school librarians can continue to provide effective information literacy instruction despite the challenges of limited funding and high expectations.

In recent years, various organizations, from business to education, have turned to collaboration as a way of increasing profits and creating new opportunities for growth. Collaboration is a process that takes many forms in many organizations. This paper focuses on collaborations among librarians in academic settings, arguing that secondary school librarians, who are preparing a higher number of students than ever for postsecondary education, must collaborate with academic librarians. A review of the literature reveals numerous articles describing collaborative partnerships and lamenting information literacy skills gaps among college students. This article intends to serve as a call to action to school and academic librarians by consolidating information on library collaborations already taking place and providing guidelines for successfully entering into a collaborative relationship. This paper reviews the context for collaboration in libraries, discusses examples of school library collaborations, and explores several implications of collaboration.

The Context for Collaboration

Emphasis on Information Literacy Instruction

Hull and Taylor (2003) note that in the early 1990s, the main concern regarding student access to technology was the lack of computers, but by the following decade the main concern had become “students’ lack of proficiency in using technological resources to access relevant information” (p. 85). Recommendations from the American Association of School Librarians (AASL) and American Library Association (ALA) are in line with this need for information literacy instruction, from the 1998 publication of Information Power, which defined information literacy and laid out a plan for instruction, to the 2007...
The release of the AASL Standards for the 21st Century Learner, which emphasize the school librarian’s commitment to information literacy education.

Gaps in Skills

Despite the publication of standards, however, the reality of the gap between the skills expected from high school graduates and the skills actually demonstrated by entering college students reveals a need for substantial change in information literacy instruction and increased communication between secondary and postsecondary schools. Hull and Taylor (2003) note that due to “the pervasiveness of the knowledge gap, there needs to be a more systematic effort in both the fields of education and librarianship to better prepare students for college-level research” (p. 84) and that this knowledge gap is becoming more problematic as the amount of accessible information increases. Gordon (2002) echoes Hull and Taylor’s concerns about student skills, noting that first-year college students either have not been exposed to or have not retained the research skills essential to collegiate success. Gordon surveyed a group of graduate students in master’s and doctoral programs, and even these students revealed a lack of comfort with basic research skills such as the use of Boolean operators and the effective searching of electronic databases. Polls of secondary school library media specialists (SLMS) reinforce these concerns. For example, in their survey of secondary SLMSs, Islam and Murno (2006) found that fewer than 38% of the school library media specialists polled believed their students were acquiring adequate information literacy skills by the time they graduated from high school (p. 505).

Increase in Post-Secondary Enrollment

The need for adequate secondary school preparation for collegiate-level work has become increasingly pressing as the number of students progressing from high school to college has increased. Fifty years ago, only 34% of students graduated from high school and 6% earned bachelor’s degrees (Hess, 2008), but in the present day college is no longer an institution reserved for the elite. Instead, college is increasingly considered an expected extension of a high school education. As the number of students who expect to continue their educations past secondary school increases, so does the need for deliberate work in addressing this knowledge gap between grades twelve and thirteen.
Collaboration in Education

One of the most significant trends guiding collaboration in schools is the P-16 movement. Beginning in the 1990s, the P-16 movement was developed in response to the perceived need for a fluid educational experience from preschool through college. Variations on P-16 such as K-20, which goes up to grade “20” to indicate possibilities for learning beyond college, share the same emphasis on easing the educational transitions for students from youth to early adulthood. In his discussion of the P-16 movement, Hess (2008) argues that the divisions between primary, secondary, and postsecondary schools are “arbitrary” and “synthetic” (p. 511). The P-16 movement hopes to remedy the gaps that have developed as a result of treating the different stages in a child’s education as completely distinct components.

P-16 initiatives include the creation and implementation of P-16 data systems that allow educators to track student achievement throughout their academic careers (Chamberlin & Plucker, 2008). Hess (2008) identifies Florida’s K-20 Education Data Warehouse, Indiana’s Core 40 high school curriculum, and California’s Academic Partnership Program as some of the most constructive developments in the P-16 education movement.

Chamberlin and Plucker (2008) note that most P-16 systems were initiated by state departments of Education or institutions of higher learning. P-16 committees include educators, business and community leaders, and representatives from state agencies. As such, these committees are strong examples of cross-sectoral collaboration.

According to Nebraska’s P-16 Initiative (n.d.), 30 states have some sort of P-16 initiative, though not all are codified by law. P-16 legislation has formalized some collaborations that were in already in existence. For example, the 1995 Public Education/Higher Education Coordinating Group became the Texas P-16 Council after the passing of legislation (Chamberlin & Plucker, 2008). In Florida, earlier P-16 efforts became law with the passing of the 2000 Education Governance Reorganization Act, which established an official K-20 education code (Chamberlin & Plucker, 2008).

The Trend of Collaboration in Libraries

Collaboration is not a new concept in the library world. Borthwick (2001) defines educational partnership as “a process that brings together members (e.g. institutions, organizations, and agencies) and resources to produce outcomes directed to the enhancement of education” (p. 35). Partnerships are “dynamic and complex interagency relationships” (p. 36). This process of bringing together members and resources has manifested in numerous ways in different library
contexts. For example, collaboration has filled gaps in funding and staffing (Woolls, 2001). Public libraries are partnering with communities and businesses to increase funding and extend community outreach, and developments in technology have led to new forms of collaboration.

There is extensive literature about library consortia that enable the sharing of resources. This practice has been invaluable to academic libraries in the United States that take advantage of technology in order to provide shared cataloging, reference, and access to electronic resources (Webster, 2006; Kohl & Sanville, 2006) and equally invaluable to libraries in locales such as rural India (Laxman Rao, 2006). Webster (2006) argues that the developments in technology have led to more “connected and interdependent” libraries. Collaborative resources such as the Ontario School Curriculum Resource, developed by a consortium of school boards, academic libraries, and public libraries, are evidence of this interconnection (Borek, 2008). These consortia tend to focus on accessibility of resources, which can include the sharing of expertise such as reference services or curriculum materials, but in general, they focus more on the sharing of data than expertise. Their emphasis is not on the development of interdisciplinary projects that will be required to meet students’ information literacy education needs.

Collaboration and School Libraries

School partnerships increased in the late 1980s, with many universities forming partnerships with local schools to assist in teacher training (Borthwick, 2001). School partnerships have continued to serve an important function in education reform. Collaboration plays a central role, along with leadership and technology, in Information Power, the American Association of School Librarians’ 1998 declaration of defining principles and standards for the profession.

Intrainstitutional Collaboration

Collaboration within institutions is not unusual. As members of a faculty working with other educators in the same institution, librarians are poised to participate in collaborations with colleagues. The literature supports the existence of a strong history of librarian-faculty collaboration, as in Ercegovac’s (2003) case study of collaboration between a science teacher and librarian. Another example is evidenced by the structuring of the Georgia State University Library staff. The majority of librarians serve as liaisons to academic departments, working directly with those departments in collection development, providing library instruction and reference, and serving as department advocates (Hull & Taylor, 2003). The same is true of the University of Nevada, Las Vegas.
School-Public Library Collaboration

Collaboration between school libraries and public libraries also has a strong tradition. Dual libraries that serve an academic community and the public have arisen as one example of these collaborations. Woolls (2001) argues that much of the collaboration between schools and public libraries at the time of writing involved districts without professional librarians. In essence, public librarians served as part-time replacements for SLMSs. This type of cooperation addresses a need and is a far better alternative to leaving schools and students without the expertise of any professional librarians at all. However, it is often a substitution for a school librarian, whereas a collaboration between an SLMS and public librarian might generate innovative ways of addressing student achievement.

Even in active collaborations between school and public libraries, differences between school and public libraries require careful consideration. F. Harris (2003) discusses the differences between schools and public libraries, particularly in how they conduct information transactions. In public libraries, the user is the person who decides how much assistance is needed, whereas in school libraries, “a reference transaction is also a teaching transaction” (p. 216). F. Harris argues that SLMSs take a more active role in determining how much help to give a student and in guiding the student to an understanding of the assignment and the information need. While exposing students to different kinds of libraries introduces them to different kinds of information transactions, increased collaboration with public libraries may not actually improve student readiness for academic research in college.

Gilton (2008) also argues that gaining skills in a public library does not translate to academic library skills, pointing out the different information systems used in each and the fact that academic libraries are generally much larger than public libraries. Furthermore, Gilton notes that, although public librarians have a long history of instructing patrons in information use, that instruction has been informal and indirect, in contrast to the direct instruction that takes place in school and academic libraries.

Models of School-University Collaboration

A wealth of literature exists on the concept of school-university collaboration. For example, Ravid and Handler (2003) identify four distinct models of school-university collaboration. The first is the PDS (Professional Development School) model, in which a university collaborates with a professional development school. The PDS model emphasizes using the collaborative school as a site for teacher training. A collaboration in the
Consultation Model consists of a small group of university faculty working with one or several teachers in a school. The third model is the One-to-One Collaborations Model, with two participants, one from a university and the other from a school, acting as equal partners and conducting a research project together. Finally, the fourth model is the Umbrella Model, in which multiple collaborations take place under the auspices of one larger umbrella organization. Each project team has university and school educator participants, as well as other stakeholders from the organization.

Collaborations also differ based on who initiated the collaboration and for what reason. Borthwick, Stirling, Nauman, and Cook (2003) note the difference between voluntary and mandated partnerships. Some districts have mandated partnerships for teachers in low-achieving schools as a way of improving student achievement. In studying the perceptions of participants in a number of collaborations between a Chicago university and several Chicago public schools, half of which were voluntary and half of which were required for schools on probation, Borthwick et al. found that participants in mandated partnerships were more focused on short-term goals and less interested in potential long-term benefits of collaboration. When participation was mandated, participants focused on short-term goals in order to meet the specific requirements of the mandated collaboration, rather than exploring the full possibilities for the collaboration that had been established.

Often collaboration is impromptu and informal. In Lonsdale and Armstrong’s (2006) survey of secondary and university librarians in the United Kingdom, they discovered that the majority of collaborations tend to be impromptu. These ad hoc collaborations sometimes evolve into more formal systems, such as the Georgia State University Library program that began as a result of informal conversations between two academic librarians and then developed into an extensive project (Hull & Taylor, 2003).

Examples of SLMS-Academic Library Collaboration

A number of collaborative efforts between school libraries have taken place or are currently underway and can be examined for lessons on collaboration. For example, a research partnership such as the one described by Harada (2005), in which a university partner studied teacher-SLMS collaboration, is an example of a collaboration in the Consultation Model. The university partner observed instruction and conducted interviews for several years in order to develop research on existing collaborations within the secondary school in the study. As the Georgia State University Education and Communications liaison librarians, Hull and Taylor (2003) co-taught a course to pre-service SLMSs in the College of Education’s Library Media Technology Program. This type of direct
instruction to students training to be SLMSs increased the students’ awareness of
the need for information literacy instruction and helped the students and their
instructors to develop strategies for use with K-12 students. When the pre-service
SLMSs began to work in area schools, the program led to ongoing collaboration
when the academic librarians visited their former students at their school sites.

The Georgia State University Library course (Hull & Taylor, 2003) demonstrates collaboration in several ways. First, this is an example of
intralibrary collaboration between the two librarians as co-teachers. Secondly, the
course demonstrates intraorganizational collaboration between the university
librarians and members of academic department faculty. Finally, because the
collaboration continued once the former students began their careers as school
media specialists, the program also illustrates interorganizational collaboration
between academic librarians and school media specialists. In this way, a
collaboration that began informally as a conversation about a professional
development exercise eventually led to collaboration in the style of the
Consultation and One-to-One Collaborations models.

Nichols, Spang, and Padron (2005) examine the extensive collaboration at
Wayne State University, including a continuing education course in information
literacy for K-12 teachers and librarians, on-site information literacy workshops
to K-12 educators that had been collaboratively developed by K-12 educators and
university librarians, and an information literacy course for pre-service SLMSs. In
the 1990s, Brooklyn College’s Collaborative Library Project provided research
instruction and access to collections for a semester (Evans, 1997) to a group of
high school students, their teachers, and their school librarians. In the Brooklyn
College project as well as the project at Wayne State University (Nichols, 1999;
Nichols, 2001), collaboration with surrounding high schools arose from an
awareness that the undergraduates at these universities predominantly come from
the surrounding areas. Therefore, library-academic library collaboration was seen
as an investment in the future students of the universities.

Essential Elements of Successful Collaboration

In their analysis of studies of collaboration between universities and K-12
schools, Kersh and Masztal (1998) define a successful collaboration as “making a
sustained and lasting positive effect” (para. 2). In their analysis of various studies
of collaborations, in which each collaboration examined had lasted a minimum of
three years, Kersh and Masztal identify a number of essential components to
successful collaboration. A look at Kersh and Masztal’s studies as well as others
generates the following list of elements that will enable a collaboration to make a
sustained and lasting positive effect.
**Clearly defined, practical goals.** Kersh and Masztal (1998) stress the importance of writing a long-range development and management plan to develop a “shared vision” and documenting the plan to achieve that vision. The development plan should carefully assess the resources required before the collaboration begins. This plan must involve realistic goals and an awareness that change is a lengthy process. This goal “must reflect a genuine problem facing the school” (Kersh & Masztal, 1998) and have specific practical application (Nichols, 1999). For example, projects often focus on either honors students (Evans, 1997) or low-achieving students because of the perceived need for college-related experiences and instruction for each group. The honors students are seen as likely to attend college, whereas low-achieving students receive a lot of attention as educators try to motivate those students and increase their skills.

**Clearly defined leadership structure and participant roles.** The development of a collaborative plan must also address the leadership structure and define participant roles. Since collaborations involve participants in different positions from different organizations, leadership roles can create tension in the group. Leadership issues have been noted in collaborations (Borthwick et al., 2003), particularly in one-to-one collaborations, since neither partner has authority over the other in case of conflict or one partner not fulfilling their responsibilities. Kersh and Masztal (1998) noted that administrators in particular are placed in an uncomfortable position in collaborations since they must “accommodate the administrative expectation of the principal as a strong leader while simultaneously releasing ‘power’ to teachers” in order to participate collaboratively (Component 3: The School section, para. 3). Early establishment of group norms and participant roles can help prevent confusion and disharmony.

**Equality.** Successful collaborations treat participants as equals, each with expertise and skills to contribute to a project. Kersh and Masztal note that university educators must act as “inquirers rather than as experts leading the reform” (1998, Component 4: The University section, para. 1). They also point out that teachers are generally not trained to be leaders, so sometimes they are not comfortable with taking leadership roles or resisting another participant who is too comfortable with doing so. Therefore, negotiating an equal relationship between collaborators can sometimes be challenging and must be deliberately maintained.

**Genuine personal commitment from all parties.** All members of the collaborative team must want to participate. Borthwick et al. (2003) warn schools about the potential negative impact of mandating partnerships, rather than keeping
them voluntary, because doing so can create “a climate of distrust or even fear, particularly on the part of teachers” (p. 358).

Administrative support. The necessity for administrative support from both school and university administrators is a recurring theme in the literature. For example, in response to a 2002 nationwide survey that showed that 66% of respondents had supportive principals, Islam and Murno (2006) conducted their own study on SLMS-administrator relationships and found that a majority of respondents felt a noticeable lack of administrative support for their work as SLMSs. Nonetheless, administrative support is imperative if participants are to acquire the resources they need to achieve their goals. Some of the most successful collaborations involve administrators as active participants. Kersh and Masztal argue that “For any sustained partnership, the principal must continuously, vigorously, and openly support the partnership” (Component 3: The School section, para. 3).

Evaluation. F. Harris (2003) notes that standards are only as meaningful as their implementation, and Hess (2008) echoes this sentiment. Hess argues that the development of standards is not enough to manifest change; what really matters is how those standards are implemented by teachers, schools and colleges. While collaboration is an excellent opportunity to explore effective and innovation instructional strategies, it must be paired with evaluation. Kersh and Masztal (1998) observe that few studies focus on collaborations and their failings, noting that it is in the universities’ and schools’ best interest to “put the best face possible on the project” (Learning from Collaboration section, para. 1) in order to maintain justification for funding and time spent. Furthermore, participants benefit from collaboration and provide valuable data for other educators.

Communication. As in any relationship, communication is seen as a key component of any successful collaboration, whether in consortia (Borek, Richardson, & Lewis, 2008), P-16 initiatives (Chamberlin, 2008) or K-12 – university partnerships (Kersh & Masztal, 1998). Members must communicate with one another about progress toward the collaborative goal and feel empowered to communicate concerns and ideas about the project. In some collaborations, there is a real or perceived resentment on the part of teachers toward an external partner (Borthwick et al., 2003), and communication is essential to dealing with these emotions before they interfere with the project.
Advantages and Disadvantages of SLMS-Academic Librarian Collaborations

Potential Disadvantages

Lonsdale and Armstrong (2006) found that the university librarians in their study looked very favorably on collaboration, while others have noted the potential disadvantages, particularly for university librarians (e.g., Evans, 1997). For example, the time-consuming nature of collaboration can be seen as a reason not to collaborate (Hull & Taylor, 2003), or a school-academic library collaboration in which high school students are given access to the academic library can lead to serious demands on the academic library’s resources, to the detriment of other patrons.

Other concerns stem from some of the very qualities that make collaborations effective. Over the course of collaboration, for example, participants become a learning community who know one another well. This can make collaborations more pleasurable and interesting and increase a sense of trust between participants. However, too often, once formed, a collaboration becomes dependent on the individuals involved, so projects are delayed or collaborations are dissolved when individuals leave their positions (Nichols, 1999; Nichols et al., 2005), leading to wasted effort and resources, and frustration and disappointment among the other participants. In a collaborative effort between an academic librarian and a school, if one of the librarians leaves for a different school, or the administrator who supported the project is promoted to a different position, the project could be jeopardized.

Advantages of SLMS-Academic Collaboration

Despite these potential negative sides of collaboration, however, there are also significant advantages for SLMSs and academic librarians. Both SLMSs and academic librarians stand to gain useful insight into their own teaching practices through collaboration. Cahoy (2002) points out that “Learning about the needs of students in grades above or below your focus can help highlight the skills most needed by your students” (p. 15).

Benefits to SLMSs: Collaboration with academic librarians offers a number of advantages to school librarians, such as opportunities for professional development. In Evans’ (1997) study of the Brooklyn College project, for example, school teachers and librarians were not up-to-date on current research materials, since current research is not emphasized in school settings. The project provided an opportunity for teachers and librarians to gain valuable research skills that they could share with their students. Collaborations with academic libraries
also provide school librarians access to additional resources, since academic libraries have much larger collections than school libraries (Borthwick et al., 2003). As previously noted, since teachers usually do not receive specific training as leaders, collaborations provide opportunities for SLMSs to develop and become aware of their leadership skills (Kersh & Masztal, 1998). Furthermore, Nichols, Spang, and Padron (1999) found that K-12 collaborative participants felt that having university partners lent more “credibility” to their projects, as did the involvement of administration.

Benefits to academic librarians. Although largely unreported in the past (Borthwick et al., 2003), collaboration with school librarians has many benefits for academic librarians. First of all, collaborative projects generate opportunities for research and publishing, as noted in Harada (2005) and Kersh (1998). More importantly, these types of projects keep academic librarians informed about information literacy instruction that is taking place in lower grades (Hull & Taylor, 2003), which will help them understand better how to assess and meet the needs of their own students. Increasing secondary students’ exposure to academic libraries will help to ease the transition between high school and college. Teachers can contribute to university instruction as well by contributing their firsthand knowledge of education and providing “opportunities for the university partner to be reminded of the world that teachers face daily” (Kersh & Masztal, 1998, Component 2: The Nature of Partnerships section, para. 7). W. Harris, Cobb, Pooler, and Perry (2008) make the significant comment that educators in P-12 schools have considerably more experience with “standards, assessment, and the politics of accountability” (p. 496).

Implications for Future Collaboration

School and academic librarians have a responsibility to the students they serve to help educate them in information literacy. Librarianship as a profession is changing, but this should be a time of excitement about the future. Through collaboration with academic librarians, school librarians can expand their resources and expertise. They can gain insight from another professional who has an idea of the skills students will need in grades 13 to 16, where the school librarian’s expertise fades. It is an ideal opportunity for collaboration, where each partner’s expertise complements the other. School and academic librarians share expertise on the same subject but from different perspectives. Only by embracing new perspectives can school librarians challenge themselves to develop innovative ways of educating their students. Hess (2008) warns against merely “appending” reforms such as collaboration and viewing them as the “outer limits of potential changes” (p. 512). Collaboration is an exceptional opportunity to
develop expertise and expand support for our students, as long as librarians are deliberate and informed about the process.

References


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Information Literacy Instruction for Upper-Year Undergraduate Students: A Stratified Course-Integrated Approach

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Information Literacy Instruction for Upper-Year Undergraduate Students: A Stratified Course-Integrated Approach

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Information Literacy Instruction for Upper-Year Undergraduate Students:  
A Stratified Course-Integrated Approach

In our current information economy, it is critical to develop information literacy (IL) skills for success as students, as professionals, and in everyday life, in order to navigate the world as informed citizens. Library and information science (LIS) literature over the last century features much lively discussion about IL instruction: what form should it take, and who should be responsible for the instruction? Gunselmann and Blakesley (2012) provide an excellent summary of seminal articles that have explored these questions; however, there are no definitive conclusions and the debate persists. The only consensus reached is that IL is an essential skill. The ability to plan and develop IL instruction lessons and programs is, therefore, a crucial skill for librarians to possess, regardless of the information environment in which they practice. IL instruction is particularly germane to the work of academic librarians, who are tasked with helping undergraduate and graduate students develop critical information literacy skills.

Students face a number of potential barriers to learning when they are initially introduced to the research process at the undergraduate level. One of these barriers is indirectly caused by the disconnect between faculty members and undergraduates, who reside at opposite ends of the educational spectrum. Faculty members might assign the task of completing a research paper to first-year students without initially consulting librarians about the most effective way of integrating this type of assignment into the curriculum, and without giving consideration to students’ ability to successfully identify and research a topic. To address this problem, Leckie (1996) suggests restructuring the traditional research paper assignment that is often assigned to first-year undergraduates. She proposes a six-step stratification process in which faculty members guide their students through the research process by developing multiple assignments and by placing these assignments within a particular disciplinary context.

This article will describe Leckie’s stratified course-integrated model of providing IL instruction. It is proposed that the use of Leckie’s model as an IL instruction framework be examined for potential application beyond its suggested use with first-year undergraduate classes. Instead, it may be consistently applied in classes across the span of an undergraduate education, with a particular emphasis on upper-year undergraduate classes, in order to maximize student learning and to help students meet the competency standards as codified in the Information Literacy Competency Standards for Higher Education (Association of College and Research Libraries, 2000). The present exploratory research uses findings gleaned from observation and interviews to support the assertion that IL programs may benefit from a stratified course-integrated approach, particularly
for upper-level undergraduates preparing for a thesis or other culminating project in their final year of study.

Literature Review

There is a dearth of studies in the literature that examine course-integrated library instruction conducted specifically within a framework of stratification. This is an area that requires a closer look in order to gain additional insight into effective teaching and curriculum development. As noted in the introduction, it is debated whether IL instruction falls under the purview of faculty members’ or librarians’ work (or both), and is therefore an important area of study in LIS research. Mahaffy (2006) provides an excellent summary of sample assignments that are designed to stimulate critical thinking and reflect the Information Literacy Competency Standards for Higher Education (Association of College and Research Libraries, 2000). Mahaffy makes a brief mention of the importance of making library instruction relevant to the students’ coursework using a stratified system:

Effective assignments, therefore, are woven into the fabric of the course design, simultaneously furthering the student’s information-literacy skills and his [or her] knowledge of the subject matter. The instructor may find this easier to master by designing a series of smaller assignments that students work on throughout the semester rather than relying on one major paper as a final project. (p. 326-327)

Although there is infrequent discussion of stratified course-integrated models of IL instruction specifically, the development of course-integrated IL instruction in undergraduate education continues to be greatly discussed in the scholarly literature. There are two main themes that stand out in academic discourse on this topic: the impact of faculty-librarian collaboration, and the idea of “bridging the gap” between faculty members’ and students’ contrasting approaches to the research process.

Librarian-Faculty Collaboration

Collaboration between librarians and faculty members is essential in order for stratified course-integrated IL instruction to succeed. Much scholarly attention has been paid to the benefits afforded to participation in librarian-faculty collaborative relationships. There is also a great deal of commentary regarding the challenges inherent in developing partnerships between these two groups. As Given and Julien (2005) note, although faculty members and academic librarians are both
engaged in pursuing a similar goal (educating students), there are many differences in the steps they take as they pursue these objectives. These differences can result in conflict between faculty members and librarians.

For example, Given and Julien (2005) undertook a content analysis of messages posted to an active listserv for librarians (BI-L [ILI-L]) to determine librarian attitudes toward librarian-faculty relationships. Although some librarian-writers were generous, many of the comments and attitudes posted by librarians with regard to faculty were negative in tone. In addition, many of the librarian-writers felt that faculty members did not accord librarians enough respect. Given and Julien suggest that librarians should first recognize and acknowledge that faculty members and academic librarians are “masters of their own (separate but related) spheres” (p. 36), and should also respect the faculty members’ position in order to develop improved relationships with faculty.

Of course, it is evident that the reverse is true as well: faculty members should respect the efforts of librarians as the librarians strive to enter into collaborative relationships with faculty. Collaboration cannot succeed unless faculty members are open to devoting class time to the purpose of developing IL skills. However, many faculty members feel the pressure of time constraints and are therefore resistant to taking time away from the course content in an effort to devote class time to this purpose (Feldman & Sciammarella, 2000). Leckie and Fullerton’s (1999) interviews with science and engineering faculty revealed faculty perceptions that the disciplinary knowledge those faculty cover in a semester is so extensive that there is little room on the syllabus for lessons involving “frills” (p. 22) such as IL instruction. Instead of aggressively foisting IL instruction on faculty members who are already feeling pressured, librarians should instead approach discussions with faculty by articulating how IL instruction and librarian involvement in classes will yield greater benefits for both faculty and students.

The collaborative relationship between teaching faculty and librarians may also be affected by a perceived power imbalance between the two groups. Julien and Pecoskie (2009) interviewed 56 librarians and paraprofessionals with instructional responsibilities in academic and public libraries and discovered a common pattern of “deference discourse” (p. 151) in the discussion of participants’ relationships to teaching faculty. A power imbalance, either real or perceived, can increase the challenge of improving IL instruction programs since, rather than maintaining a focus on students, librarians are distracted by navigating their relationships with faculty members.

Collaboration should be entered into cooperatively. Farber (1999) describes the ideal cooperative relationship between librarians and teachers as “mutually reinforcing” (p. 233). In cooperative relationships, the aim is that the teacher’s objective to help students gain a comprehensive understanding of a
subject and the librarian’s objective to help students find and evaluate information are both met. Simmons (2005) also recommends a cooperative approach in which both the librarian and the faculty member work together. Simmons notes that this collaboration is intended to lead the students into a discourse community in which the student is able to gain an understanding of the breadth of disciplinary research from the librarian. At the same time, the student is able to grasp the depth of the specific practices of a discipline from the faculty member.

Beyond the issues relating to faculty-librarian attitudes are larger, systemic concerns. Even if faculty and librarians actively seek to collaborate and create an IL-based partnership, there may be difficulties in implementing programs. One way of increasing collaborative opportunities is by developing what Stowe (2011) terms “curriculum-integrated library instruction” (p. 84). This type of instruction involves a continuum of instruction for students. The instruction develops over the course of a four-year university degree with increasing complexity as the students progress through their courses. The goal is to design and establish a program that is “both immediately relevant and progressively challenging in building a foundation for students in critical thinking and lifelong learning” (p. 82).

In 2010, the Brooklyn Campus of Long Island University added library instruction as a component of two classes in their English department, with the aim of gradually integrating IL instruction across a full range of required English composition courses. This program was developed through a partnership between the library and the English department, but faced a number of challenges due to budgetary restrictions and personnel issues caused by a library hiring freeze (Stowe, 2011). These restrictions may become more commonplace given the current economic climate. However, preliminary feedback from all participants—librarians, faculty members, and students—appears positive and the program was being incorporated into additional classes over the 2011-2012 academic year for continued assessment.

A more recent example of successful IL instruction program focusing on faculty-librarian collaboration is the Coates Library of Trinity University. Oakleaf, Millet, and Kraus (2011) performed a case study of the Coates Library IL program, in which an emphasis on improving campus engagement in IL instruction started almost a decade ago has subsequently resulted in a significant increase in course-integrated library instruction. One consequence of this increased instruction was more frequent communication between faculty and librarians as well as an increase in faculty viewing “librarians as educational partners” (p. 834). A similar collaborative approach was undertaken at The College of New Jersey, in which the chemistry faculty and chemistry librarian shared knowledge, experiences, and goals for student learning in the creation of the Chemistry Seminar Program, an IL instruction program consisting of two one-
hour seminars for freshman, sophomore, and junior chemistry undergraduates (Tucci, 2011). Tucci notes that “traditional boundaries that limited the interactions of the subject librarian and the faculty were disregarded and the librarian became a valued partner with faculty” (p. 303). Therefore, one solution to difficulties experienced in faculty-librarian relationships may be to increase the frequency of contact between these two groups by creating opportunities for increased collaboration on projects with specific goals.

**Bridging the Gap from Novice to Expert**

The second theme to be considered is the existence of a chasm separating the faculty member as “expert researcher” from the student as “novice researcher” (Leckie, 1996, p. 202). Leckie suggests that faculty members are independent researchers who have developed their own personal information-seeking strategies, and who have achieved their status through a process of acculturation, extensive knowledge of their discipline, awareness of important names in the field, participation in informal scholarly discourse, a view of research as a process in which the journey is intuitive rather than entirely straightforward, and a bit of luck. This model depicts a series of characteristics that are quite different from those possessed by the average undergraduate student.

The student model, as proposed by Leckie (1996), paints the undergraduate as an untrained, relatively blank slate. The student has not conducted enough research to have developed a personal information-seeking strategy, possesses very little disciplinary knowledge, is unaware of important names in the field, is not part of a scholarly network, and views research as a “fuzzy library-based activity” (p. 203) (or likely Internet-based, now) that is required for homework completion. Simmons (2005) notes that the undergraduate student is poised to learn the specific discourse of the discipline they choose to study (i.e., beyond the general academic discourse applicable to all disciplines). Because the faculty member is so immersed in the scholarship of the discipline, the academic librarian is therefore instrumental in providing this type of instruction.

Not only is there the problem of a chasm between faculty and student understanding of the research process, but many faculty members are unaware of precisely the size of the gap between the two sides. Kolowich (2011) notes that professors may overestimate the research skills of their students and may not require students to confer with librarians before embarking on a research project. In an exploratory study of interview transcripts of faculty members and subject librarians from the disciplines of sociology and civil engineering, McGuinness (2006) found evidence of a tacit assumption among faculty that students will naturally yet haphazardly develop IL skills and that IL instruction does not need
to be explicitly stated as part of the curriculum. The development of IL skills was not seen as a priority; rather, the acquisition of these skills was considered a natural, intuitive process that occurs as the student progresses through an undergraduate program. Leckie and Fullerton’s (1999) interviews with science and engineering faculty revealed that a very large number of faculty admit having “a poor understanding of how students learn to do library-based research” (p. 14), with the most common thinking that “students somehow learned to do this on their own” (p. 15). Another common faculty perception was that undergraduates who had not learned to successfully conduct library-based research by their upper years were “unmotivated, uninterested, or just poor students” (Leckie and Fullerton, 1999, p. 15). More recently, Raven (2012) discovered a considerable gulf between student and faculty research expectations in a survey of first-year undergraduates and their instructors, and, most strikingly, found that very few of the survey participants believed that librarians should be “responsible for first-year students learning how to do research” (p. 9). Instead, students were evenly divided between believing either instructors or students themselves should be responsible for developing this skill, whereas 80% of instructors felt that students were solely responsible for their developing their research abilities.

The chasm between the faculty and student mental models demonstrates the clear importance of conducting research that examines and assesses IL instruction from the student perspective. Such research may provide insight into the best methods of integrating IL instruction into the curriculum. Head (2008) compiled data from focus groups and a student survey about the ways students conceptualize and operationalize academic research. The population used for the study consisted of upper-division undergraduate students majoring in humanities and social sciences. This population was specifically selected because it was assumed that upper-year students would have more experience with the secondary research process than would first- or second-year students.

Interestingly, the results from the discussions and surveys indicate that upper-division undergraduate students experience difficulty in “limiting the scope of a research topic and dealing with the inevitable information overload that accompanies new forms of digital media” (Head, 2008, p. 433). In addition, Head found that students generally initiate the research process by accessing “nearby and convenient resources” (p. 434) such as a textbook or other assigned class readings. These third- and fourth-year students experienced many of the same challenges and emotional responses faced by first-year students when asked about their research process. Many of the students experienced feelings of being overwhelmed by information overload and an inability to narrow down a topic and make it manageable.

Head (2008) also examined the handouts provided by faculty members that listed assignment requirements. The content analysis she performed based on
the information included on these handouts gleaned some findings that correlate with the model of faculty member as “expert researcher.” The handouts offered little direction about how to plot a research course, how to craft a high quality paper, or how to prepare a paper that adheres to a specific grading rubric. Correspondingly, the surveyed students responded that a lack of information from instructors was their biggest challenge in beginning an assignment. This study’s results are clearly indicative of the importance of continuing to provide research support to students even as they progress through their final year of their undergraduate education. This is an area in which faculty-librarian collaboration in cooperatively developing long-term IL instruction may be instrumental.

The difference between the research process of scholars and that of undergraduate students, and ideas for leading the students to develop the skills necessary for bridging this gap, has also been studied by Bodi (2002). Bodi notes that a research paper is an excellent tool that allows students to “exercise the qualities of analysis, synthesis, and evaluation” (p. 111). Bodi proposes a research model that embraces flexibility, yet maintains three key components: find a research topic, understand the difference between searching techniques (e.g., keywords vs. controlled vocabulary), and evaluate the quality of sources. She claims that librarians tend to invoke procedural, linear, step-by-step instruction, but that because the research process itself is interactive and circular, the traditional mode of instruction is not appropriate. Her claims seem strongly worded, particularly since she does not provide any sources as evidence; however, Bodi does temper the statement by noting the importance of collaboration between faculty, librarians, and students to improve student research papers.

The practice of integrating library instruction into the curriculum has also yielded positive results with second-year medical students. Minchow, Pudlock, Lucas, and Clancy (1993) found that incorporating information management skills into the curriculum within the context of problem-based learning resulted in increased learning for students: “Formal library instruction was not in itself sufficient to provide the information skills for their needs. Integration of information-seeking skills into the curriculum in a directed sequence of assignments reinforced the applicability of these skills” (p. 11). In this case, the class was coordinated by the collaborative efforts of both faculty and librarians in order to improve student research skills.

IL instruction is also an integral part of the curriculum at Trinity University, where both faculty and librarians assess students’ IL skills collaboratively, using a rubric model (Oakleaf, Millet, & Kraus, 2011). The IL rubric was developed cooperatively by librarians, faculty, staff, and administrators through a series of workshops and is being integrated into campus-wide teaching and assessment activities. The rubric is intended to be used for a number of
purposes, including as a tool “to track student learning across time and multiple programs on a campus level” (p. 836).

The studies discussed thus far illustrate the clear need for increased collaboration between faculty members and librarians. These examples also exemplify the vital role that librarians play in helping to bridge the gap in understanding between faculty members and students with regard to their differing approaches to research. These two recurring issues may be addressed within the context of workshops, courses, and programs that are designed and implemented collaboratively by faculty and librarians using a student-centered approach. One possible approach is to use a stratified course-integrated model as a pedagogical framework for developing IL instruction.

The Stratified Course-Integrated Approach

The stratified course-integrated approach integrates information-seeking and evaluative skills into the course content. The research paper process is thereby altered so that all students work on a specific component of an assignment at the same time, preferably for a portion of the term paper grade (Leckie, 1996). The objective of using this approach is to “reveal and deal explicitly with the expert researcher assumptions lurking at each stage of the term paper process” (p. 206). Leckie suggests that there is a wide gap between a faculty member’s expectations of the undergraduate student and the student’s actual ability to complete the assignment. This division is due to the faculty member’s status as an expert researcher in comparison to the student’s status as novice researcher. Leckie notes that there is, therefore, a disconnect that ultimately results in frustration on the part of the student, who experiences undue difficulty in completing the assignment, and on the part of the faculty member, who must read through a large pile of poorly-researched and potentially poorly-written student papers.

In addition to the concerns facing the knowledge divide between faculty members and students, the traditional research assignment also creates additional work for the academic librarian, who must work with the students to accomplish the goals that have been predetermined by the faculty member, often without consulting with librarians (Leckie, 1996). If the stratified methodology is used, there is a greater emphasis on collaboration between faculty and librarians. Rather than solely serving as a resource for students, the academic librarian is considered a “bibliographic instruction mentor” (p. 207) to faculty members. In this sense, then, the librarian’s role is to support, assist, and encourage the faculty member with respect to integrating IL instruction into a course. Leckie proposes that the responsibility for introductory bibliographic instruction be shifted to the faculty member, who is able to place the instruction firmly within the context of the discipline. The librarian, then, is no longer considered the sole provider of library-
based research skills. Therefore, unlike bibliographic instruction in which skills might be presented in an abstract sense, the instruction provided by the faculty member would be highly relevant to the class and would enhance the curriculum content.

Leckie’s (1996) model includes six stages of stratification, as follows:

- Narrow the topic;
- Understand and use the popular literature;
- Demystify scholarly research;
- Find and use the scholarly literature;
- Understand legitimate shortcuts; and
- Develop a strategy for the completion of the research paper.

Leckie describes the process of progressing through these stages as a combination of completing short written assignments, receiving feedback, and participating in follow-up discussions during class. It is hoped that students will gradually hone their research topic and findings as they learn more about the research process from this type of feedback-rich instruction. The entirety of the body of work developed through this progression is then assembled and repackaged as a high quality culminating research paper.

**Meeting Competency Standards with a Stratified Approach**

Leckie’s (1996) six-stage stratification model’s value as a framework for organizing IL instruction is made clear when it is examined alongside the Association of College and Research Libraries’ (ACRL) set of broad standards, observable performance indicators, and specific outcomes for assessing an individual’s IL competence. These IL competency standards are frequently used as a guide in assessing students’ IL skills. The Appendix contains a presentation of how the six stages of stratification and five ACRL standards may be combined.

The competency standards developed by the ACRL (2000) provide an excellent tool for instructors to use when assessing the IL levels of individual students. These standards were developed out of an effort to pay heed to one of the key missions of higher education institutions: to develop lifelong learners. The need for a set of standards resulted in part from the plethora of new information technologies and online information sources in the digital age, as well as the increasing complexity of the information environment (Head, 2008).

IL competency assessment may be conducted by measuring students’ abilities and matching these abilities to the specific performance indicators. In order to ease the educator’s task in designing and developing a curriculum based on these standards, the Standards Toolkit (American Library Association, 2011) provides a set of tools through a web site developed for this purpose. These tools include an introduction to each of the standards as well as practical examples of
the performance indicators and outcomes. In addition, the website includes instructions for using and adapting the standards for use with different learning objectives.

In order to assess the potential application of stratification in course-integration IL instruction, an undergraduate course-integrated workshop that demonstrates use of a stratified course-integrated teaching approach was observed. Considerations were given to how the workshop handles issues relating to faculty-librarian collaboration and to bridging the knowledge gap between faculty members and students.

Methodology

Qualitative research methods were used for data collection and analysis. Research activities included non-participant observation of a single IL instruction workshop, and pre- and post-workshop interviews with the workshop instructor, “Anna” (all participants are given pseudonyms and all quotations are transcribed verbatim), an Instruction and Reference Librarian. The interviews were conducted to gather information about the workshop’s context and to explore librarian perspectives on IL instruction, faculty collaboration, and student learning.

The observed instruction session is part of a course for third-year Materials Science and Engineering (MSE) students at a large urban university. This specific workshop was selected because it serves as an example of the type of feedback-rich environment that is a core element of the stratified course-integrated model. The course in its entirety is not included in this article’s analysis; rather, this article focuses on providing a detailed analysis of the single observed workshop, with specific examples noted in support of the two main themes discussed in the literature review: the impact of faculty-librarian collaboration and the librarian’s challenge of bridging the gap between faculty and student understanding of (and ability to participate in) the research process. This observation is, therefore, intended to serve as an introductory exploration of potential uses of a stratified approach rather than an assessment of the stratified course-integrated model in practice.

The MSE course is held over a single semester and is required for all students in their sixth semester of the undergraduate program. Students attend one hour of lectures and one hour of tutorial per week, in addition to library workshops. The coursework consists chiefly of planning and delivering a research proposal. Student course objectives are to gain in-depth knowledge of a specific area of work within the broader MSE discipline; to read technical materials that will allow students to advance in the discipline; to organize, write and present about the ideas of the discipline using university-level sophistication and clarity; and, to present clear, well-organized technical presentations. The main focus of
the class, therefore, is to help students develop a solid foundation of research skills as well as an appropriate level of understanding of scholarly discourse to enhance their writing skills. The work they complete in this class prepares the students for their fourth-year culminating assignment in which they will conceive, design, and carry out an original research project.

Attendance at the observed workshop is required for successful completion of the MSE course. Participation is ensured because a small percentage of the students’ grade on the research assignment is reserved for two short exercises that are completed and submitted to Anna during the workshop. Prior to the session, students had already submitted a draft proposal for researching a specific topic. The purpose of the library workshop was to teach the students how to begin the process of researching their topic. In the week following the workshop, the students were required to submit a revised research proposal based on their preliminary searches. The students’ completed workshop exercises were to be delivered with comments from Anna to the faculty member so that students’ progress on their research assignments could be assessed and feedback provided before they moved on to the next stage of their work.

The observed instruction session was held in the instruction lab of a Sciences and Health Sciences library. In addition to Anna, there were 28 students and two teaching assistants in attendance; the faculty member was not present. One of the teaching assistants sat at the back of the class and the other sat at one of the computers in the middle of the instruction lab. The workshop was 50 minutes in duration. There were 24 computer stations in the lab, so some students shared computers while others worked individually. The instruction session was observed without the author’s participation, although the author’s presence was known and obvious. Observations were recorded in a non-structured way (i.e., no specific rubric was adhered to as a guide). Interviews took place both in person at Anna’s workplace and through e-mail communication. The in-person interviews were unstructured; follow-up questions were posed via e-mail.

The observation and both interviews were held between September and October 2011. Because this article centers on both librarian-faculty and librarian-student relationships, interview questions focused on the librarian’s interactions and collaborations with both faculty and students.

Findings and Analysis

Instruction Session: Organizational Structure

The instruction session was timed so that the students had already formulated a potential research topic but had not yet begun searching for relevant articles in the
literature. Thus, the students were in Stage 1 of Leckie’s (1996) model ("narrow the topic").

Anna articulated four goals for the instruction session. At the end of the session, students would have learned how to:

- understand the difference between primary and review articles and be able to recognize and differentiate them using citations and/or full text;
- be able to construct simple searches for known items in Scopus and Compendex databases;
- be able to construct a search using the Compendex database to find review articles specifically; and
- be able to construct a simple Boolean topic search using the Compendex database.

Thus, the information covered during the session briefly touched on all six of Leckie’s (1996) stages of stratification: narrowing a topic; understanding and using popular literature; explaining scholarly research; finding and using scholarly articles; understanding legitimate shortcuts; and developing a research strategy. The workshop was presented in three separate segments. Each segment was roughly fifteen to twenty minutes in length and concluded with an exercise completed either in a group or individually.

**Part I: Definitions (group exercise).** Anna began the instruction session by asking the students if they were familiar with terminology such as primary literature, secondary literature, review article, and peer-reviewed article. She asked questions about each term, called on volunteers, and engaged the students in order to assess their prior knowledge and maintain interest. For the group exercise, the students were randomly divided into groups based on their seating arrangements and each group was given a sample article. The students were required to determine whether the article was an example of a primary or secondary review article and had to be prepared to explain how they reached that decision. Anna let the students work in groups for about five minutes and then a spokesperson from each group reported their answers. Again, a great deal of comments and positive feedback was given to the students as they provided answers.

This section of the workshop focuses on the students’ ability to demonstrate ACRL Standard One: “The information literate student determines the nature and extent of the information needed.”

**Part II: Peer-reviewed articles (individual exercise).** The next stage of the workshop was devoted to learning how to determine if a particular journal is peer-reviewed by looking up the journal name using *Ulrich’s Periodicals Directory*. Anna demonstrated the steps by projecting her computer to the
overhead screen and explaining the process as she completed a sample search. She pointed at relevant sections on the overhead screen as she spoke and then asked the students to complete an exercise individually.

This written exercise required the students to log on to the *Scopus* database, search for one of the five articles listed in a handout, determine whether the article was a review article or primary article, and explain why they reached the answer they did. The students were given five or six minutes to complete the exercise without consulting one another. Anna walked around the room, checked in with each student at least once, and answered questions that were posed to her. This exercise was the first document to be submitted to Anna for delivery to the faculty member.

The completion of this written exercise helps the students achieve the competency outlined in ACRL Standard Two: “The information literate student accesses needed information effectively and efficiently.”

**Part III: Developing a search strategy (individual exercise).** This part of the workshop was spent discussing how to search for articles using the *Compendex* database. This section incorporated lecture, presentation slides, and live computer demonstration projected to the overhead screen. Anna’s discussion included the importance of developing a high quality search strategy by breaking a topic into three separate concepts, and by including keywords, synonyms, wildcards, and Boolean operators in searches.

The students then completed a written exercise over the final ten minutes of the workshop. This exercise required students to apply the search techniques that had been taught in this final section of the workshop. First, students were to take a sample topic and break it into three distinct concepts. Next, the students were instructed to use synonyms, wildcards, and Boolean operators to create three potential search strings, and to test those search strings using the *Compendex* database. This written exercise was the second document to be submitted to Anna for delivery to the faculty member.

The completion of this written exercise helps the students achieve the competency outlined in ACRL Standard Two: “The information literate student accesses needed information effectively and efficiently.”

Because this workshop was aimed at assisting students during the initial stages of work on their research project, only the first two ACRL standards are pertinent. The instruction session briefly touched on all six of Leckie’s stages of stratification, but each stage was covered minimally, as it would have been impossible to give in-depth coverage to each stage during a 50-minute instruction session.
Cooperative Collaboration

Interviews with Anna revealed evidence of cooperative collaboration. She prepared for the session by consulting with the faculty member who teaches the MSE course. She has worked with this particular faculty member on this specific class for the past two years and has worked with the faculty member on other classes as well, so they have a history of collaboration. This fits the model of cooperative collaboration espoused thus far as the ideal environment in which to successfully implement IL instruction.

Another example of collaboration that was observed during the session involved an incident wherein a student asked a question about the difference between review articles and primary articles. Anna attempted to answer the question, but after a couple of minutes of continued questioning and explanation, the student did not seem to be gaining any clarity from the discussion. At that point, “Noah,” the teaching assistant sitting in the center of the class, interjected in order to provide examples from the literature that illustrate the differences. The student appeared to finally grasp the difference between the two types of literature and Anna was able to move on with the lesson. At the conclusion of the workshop, Noah approached the student and repeated the detailed explanation. He ensured that the student genuinely understood the difference between review articles and primary articles. Anna had a quick conversation with Noah to thank him for helping the student. The input from the teaching assistant during the workshop was not interpreted as an interruption or as Noah undermining Anna’s authority. Rather, his assistance was welcomed because it allowed the session to proceed without Anna having to spend an undue amount of time resolving a single student’s difficulty comprehending the material.

Bridging the Gap

Anna has taught the MSE workshop for a number of years and is constantly revising and refining her teaching plan in order to meet not only the faculty member’s needs, but also those of the students. This student-centered approach of developing an instruction session corresponds with what has been noted in the literature about librarians who base the quality of their instruction on the success of their students. During the post-workshop interview, Anna noted that many of the students appeared to have blank looks on their faces during the Boolean searching segment. She speculated that terminology may have been unfamiliar or, perhaps, forgotten by students who may have covered Boolean concepts in first-year IL instruction sessions. She planned to revise this portion of the workshop for future presentations.
The purpose of the workshop was to provide students with introductory research skills. Students could use the information gleaned from the instruction session to begin researching their selected topic using library resources. The session, therefore, helped the students develop the competencies described in the ACRL standards, primarily Standards 1 (“determine the nature and extent of the information needed”) and 2 (“access needed information effectively and efficiently”). Intrinsic motivational strategies were employed since the learning interaction coincided with an immediate need. The step of completing and submitting the written exercises at the workshop would be instructive and allow both the librarian and the faculty member to determine which students were on the right track to understanding the course material. In addition, these activities helped the students to assess their own level of competency. Finally, participation in this workshop placed the students in an environment where they had access to a resource able to assist them in refining their topic and in improving their search strategies as they developed their research proposals.

Challenges in Implementing the Stratified Course-Integrated Approach

Adopting a stratified course-integrated approach to library instruction may be beset with a certain set of challenges. Leckie (1996) and Leckie and Fullerton (1999) note four major issues related to this type of instruction: the increased workload and effort associated with marking additional assignments and providing extra feedback to each student; the need to devote further class time to IL instruction which may involve decreased time spent on covering curricular content; the challenges inherent in implementing this type of instruction with large class sizes; and the possibility that effective IL instruction is time- and discipline-specific.

With regards to the first point—increased marking and feedback—the benefits from receiving increased feedback may rectify the problem of students feeling confused and overwhelmed by the research process. As noted in the Literature Review, students cannot learn the discourse of a discipline and the process of conducting and writing about research unless they are explicitly taught how to participate in this type of scholarship through faculty or librarian intervention. Therefore, additional marking should not be viewed as a negative component of instruction, but rather a way for experts in the field to share knowledge with the novices who, with training, will become the next generation of experts.

The second challenge relates to increasing the amount of course-integrated IL instruction at the expense of covering course content. The maxim “Give a man a fish and you feed him for a day; teach a man to fish and you feed him for a lifetime” is applicable. Faculty should not simply aim to deliver information to
students. Instead, faculty should be teaching students how to participate in the
discourse of the students’ chosen discipline and how to read and evaluate the
literature on a given subject. This is where faculty-librarian collaboration is
essential, as the academic librarian is well-versed in providing this type of
instruction. As Leckie (1996) notes, “I would much rather look at 40 research
papers that were relatively well done than 40 that were awful, so I would consider
the time spent on research skills as a good investment from a pedagogical point of
view” (p. 206).

The third issue is that it can be difficult to coordinate this type of
instruction for large class sizes. The benefit of providing this type of instruction to
upper-year undergraduate classes is that class size is generally smaller than in
first- or second-year classes. Thus, implementation strategies requiring additional
support from teaching assistants or other librarians would likely be unnecessary.

A fourth issue is suggested by research demonstrating that different types
of IL instruction may be required for different disciplines and that librarians
should take a flexible pedagogical approach. For example, survey and interview
research conducted by Leckie and Fullerton (1999) found the highest levels of
support for first-year course-integrated instruction by arts and social sciences
faculty, whereas faculty in the sciences and engineering are more supportive of
the course-integrated approach for upper-level courses. Therefore, it may be
beneficial to complete a deeper exploration of faculty attitudes and discipline-
specific IL instruction initiatives in order to determine the most appropriate and
effective application of the stratified course-integrated model in the undergraduate
setting.

Conclusion

Many undergraduate students are unfamiliar with the process of researching a
topic effectively, yet they are frequently assigned the task of writing a research
paper without being given the necessary preliminary instruction. An introduction
to the research process is necessary for students to successfully complete these
assignments. This type of instruction may be most effective in a stratified, course-
integrated format in an effort to maintain relevancy for students and to meet these
students at their point of need. In addition, this type of instruction may be the
most effective preparation for succeeding in future complex academic pursuits,
such as theses, culminating projects, and graduate-level work. It is readily
apparent that the original research in this article is extremely limited in scope.
However, this initial exploration into IL instruction models considered in tandem
with the literature review suggests the merits of a deeper look at potential
applications of the stratified course-integrated model at the upper-year
undergraduate level. In order for students to achieve success in research
assignments, faculty-librarian collaboration is key, and faculty members should provide instruction that helps novice researchers develop knowledge of the discourse of their chosen discipline.

The inclusion of stratified course-integrated instruction in upper-division courses may be an excellent opportunity for librarians and faculty members to engage in cooperative IL instruction. In addition, this can be a valuable way to ensure students remain connected to the idea of the library as a valuable resource. It is essential for students to develop the concept that IL instruction is not merely an introductory “How to use the library” workshop undertaken during their first year of undergraduate study. Rather, IL should be considered a key part of lifelong learning for all individuals. Educational institutions increasingly prioritize the value of IL instruction in an undergraduate education, and, as was noted in this article, LIS research includes a number of recent examples of large-scale IL programs being implemented at the undergraduate level.

Further research in this area could focus on applying stratified course-integrated instruction to upper-year undergraduate classes in various disciplines to determine the impact of this type of IL instruction on student success and which disciplines are better suited to this type of instruction. It would also be helpful to conduct survey research to determine student interest in this type of instruction and to determine how best to implement course-integrated IL instruction in the curriculum to maintain a student-centered focus. As IL instruction becomes further ingrained in the undergraduate curriculum, the integration of these skills within the context of assignments and other coursework is likely. It is, therefore, essential for faculty members and academic librarians to embrace a culture of cooperative collaboration in order to further advance the development of undergraduate research skills. This is vital not only for the purposes of applying these skills toward undergraduate theses or other culminating experiences, but to develop a pattern of lifelong learning on the part of these future scholars and practitioners.
References


## Appendix

The Stratified Course-Integrated Model of Information Literacy Instruction and Corresponding ACRL Standards

<table>
<thead>
<tr>
<th>Leckie’s (1996) 6-Stage Model</th>
<th>ACRL IL Competency Standards</th>
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<tbody>
<tr>
<td>1 Narrow the topic</td>
<td>1 Determines the nature and extent of the information needed</td>
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<tr>
<td>2 Understand and use the popular literature</td>
<td>2 Access needed information effectively and efficiently</td>
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<td></td>
<td>3 Evaluate information and its sources critically Incorporates selected information into knowledge base and value system</td>
</tr>
<tr>
<td>3 Demystify scholarly research</td>
<td>3 Evaluate information and its sources critically Incorporate selected information into knowledge base and value system</td>
</tr>
<tr>
<td>4 Find and use the scholarly literature</td>
<td>2 Access needed information effectively and efficiently</td>
</tr>
<tr>
<td></td>
<td>3 Evaluate information and its sources critically Incorporate selected information into knowledge base and value system</td>
</tr>
<tr>
<td>5 Understand legitimate shortcuts</td>
<td>2 Access needed information effectively and efficiently</td>
</tr>
<tr>
<td></td>
<td>5 Understand many of the economic, legal, and social issues surrounding the use of information Access and use information ethically and legally</td>
</tr>
<tr>
<td>6 Develop a strategy for completing a research paper</td>
<td>4 Individually, or as a member of a group, use information effectively to accomplish a specific purpose</td>
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Consider the Source: The Value of Source Code to Digital Preservation Strategies

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INTRODUCTION

When faced with a screen of technical software instructions to a computer (known to programmers as source code), even in a language as common as HyperText Markup Language (HTML), it is not hard to imagine how the average computer user might see the strings of verbs, abbreviations, slashes, and semicolons as little more than technical gibberish, and quickly close the editor. As long as the program or document works as described, of what benefit is peering into its internal structure? Even from a digital preservation standpoint, a similar argument might be raised: As long as file format registries are maintained and digital objects are migrated when necessary, of what benefit is the cryptic source code of millions of projects? This approach, however, does little service to the nature and value of source code, which can be seen as integral to durable software preservation, in terms of both recording modern computing history and as part of a strategy to maintain access to digital objects.

Although the burgeoning digital preservation field has been the source of a great deal of research activity in the past decade—including the formation of the Preservation Metadata: Implementation Strategies (PREMIS)\(^1\) working group and a comprehensive reference model for designing an Open Archival Information System (OAIS)\(^2\)—software preservation is a sub-field that has yet to be thoroughly explored. Matthews, Shaon, Bicarregui, and Jones (2010) suggest that there is a need for further “conceptual analysis,” as well as the development of experience and tools for software preservation. The debate over why and how software should be preserved has several perspectives, often centered around the need to defend against format obsolescence. This article will make a survey of the issue, as well as examine the current approaches to software preservation with a view towards how source code, and the open source community in particular, can assume an important role in the digital preservation field.

DEFINITIONS AND MODELS

Definitions

A definition of “software” can encompass a surprisingly large amount of digital bits. The Institute of Electrical and Electronics Engineers (IEEE) Standard Glossary of Software Engineering Terminology defines a software product as the “complete set of computer programs, procedures, and possibly associated documentation and data designated for delivery to a user” (“Software product,” 1990), while a “software item” is described as “source code, object code, job

\(^1\) PREMIS: http://www.loc.gov/standards/premis/
\(^2\) Reference Model for an OAIS: http://public.ccsds.org/publications/archive/650x0b1.pdf
control code, control data, or a collection of these items” (“Software item,” 1990), or in other words, an identifiable component of a software product. Examples of software can include everything from system software, like an operating system or device driver, to programming software, such as a compiler or debugger, in addition to application software, such as web browsers, word processors, and graphic design programs. The form of software an end user typically encounters is the executable program or, in IEEE's vocabulary, “object program” (“Object program,” 1990). This is compiled from human-readable source code, which is usually written by a programmer in plain text format and often annotated with explanatory comments, so that any programmer who studies the source code can learn more about how the software functions and any particular quirks it might have. Van de Vanter (2002) calls this semantic dimension of source code, including use of white space and choice of names, its “documentary structure” (p. 1).

In digital preservation, software often assumes a secondary role as a tool to view digital objects in a collection (Matthews, McIlwrath, Giaretta, & Conway, 2008). But if a software product produces a research result inaccurately, displays an object incorrectly, or ceases to function altogether, the relevant digital object or result is effectively lost, sometimes without the user even noticing. This can be the result of running an unsupported program in a new operating environment with changed or missing dependencies, or a manufacturer's decision to no longer support a format (Sandborn, 2007, p. 886). Software can also have very complex and dynamic behavior; thus, simple strategies such as preserving a copy of the object program are inadequate. There is a very clear need to preserve not only digital objects, but reliable access to these objects, which means adopting one or more approaches toward software preservation.

Models

In the United Kingdom, important research on the topic has taken place in the past decade, notably by the Software Sustainability Institute³ and the e-Science Department⁴ with a great deal of funding for projects related to digital preservation and curation coming from the Joint Information Systems Committee (JISC), a non-departmental public body that supports higher education and research in Information and Communications Technology. Two related key studies that have emerged recently are Matthews et al. (2008) and Matthews et al. (2010). The first study proposed supplements to a draft of the InSPECT⁵ report and the

³ The Software Sustainability Institute: http://software.ac.uk/
⁴ e-Science Department in the Science and Technologies Facilities Council in Oxford:
   http://www.stfc.ac.uk/e-Science
⁵ Investigating Significant Properties of Electronic Content:
   http://www.significantproperties.org.uk/
latter extends this research to propose an overall framework for software preservation, which includes a performance model, a conceptual model of software components based on the Functional Requirements for Bibliographic Records (FRBR), and an OAIS-based categorization of the significant properties of software.

First, Matthews et al. (2010) outline four major aspects of software preservation: storage, retrieval, reconstruction, and replay (pp. 92–93). The “storage” and “retrieval” dimensions are dependent on the digital preservation strategy of the repository. The authors remain neutral on this subject, but point out that it should at least ensure secure and authentic maintenance of the digital objects, with the inclusion of sufficient metadata for retrieval purposes. “Reconstruction” refers to the ability of a repository to reinstall or rebuild a piece of software from what has been stored, while “replay” refers to how well the software performs in relation to its original behavior.

Performance Model

The performance model relies on a concept of “adequacy,” that is, whether the replay of a software product conforms to certain designated significant properties within an acceptable tolerance (p. 94). These significant properties are based on how the reconstructed software processes and displays data to the user. Matthews et al. (2010) include a flow chart of their performance model to illustrate the relationship between these concepts (see Fig. 1). In this chart, the software source must be processed before the software can perform. Its performance is directly linked to its ability to process input data, leading to performance of the data, which is then viewed by a user. The user interacts with the software, thus changing the performance of its input data.

![Performance model of software and its input data (Matthews et al., 2010, p. 95).](image-url)
**Conceptual Model**

The FRBR-based conceptual model is comprised of four entities that describe a “complete software system”: product, version, variant, and instance. This is parallel to the FRBR entities work, expression, manifestation, and item. As a simple example, LibreOffice 3.6.2 for Mac OS X (PPC) can be broken down as:

- **Product**: LibreOffice
- **Version**: 3.6.2
- **Variant**: Mac OS X (PPC)
- **Instance**: An actual copy of the software system on a particular computer

**Properties Model**

The preservation properties model looks at seven main categories of software features and relates the categories to the nearest OAIS equivalent, which have been placed in parentheses here. These are: functionality (*descriptive information*), software composition (*representation information/preservation description information*), provenance and ownership (*provenance information*), user interaction (*significant properties*), software environment (*representation information*), software architecture (*representation information*), and operating performance (*significant properties*) (pp. 98–100). That the OAIS model falls short of comprehensively defining the significant properties of software, such as user interaction and operating performance, emphasizes its current inadequacy for software preservation.

**APPROACHES TO PRESERVATION**

As a software preservation framework has yet to be agreed upon and established, a number of techniques have been debated. Hong, Crouch, Hettrick, Parkinson, and Shreeve (2010) have discussed seven of these techniques, each of which has its place:

- Technical preservation
- Emulation
- Migration
- Cultivation
- Hibernation
- Deprecation
- Procrastination
Technical Preservation

Technical preservation involves the intention to maintain software and hardware in the same functional state, which usually implies purchasing spare parts when needed. Naturally, this often becomes costlier as time goes on and unusual parts become harder to find. A good example of a facility pursuing technical preservation would be the Computer History Museum in Mountain View, California, which is home to “one of the largest international collections of computing artifacts in the world,” including hardware, software, documents, and ephemera (Computer History Museum, n.d.). Applying Van de Vanter's observation of the documentary structure of source code, software can be seen as a cultural artifact (in addition to being a computing artifact) and source code can be seen as the “intellectual essence” of this artifact (Shustek, 2006, p. 112). Zabolitzky (2002) notes that the source code is the only artifact containing the full information regarding the functioning of a software product, and everything else is “essentially hearsay” (p. 4). He also suggests that the availability of the source code of an operating system makes parts replacement much easier, as the code can be adjusted to allow interfacing with a different piece of hardware. Even if a software product no longer serves any practical purpose, this primary document, in addition to any related documentation or specification, is still of importance to current or future historians studying the evolution of software, and this needs to be taken into consideration by digital curators.

Emulation

It is also possible to emulate aging hardware by writing software that mimics its architecture and processes. For instance, an emulator such as Charon⁶ allows a user to run various Digital Equipment Corporation platforms as virtual machines on modern personal computers, encapsulating a guest operating system within a host operating system. These types of emulators can facilitate migration and viewing of data from an old system to a virtual machine running a legacy operating system and any related software, provided, of course, that it has been preserved well. Emulation has been championed in the digital preservation field since the 1990s, notably by the computer scientist Jeff Rothenberg.⁷ In order to, in turn, preserve emulation software—without creating an endless chain of emulators—Rothenberg proposed that a layer be created between the emulator and the platform, called an Emulation Virtual Machine, which would make the emulator platform-independent for the foreseeable future (Van der Hoeven & Van

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⁶ Charon: http://www.winvms.com/
While in theory this seems like an ideal solution, his design for the concept mostly encountered skepticism. In addition to being extremely difficult to program, Bearman (1999) considers emulation to be disproportional to the needs of an archive when migration would be adequate, because he considers Rothenberg's criticisms of migration (discussed further on) to be ill-founded and without strong evidence.

That is not to say that long-term emulation no longer garners interest. Gladney and Lorie (2005) cite Bearman's criticism and note that, while it has not been refuted, they propose a more technically feasible approach: the Universal Virtual Computer. While an in-depth treatment of this concept is not within the range of this discussion, it is worth noting that Van der Hoeven, Lohman, and Verdegem (2007) have built on Gladney and Lorie's and Rothenberg's ideas to develop an open source modular emulator written in Java called Dioscuri, which consists of a number of flexible, platform-independent components that emulate a simple x86 computer and can transfer data between the real and emulated environment.

**Migration**

Migration, as alluded to above, means transporting information from one type of system or format to another. Hoorens, Rothenberg, Van Orange, Van der Mandele, and Levitt (2007) state that format migration leads to “cumulative corruption and degradation,” as data is forced into each new “Procrustean bed” of a format (p. x). Evocative language aside, while this can be true in poorly planned automated migration scenarios, much like how successive runs through a machine translator can render a sentence into nonsense, software migration does not have to be not quite as random and inevitable. This type of migration involves rewriting and recompiling source code for another operating environment (Hong et al., 2010). The rewrite could range from a small tweak to a complete overhaul of the code in a new programming language. Migration can be greatly facilitated by way of the fourth option for software preservation listed by Hong et al.: cultivation.

**Cultivation**

Cultivation involves opening the software to outside development by sharing the source code. This can mean adopting an open source license, such as the widely

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9 At the time of writing, Dioscuri is only capable of running 16-bit operating systems, like MS-DOS. Development is under way to add 32-bit functionality and support Windows 3.11.

10 The Open Source Initiative provides an extensive list:
   [http://www.opensource.org/licenses/category](http://www.opensource.org/licenses/category)
used General Public License, or simply sharing the code privately with a group of developers. As mentioned earlier, source code has a documentary structure, which makes it a strong candidate for one of the chief semantic bearers when it comes to preserving software (Van de Vanter, 2002). By sharing code, programmers are encouraged to provide meaningful documentation of their work to make it comprehensible to others. A piece of software can then be analyzed by another programmer who can fix bugs or extend its original capabilities.

A compelling case can be made for adopting an open source license. First, a publicly available source code will help future programmers avoid the immense challenges related to reverse-engineering from the object program. Further, in addition to making emulation and software migration more feasible (Zabolitzky, 2002), backwards compatibility is a high priority in the open source community (Rosenthal, 2010, p. 3). When it comes to rendering an obsolete format, the source code of an old renderer is likely to be vastly more useful than the information contained in a format registry (Rosenthal, 2010, p. 5). Rosenthal also notes that, if an open source renderer does not exist, it is unlikely that a format registry is even aware of the format (p. 5). One of the main hurdles in this open source approach, however, is that source code is considered by many companies to be a trade secret, and it can be challenging to convince a software manufacturer that there is any reason to share these secrets with anyone. Alternatively, the Library of Congress suggests that those concerned with exposing their code make an escrow deposit of documentation and source code related to “rendering software, validation tools, and software development kits” with a trusted archive (Library of Congress, 2007), a sort of hibernation.

Hibernation

Hibernation involves placing the entire software product (including documentation and significant properties) into storage, to be re-examined at a later date when it needs to be used. In this case, open source software is at an advantage, because preparation is likely to be already near completion (Hong et al., 2010). Source code itself would again be useful, as future programmers would find it much easier to migrate or emulate the software if the structure is at hand.

Deprecation and Procrastination

The final two approaches—deprecation and procrastination—are not preservation strategies as such and will not be discussed in depth here. In brief, deprecation is a way of noting that a specific software feature or practice will no longer be supported in the future, whereas procrastination means to “do nothing” (Hong et

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11 A field known as software archeology.
al., 2010). Deprecation, at the very least, provides some degree of notice that interested parties should consider ways of adapting to the change.

**FURTHER INFORMATION AND CONCLUSION**

In light of this discussion, there are a number of current projects that contribute to the preservation of source code that are worthy of discussion. Foremost are the many open source software (OSS) repositories, such as SourceForge, Launchpad, and GitHub, which offer numerous preservation-friendly features to developers, such as version control and bug tracking, and can often host both public and private code. In the United Kingdom, the Software Sustainability Institute promotes a number of user-friendly guides on how to make software durable, in addition to their research on software preservation. JISC also funds OSS Watch, an open source software advisory service that provides advice on building an open development community. There are a number of European Union-sponsored projects, including the Open Planets Foundation, which provides practical digital preservation expertise to its members, and the Keeping Emulation Environments Portable (KEEP) Project, which focuses on building a stable foundation for Europe's digital heritage. The IEEE also holds many annual conferences related to software engineering, two of which are of particular interest: the International Conference on Software Maintenance (ICSM) and the International Working Conference on Source Code Analysis and Manipulation (SCAM). All of these projects could use support, even in such a basic way as spreading awareness about software preservation issues.

One of the major challenges in the digital preservation field is the difficulty of ensuring long-term access to digital objects, especially in cases when the software that was used to create an object is no longer current. Zabolitzky (2002) notes that a proactive approach to software preservation is necessary, and that passive gathering of software is not likely to produce a comprehensive and relevant collection, nor can it ensure that the software will perform accurately when needed. Access to source code is a major factor in a preservationist's ability to

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12 An extensive list, comparing the features of each: http://en.wikipedia.org/wiki/Comparison_of_open_source_software_hosting_facilities
13 SourceForge: http://sourceforge.net/
14 Launchpad: https://launchpad.net/
15 GitHub: https://github.com/
16 Resources for developers: http://software.ac.uk/resources/guides
17 Based on a previous project called Preservation and Long-term Access through Networked Services (PLANETS): http://www.openplanetsfoundation.org/
18 KEEP: http://www.keep-project.eu/ezpub2/index.php
19 ICSM: http://conferences.computer.org/icsm/
20 SCAM: http://www.ieee-scsm.org/
recreate adequate software performance and, to this end, open standards must be actively promoted, regardless of which preservation approach currently seems best. Additional requirements include a strong digital preservation framework that is tailored to the growing complexity of software and a continued discussion of ways to protect the intellectual property of software developers while preserving access to the work of software users.

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Preserving Film Preservation in the Digital Era

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Introduction

Nearly forty-one minutes into the 1983 restoration of George Cukor’s *A Star is Born* (1954), film historian Ronald Haver was forced to use a montage of production stills and publicity photographs to make up for the still missing footage. Though Haver managed to locate the original soundtrack in its entirety, and most of the film through various motion picture vaults and mislabeled cans, a few portions of footage (cut after the 1954 premiere due to complaints concerning its three-hour running time) remain lost (Warner Bros., n.d.). Perhaps it will take another thirty years to completely restore the film, or perhaps this is the best it is going to get. Film buffs and historians are still waiting, hoping, and praying for the lost forty-five minutes of Orson Welles’s *The Magnificent Ambersons* (1942) to appear on some dusty shelf, in a miscataloged canister, or at an unassuming garage sale somewhere—it has been known to happen. Like *A Star is Born*, Welles’s masterpiece became victim to studio alterations, and the cut footage went missing.1 Featuring major stars like Judy Garland (*A Star is Born*) and Orson Welles, it seems strange that these films have been so neglected and mistreated, and it begs the question: What has become of the “lesser” films, those without the Garlands and the Oscar nominations and the big budgets? Over 50% of all films made prior to 1951 and roughly 75 to 80% of all silent films are gone forever (Goldman, 1993; Houston, 1994). But thanks to a somewhat recent shift in perspective that was sparked by the film schools of the 1970s, more and more people regard and acknowledge film as an important and vital part of our cultural heritage, no longer just a shimmering goldmine for the studios and theaters.

It has become a priority to preserve and restore older films before their nitrate-induced expiration date and to properly store and care for contemporary films. Unfortunately, this outlook is not enough to guarantee the locating and restoring of films before decay calls “time’s up!” The ultimate goal of preserving a film is to present it in its original format, running time, and crisp black-and-white or vibrant color—to present it to audiences now the way it was presented to audiences then—so archivists and preservationists run into a mountain of both ethical and technological dilemmas when trying to achieve this often impossible feat. They face issues of authenticity, value, and adaptation to modern technology; they are limited by financial restrictions, and a lack of resources and storage space; they are also competing with free and easily accessible digital archives like the Internet Archive and video sharing sites such as YouTube and Google Video. With the rise and prominent nature of the World Wide Web and digitization methods, the archival institution’s need to survive often conflicts with the ethics and intentions of the film archivist. Traditional film preservation is not perfect,

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1 Filmmaker Peter Bogdanovich told Turner Classic Movies that he believed the footage was literally dumped into the ocean (Grey, 2010).
nor is there an agreed-upon set of standards for archivists to follow, but digital preservation is not the solution. It may prove successful as a marketing tool, it may help film archives achieve greater accessibility, and it may provide assurance that if a film print is destroyed the motion picture itself will survive. However, digital preservation comes with a slew of problems and remains a poor substitute for traditional film preservation.

**Issues in Film Preservation**

Make no mistake: The current state of film preservation is not a favorable one. Most moving pictures made before 1950 were shot with cellulose nitrate film, a highly flammable\(^2\) and chemically unstable film stock that decomposes at an alarming rate when neglected, and at a somewhat slower rate when ideal storage conditions are employed (Read & Meyer, 2000). Add to this the fact that early cinema was considered a commercial asset with little to no cultural value, and one senses the film archivist’s frustrations and struggles to preserve what is now considered “an expression of the cultural identities of peoples [that] form[s] an integral part of a nation’s cultural heritage…and, as such, constitute[s] important and often unique testimonies, of a new dimension, to the history, way of life and culture of peoples” (United Nations Educational, Scientific and Cultural Organization, 1980). During Hollywood’s heyday, once a film was removed from theater circulation and had exhausted its monetary gains there was no reason to keep it around or protect it for further use.

These moving images, apparently thought of as durable…even while experienced in the course of being progressively dissolved, were repeatedly shown in different locations and at different times until they were completely destroyed at last—that is, when the physical condition of the carrier was in a state so disastrous as to make its further exhibition virtually impossible . . . Exploited to the utmost, their carriers had no further reason to exist; their destruction was not only inevitable but desirable insofar as new carriers and new images had to be created for commercial reasons. (Usai, 2001, p. 67)

Because of such treatment, preservationists and restorers are often left with the task of filling in the blanks to the best of their abilities.

After 1950, a shift towards cellulose diacetate film (a safer, less flammable alternative to nitrate) gave enthusiasts a somewhat false sense of security until it was discovered that acetate negatives, though more long-lasting

\(^2\) Not only does nitrate film burn twenty times faster than wood, but it also holds enough oxygen to keep burning underwater (Slide, 1992).
than nitrate film, deteriorate at a much faster speed than initially expected (Read & Meyer, 2000). Responsible for the term “vinegar syndrome,” which was not identified until the early 1980s, acetate film gives off a strong odor of vinegar when decomposing and can easily contaminate nearby prints (Goldman, 1993). This realization was made around the same time filmmaker and preservation advocate Martin Scorsese noticed that the original print of his film *Taxi Driver* (1976), made only five years earlier, was already a victim of color degradation: “At the time, the term ‘vinegar syndrome’...had not even been invented by film archivists. All we knew was that prints were starting to shrink, become curled, and would be unprojectable by the time their...unpleasant acidic smell had reached almost unbearable levels” (Scorsese, 2001). Under such circumstances, it would seem that digital technology is a godsend: Transfer everything onto convenient digital files and throw away those dangerous nitrates and stinky acetates.

Assigning value to films—which one has it and which does not—poses another challenge for archivists. They agree that film itself is of significant value, but in a field lacking both financial resources and facility space many are forced to surrender films to a hierarchical order to determine who the survivors will be. While it may not seem difficult to recognize important films in contemporary culture, it is impossible to determine which films will be considered important to future generations. Filmmaker David Forbes (2009) points out, “what may not look important today may be vital in 20 years’ time” (p. 42). If classic Hollywood held this belief, today’s archivists would have a much easier job. In an effort to avoid old Hollywood’s mistake—to “make up for the sins of the past” (Houston, 1994, p. 15)—many archival institutions adopted the idealist notion that *everything* should be preserved and are now overwhelmed with material they neither have the housing nor the funding to care for.

The notion that all films should be saved has been quietly superseded by factual evidence, but it is still ingrained in the archives’ mentality, so much so that it is still taken for granted, like the aspiration presiding over the current attempts to preserve (and make accessible) the Internet in its entirety. (Usai, 2009, p. 15)

It is impossible to preserve everything, but archivists are careful with such compromises. If focus is given exclusively to films deemed crucial by contemporary standards and values, those gems in the rough not yet appreciated by existing perspectives may slip through the cracks. Much the same way that the librarian presents a varied and unbiased collection to the public, the film archivist must consider all films as equals. Film author and critic Penelope Houston wrote, “Once a film has been destroyed, it is gone for good; as long as it lives, someone,
some day may find a reason to look at it” (1994, p. 82). Still, the question of resources is a difficult obstacle to overcome, and prioritization and commercial interests hold an inevitable place in the debate.

**The Commercial Influence on Preservation**

Every year since 1989, the Library of Congress’s National Film Preservation Board (NFPB) has selected up to 25 “culturally, historically or aesthetically significant films” to add to the National Film Registry and essentially push for preservation (NFPB, n.d.). Eligible films must be “at least 10 years old, though they need not be feature-length or have had a theatrical release in order to be considered. The [NFPB’s] intent is that the broadest possible range of films be eligible for consideration” (NFPB, n.d.). However, perusing a list of selections between 1989 and 2011, one cannot help noticing the majority of popular Hollywood films (Internet Movie Database, n.d.). In fact, with selections like *Casablanca* (1942), *Citizen Kane* (1941), *The Grapes of Wrath* (1940), and *Gone with the Wind* (1939), the year 1989 was a veritable who’s who of the American Film Institute’s (AFI) popular “100 Years…100 Movies” lists (AFI, n.d.). While the NFPB lists have every good intention of designating items for “immediate preservation,” the “AFI lists are broadcast each year and clearly also function in support of the marketing of such titles to home video” (Ricci, 2008, pp. 444-445).

Ricci, Assistant Professor in UCLA’s Film, Television, and Digital Media Department, points out that these lists “have been criticized for establishing canons that effectively exclude works by women and minority communities,” as well as for their “narrow construction of film history and for a lack of scholarly and/or cinephilic justification” (2008, p. 444).

The popularity of such “100 Best” lists is incredibly destructive to film preservation; public attention is drawn to the masterpieces that will sell, and company grants and sponsorships often require their funds to go toward the restoration of a project that may or may not be in urgent need of care (Kilcoyne, 2010). “This can be incredibly frustrating and painful for archivists who see the same core titles in demand” and the same neglected titles left by the wayside (Kilcoyne, 2010, p. 59). Commercial value has a big impact on the success and/or survival of archival institutions and film preservation in general.3 Stuck in a catch-22, the easiest way for archives to gain financial support is to preserve the determined classics for future re-releases while lesser-known films that desperately need attention cannot bring in the required funding to attract that attention.

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3 The prevailing commercial value of film is evident in Ted Turner's remark following his purchase of MGM's film library: “We’ve got Spencer Tracy and Jimmy Cagney working for us from the grave” (Gracy, 2007a, p. 47).
Access vs. Preservation

The effect of commercial interests on preservation is clear, but sometimes preservation itself is the problem. While most archivists acknowledge the importance of accessibility and exposure, there is no universal code on how access to preserved films should be handled. Film is a delicate format, and sometimes its safekeeping challenges accessibility. In an attempt to protect their collection and (whether intentionally or not) discourage access, some archives, such as Britain’s National Film and Television Archive, require a small fee from students, researchers, and historians (Houston, 1994). If a viewing print does not exist, the researcher, who is expected to pay the cost of having one made, has two options: a flat-out refusal, or a wait of several months (Houston, 1994). Many archivists are frustrated by such occurrences, including Prelinger (2009):

I continue to be struck by the divergence between our theoretical acceptance of access as a goal and the poor state of access that actually reigns. While expanding access has become a relatively uncontroversial objective, its implementation is roadblocked by constraint, uncertainty, and ambivalence. (p. 164)

Part of this ambivalence stems from the unavoidable fact that the fragility of an original film brings it closer and closer to extinction every time it is viewed, transferred, or handled in any way. The International Federation of Film Archives (FIAF) states in its Code of Ethics that archives "will deny access rather than expose unique or master material to the risks of projection or viewing if the material is thereby endangered" (2002, section 1.2). In spite of this, it is impossible to avoid the summation that “use justifies archives” and “access adds context and value” (Prelinger, 2009, p. 170). How can a film possibly hold onto its value if it is never seen? This is where digital preservation can help.

Digital Technologies: Benefits and Disadvantages

The importance of access to film archives is universally agreed upon but encouraged with a tinge of hesitation. Institutions understand that neither they nor the films themselves can handle a high demand for access, but access and exposure encourage public awareness, promote lesser-known films, and, in turn, instigate financial support. Digitization may be a wonderful solution to this conflict of interests, and it has already shown promising results in the UK’s Moving History project (http://www.movinghistory.ac.uk), the British Film Institute’s Screen Online project (http://www.screenonline.org.uk/education/index.html), and the San Francisco-
based Internet Archive (http://www.archive.org/details/moviesandfilms). All offer free access to digitally streaming film and video archives. Though Screen Online is limited to academic circles, the digitization and otherwise free and easy access to films by all three organizations means exposure to works that have previously been ignored. Undoubtedly for archivists, “this implies the active promotion of [their] collections, especially of material that has hitherto remained more or less invisible” (Gray & Sheppard, 2004, p. 116).

The instability of nitrate film, which can self-ignite at 300 degrees and has also done so at only 106 degrees,\(^4\) has resulted in several cases of facility fires and permanent gaps in motion picture history (Slide, 1992). There are too many such instances to mention, but one of the more devastating was the 1980 fire at the Cinémathèque outside of Paris—at the time, considered one of the most prestigious and heralded of all film archives (Slide, 1992). It is estimated that around 15,000 reels of film were lost, including many original prints (Slide, 1992). These originals are now lost forever, but digital technology can keep future losses to a much less threatening level. There is still no way to permanently preserve film, but until such a system is discovered, digital methods offer a promising defense against complete annihilation. They certainly enable archivists to breathe a bit easier.

While acknowledging the benefits of digital preservation—namely, unlimited storage space and easier access—film scholar Karen Gracy points out that “the issues of format obsolescence, authenticity, integrity, scalability, and economic incentives for providing preservation services weigh down the [archival] community in complex challenges” (2007b, p. 186). Dietrich Schüller of the Austrian Academy of Science also comments on the problem of “format obsolescence”: “Thanks to the technical development over the past 20 years, we have experienced ever shorter commercial life cycles of dedicated audio and video formats” (2008, p. 5). Utilizing a technology that seems to morph faster than we can keep up with suggests that digital files and records will require reformatting at least every three to five years (Mattock, 2010). This is a considerably shorter lifespan than film.

In a *Hollywood Reporter* review of the Academy of Motion Picture Arts and Sciences (AMPAS) archival report, “The Digital Dilemma: Strategic Issues in Archiving and Accessing Digital Motion Picture Materials,” Giardina (2007) affirms that AMPAS has already “identified instances where digital content could not be accessed after only 18 months” (para. 4). She goes on to paraphrase AMPAS project leader Milt Shefter on the subject:

\(^4\) This occurred during the summer of 1949 in New York City (Slide, 1992).
Shefter noted that a requirement for any preservation system is that it must meet or exceed the performance characteristic benefits of the current analog photochemical film system. According to the report, these benefits include a worldwide standard; guaranteed long-term access (100-year minimum) with no loss of quality; the ability to create duplicate masters to fulfill future (and unknown) distribution needs and opportunities; and immunity from escalating financial investment. “There’s nothing in the digital world that comes close to this at this point,” [Shefter] said. (as cited in Giardina, 2007, para. 6-7)

Because digitized copies themselves require repeated reformatting to keep up with each technological advancement, and because this is a costly process, they do not alleviate much financial pressure. AMPAS’s report “suggests that the annual cost of preserving film archival master material is $1,059 per title, and the cost of preserving a 4K\(^5\)-digital master is $12,514” (Giardina, 2007, para. 8). Digital technologies also run the risk of hard drive crashes, viruses, unauthorized alterations, and physical damage. DVDs and Blu-ray discs are often considered improvements in format, but film historian Eddie Muller reminds us that “a film gets scratched and it still plays. Scratch a DVD, it’s kaput” (2011, para. 21).

From the audience perspective, digitization greatly alters the experience of viewing a film. Many theaters are in the process of or have already converted to digital exhibition methods. There are nostalgic reasons for protesting these methods, but there are also legitimate consequences to digital and/or satellite exhibition.

[The] ethical principles of archival preservation...do not tolerate the diminished image quality that is currently inherent in even the best digital technologies. Even if this dilemma is ultimately solved in technological terms, with digital formats approaching an acceptable degree of emulation, we dispense with the materiality of the film experience as a historical phenomenon. Such a loss is hard to qualify. (Kilcoyne, 2010, p. 63-64)

No doubt audiences will also have issues with theaters who charge the same price of admission for a lesser-quality DVD.

Obsolescence is another consequence of digital exhibition. High Definition (HD), the format that many theaters are now using when they convert to digital, is “not yet an entirely stable format, but the technology has already moved on” (Crofts, 2008, p. 7). "Our expertise is in danger of becoming out of date even before it is fully mastered” (Crofts, 2008, p. 7). Clive Ogden at Kodak

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\(^5\) “K” refers to the means of measuring digital projection resolution in pixels: A full screen 2K image is essentially 2048 x 1536 pixels, while 4K is 4096 x 3072 pixels (CELCO, n.d.).
contends that, while digital projection offers a 2K-4K resolution, the current Hollywood standard, film stock is at least a 6K (as cited in Crofts, 2008). It is clear that digital methods are not a substitute for film, but there are reasons to utilize their benefits.

**Case Studies in Preservation: Metropolis and Vertigo**

In 2010, a fully restored version of Fritz Lang’s *Metropolis* (1927) hit U.S. movie theaters and reinstated much of the film’s plot and character development. For the first time since its 1927 Berlin premiere, the film was shown in its entirety. The missing footage, roughly twenty-five minutes in length, was presumed destroyed before Argentine archivist Fernando Peña tracked it down in a Buenos Aires archive.

*Metropolis* is an interesting case because there have been so many versions available, none of them complete until now. Archivists are primarily concerned with preserving the original film, but when there are multiple versions floating around, it is difficult to determine which one holds more value over another. Mattock (2010) explores this confusion by posing the question: If we agree that the original *Metropolis* pertains solely to the 1927 release that screened in Berlin, what do we call the U.S. version with English intertitles shown in 1920s America? Is this the original film as well? What about the second German version taking its cue from a rearranged American version, or Germany’s sound film from the 1960s? Then there is Giorgio Moroder’s 1984 interpretation adding color and a rock soundtrack. Are all of these considered Lang’s *Metropolis*, and does one deserve more attention, in terms of preservation, over another? Moroder himself claimed that he “didn’t touch the original, because there is no original” (as cited in Mattock, 2010, pp. 80-81), and film archivist Martin Koerber, also the restoration director for the 2010 release, agrees:

Many have, at some point, seen something on the screen called *Metropolis*. But what did they see? Certainly not the film written in 1924 by Thea von Harbou and directed by Fritz Lang in 1925/26, because that film ceased to exist in April 1927. (as cited in Ricci, 2008, p. 439)

In a case such as this, digital preservation can alleviate some of the pressure and confusion. From what we know of digitization’s drawbacks, the best way to guarantee a film’s survival is to preserve the actual print. Indisputably, the 2010 restoration of *Metropolis* (the closest to Lang’s 1927 version) should be preserved, but this does not necessarily render all other versions obsolete or obsolete.

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6 It was only around 2006 when the standard was 1.3K; any exhibitors who purchased these projectors are already sitting on dead technology (Crofts, 2008).
Insignificant. They are an important part of the restoration’s history and process toward completion, they show how a missing reaction shot can completely alter a film’s tone, and they offer proof that incomplete or imperfect prints can still find an appreciative audience. Digitization can keep these versions alive through alternatives like DVD bonus features—which are becoming more popular and more expected—and online film archives. (The new restoration itself is available on YouTube.)

Digital technologies are also responsible for the restoration itself. Early in the 1970s, the 35-millimeter print was “reduced to a 16-millimeter negative” before removing any dust or hair particles or attending to any scratches or smudges (Rohter, 2010, para. 11). These defects were transferred over. With so much damage to work through, “restoring the Argentine reels required the latest in digital technology” (Rohter, 2010, para. 11). In previous versions of the film, there is a tall, slender character simply referred to in the credits as "The Thin Man." He has very little to do with the film's plot and acts as nothing more than a "glorified butler" (Rohter, 2010, para. 13). The digitally restored scenes, however, show that "The Thin Man" is in fact "a much more sinister figure" and is vital to the plot's development (Rohter, 2010, para. 13). The new restoration also expands the film's political and social themes. Calling the film typical science fiction is now a vast oversimplification that no longer applies (Rohter, 2010). If not for digital technologies, Lang’s vision would remain incomplete and misunderstood.

The 1996 restoration of Alfred Hitchcock’s Vertigo (1958) is not really a restoration at all, but a reconstruction. Restoration refers to the attempt and manipulation process to duplicate the original, while reconstruction is a rearranging or new interpretation of the original (Read & Meyer, 2000). Vertigo was originally shot using VistaVision cameras, a “widescreen format [that quickly became extinct and] featured horizontally based images on regular 35mm film...[offering] superior resolution by effectively doubling the size of the image” (Kilcoyne, 2010, p. 66). Such obsolete formats present their own difficulties to restorers, but the terrible state of Vertigo’s sound track and original score was even more challenging. Opting to digitize the dialogue track, which rendered the original Foley track, or sound effects track, unusable, restorers Robert A. Harris and James C. Katz then had to create, record, and mix new effects—a some of which were included for the sole purpose of covering up original “hisses, pops, and bangs” (Kilcoyne, 2010, pp. 66-67). While Harris and Katz consider these

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According to Dave Kehr of The New York Times, “digital restoration is often a zero-sum game, in which the erasing of one flaw produces another [and] we continue to move further from the look and feel of the first-generation film” (2009, para. 7).
alterations improvements, there is an underlying discomfort that cannot be ignored.

With the passage of time and the introduction of new technologies, flaws once considered minor are no longer forgiven. The pops and glitches, the occasional dust particles, were not considered imperfections to early moviegoers—they were simply part of the film experience. Alterations like those by Harris and Katz are made to fit newer standards and expectations, and ultimately compromise a film's authenticity and historic value. The film becomes a contemporary work, not an accurate depiction of the past. Kehr (2009) makes a case against the popularity of HD imagery, stating,

For Blu-ray to look its best it requires picture and sound images of the finest, most pristine quality. That’s not difficult to come by in a contemporary release like “Transformers: Revenge of the Fallen” (the best-selling Blu-ray of 2009), but is somewhat more problematic for a film made in Germany in 1926. Blu-ray exaggerates the faults in older material…” (para. 6).

He proposes that such standards are creating a generation of viewers who will reject older films that fail to transfer as well as the latest blockbuster.

Another contention for archivists is retaining what Mattock (2010) and Ricci (2008) call a film’s “aura.” The aura of Metropolis includes, as a silent film, a live orchestra presenting the score, Berlin in the late 1920s, and perhaps a scratch here or a tiny tear there—a sense of its origins and fragile format. Vertigo’s aura comprises those lamentable pops and hisses, those brief but ambitious exhibition methods of the 1950s, and those eye-popping Technicolor saturations. Archivists do not sacrifice such auras lightly, but it is impossible to maintain a film’s aura in full if it includes another time and place, or an extinct format. We cannot travel back in time to Berlin in the 1920s or America in the 1950s—the world is not a Woody Allen movie. There are varying degrees of compromise, but restorers cross a line when “enhancing images and sound tracks…begin to corrupt the original work”—an argument that can be made for Vertigo’s reconstruction and the newer HD expectations (Ricci, 2008, p. 442). Unfortunately, archivists and audiences have little control over this. Voicing how many film enthusiasts feel, Kilcoyne (2010) admits, “if I only get to watch and re-watch a version of Vertigo because Universal spent over a million dollars…allowing Harris and Katz to restore it with a superfluous seagull, then so be it” (p. 70). Commercially successful restorations like these increase a film’s

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8 They even "claim that Hitchcock would have used digital stereo technologies on the sound track had they been available in 1958" (Ricci, 2008, p. 442).
chance of survival, but the long-term effect on archival institutions and less popular films results in a bittersweet victory.

**Conclusion**

The concerns raised by *Vertigo*'s reconstruction may never be fully resolved. Some contend that Hitchcock would have been proud (Ricci, 2008), while others, like FIAF (2002), consider such manipulations unethical. Using digital technologies in this way will always raise some eyebrows and spark debate, but the recent success of *Metropolis* has given us a rendition even closer to the original, and this cannot be ignored.

The case of *Metropolis* is one example of an ideal approach to using digital methods. A less than ideal approach would favor digital preservation over film preservation in all cases. When digital preservation was first introduced, it was promising, as most new technologies are. But as tends to happen with many new technologies, imperfections have been revealed over time which contrast with previous assumptions: Digital preservation costs more, not less, than film preservation; digital formats change rapidly and have a much shorter lifespan than film; they are susceptible to manipulation, viruses, and scratches that render them unplayable; and their quality is not up to par with film. These limitations cannot be ignored and are reason enough to endorse traditional film preservation methods. Digital methods do, however, increase public awareness of an archive’s collection, improve accessibility of lesser-known films, encourage financial and cultural support, and generally maintain the consensus that film holds an important place in our history and culture. These benefits cannot be ignored either.

Film preservationist Paolo Cherchi Usai likens the archivist to a “physician who has accepted the inevitability of death even while he continues to fight for the patient’s life” (as cited in Ricci, 2008, p. 438). Although digital methods can help with this life or death struggle, they have a long way to go before replacing traditional film preservation entirely.

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Using Technology to Connect Public Libraries and Teens

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Today’s public libraries must be many things to many people, including the young adults in their communities. In order to best serve teen patrons, libraries should have young adult librarians who focus exclusively on teens, yet many libraries do not provide these specialized positions (Vaillancourt, 2000). Libraries that do not effectively serve teens are missing opportunities to reach an important segment of their local population and to help teens become lifelong users of the library system (Jones, 2003). Teen patrons present challenges for libraries due to their varied interests, changing needs, and short attention spans, but reaching them at this important time in their lives can make both an immediate and a long term difference (Houston, 2011). Libraries can provide teens with places to belong, while at the same time supporting positive behaviors and helping them avoid risky situations (Joseph, 2010; Walter & Meyers, 2003). For these important reasons, public libraries should make it a priority to reach out to teens and connect their services to these patrons. What follows is a review of current literature by experts in this field. Researchers generally agree that successful teen services begin in the library with good planning, comfortable places that provide access to technology, and effective librarians. It is imperative that today’s library services go beyond the physical library and try to reach teens through technology including websites, social networking sites, mobile devices, and e-reading. By using technology in a variety of ways, libraries can better connect with and successfully serve today’s teens.

Connecting in Person

All public libraries have the goal of serving their young adult patrons’ informational, recreational, and educational needs, but each library makes its own decisions about how to prioritize those needs (Jones, Gorman, & Suellentrop, 2004). Researchers agree that an important first step in developing teen library services is to involve young adults in planning (Agosto, 2007; Shay, 2011; Walter & Meyers, 2003). Giving young adults opportunities to plan services, events, and teen spaces will result in a more vested interest in the libraries (Couri 2011; Macchion & Savic, 2011). Libraries should conduct surveys and focus groups to better assess teens’ needs (Bishop & Bauer, 2002; Bourke, 2010; Hannan, 2011). In addition, an active teen advisory board can be helpful in planning events (Houston, 2011; Klipper, 2011), advocating for teen programs (Comito & Escobedo, 2011; Jones et al., 2004), and bringing friends to library events (Bishop & Bauer, 2002). Researchers also recommend that libraries provide opportunities for teens to volunteer (Bishop & Bauer, 2002; Macchion & Savic, 2011). Youth involvement is so central to the success of young adult services that Jones, Gorman, and Suellentrop (2004) include it as one of six main goals for library planning.
Librarians can take what they learn from their teen patrons and use it to plan one of the key components of successful teen library programs: inviting library spaces (Bernier, 2009). Libraries should provide young adults with spaces that are just for them, apart from children’s sections (Houston, 2011; Nowak, 2011; Sullivan, 2011). Teens need to be directly involved in the planning of those spaces (Bernier, 2009; Howard, 2011). Whether it is just a small area or a completely separate room, an ideal young adult area is welcoming and comfortable. It should be a place where young adults can be themselves and work together (Houston, 2011; Walter & Meyers, 2003). This often means allowing teens to eat and socialize in this space (Bishop & Bauer, 2002; Howard, 2011).

This space should also have computers and other technology that appeal to teens, making it a place where teens go not only to read and research, but also to create and share (Van Lewen, 2009). Surveys show that young adults expect to have computer access in the library (Ayar, 2009; Walter & Meyers, 2003). By also providing free Internet access, libraries can bridge the digital divide and help teens without computers gain access to websites and social networking sites (Jones, et al., 2004). In addition, libraries can help teens by providing the time, space, and digital tools they need to collaborate and create. These digital tools might include cameras, video cameras, and access to software. Cultural anthropologist Mizuko Ito (2008) explains that teens need not only to have digital tools available to them, but also need “a degree of freedom and autonomy for self-directed learning and exploration” (p. 22). By providing these tools and the space to use them, libraries become valuable resources to teens.

Libraries should also provide training and guidance for teens on the use of technology (Ludwig, 2011). Researchers should investigate the best methods librarians can use to help educate teens about online issues such as cyber-bullying, privacy policies, and copyright laws (Agosto & Abbas, 2011; Lamb, 2011). One possibility would be to offer classes to teens during national Teen Tech Week, a program sponsored by the Young Adult Library Services Association (YALSA) that aims to promote “competent and ethical users of technologies” (Van Lewen, p. 33). Teens enjoy learning from their peers (Ito et al., 2010), so libraries should include teens as partners in their technology training when possible.

In addition to providing the space and digital tools teens need to be creative, as well as guidance on the use of those tools, libraries have opportunities to connect with teens through another incredibly popular form of technology: gaming. According to a 2009 Pew Internet study, 97% of teens play video games (Lenhart, 2009). Libraries can reach out to more teens if they offer games and gaming events. Teens play a variety of games for many different reasons; today’s video games are more social than those of the past (Ito et al., 2010). Focusing on the social aspect of gaming will help libraries be more successful in connecting
with teens. The Library Game Lab at Syracuse University surveyed 400 public libraries and discovered that “77% of those libraries . . . supported gaming in some way” (Nicholson, 2008, p. 50).

Including gaming in the public library has benefits for both the library and the teens who participate. First, by hosting gaming events, libraries get teens into the building, which helps teens begin to realize the value of libraries (Jones et al., 2004). These same events give libraries opportunities to promote other services teens might want to use (Macchion & Savic, 2011). In fact, some libraries have seen “youth who come in for gaming who then show an interest in reading and other library programs” (Van Lewen, 2009, p. 33). Other libraries have seen a general increase in teen traffic, new teens coming to use the library, and more interest in the events being held there (Neiburger, 2007). Also, research has shown that the video games themselves can “promote literacy, critical thinking, [and] problem solving skills” (Hill, 2010, p. 35). Many scholars view gaming as a type of storytelling, and therefore directly tied to promoting literacy (Bolan, Canada, & Cullin, 2007; Nicholson, 2008). Multi-player videogames also allow teens to socialize with one another and often allow them to explore new identities and realities (Macchion & Savic, 2011). Teens can gather to play games in much the same way that they might gather for a book club (Danforth, 2011), so these games encourage teens’ social interests (Long, 2005). While some might have reservations about whether gaming is a suitable pursuit for libraries, these potential critics should consider all of the other changes libraries have undergone over the years (Neiburger, 2007). If librarians want to connect with teens through activities the teens enjoy, then libraries certainly must include gaming.

In order to facilitate teens’ digital creations, gaming events, and any other library activities, libraries must have staff members who are welcoming to all patrons (Bourke, 2010; Jones, et al., 2004). All library staff members should recognize that they serve young adults as well as other patrons, regardless of the staff members’ specific library jobs or titles (Houston, 2011). By training staff members to deal effectively with teen patrons, libraries can help build a solid foundation for future library interactions and ensure that teens get the most out of their library experiences (Houston, 2011). Those who work closely with young adult patrons need to be especially patient and approachable and must realize that a positive attitude can be one of the most important factors in developing relationships between teens and librarians (Bourke, 2002; Hannan, 2011; Jones et al., 2004). Librarians can show their interest by getting out from behind the desk (Bolan et al., 2007) and speaking directly to all teens, even those who come into the library with their parents (Vaillancourt, 2000). Young adult librarians should also have other key qualities, such as flexibility, a sense of humor, empathy, and open-mindedness (Vaillancourt, 2000). Librarians must care about their teen patrons, and let the teens know it. Once librarians have established relationships,
they will be able to “work with [teens] in learning the skills needed for adulthood” (Walter & Meyers, 2003, p. 41) and “empower [teens] and encourage information literacy and independent thinking” (Jones et al., 2004, p. 272).

**Connecting Online**

Librarians must work to establish relationships with teens inside the library building, but librarians must also recognize that many of today’s teens are more likely to be online than in a library. If librarians truly want to serve teens, the librarians must reach out and “become integral members of the online community” (Hughes-Hassell & Miller, 2003, p. 145). Today’s teens are “digital natives” who were born into a digital world and have grown up on the Internet (Prensky, 2001, p. 1). They “have been raised and educated in a world where the Internet is taken for granted” (Nowak, 2011, p. 6). Technology is ubiquitous, and teens are used to being immersed in it (Flowers, 2008; Goodstein, 2007). Research shows that today’s teens are online more than their predecessors, with 95% of teens going online (Lenhart et al., 2011). As a result, “It only makes sense that if you want to reach out to this community and forge relationships that foster cooperation, collaboration, understanding, and lifelong learning between the generations, the way to do it is through the Internet” (Peowski, 2010, p. 26). The Internet now offers people more opportunities to connect and interact than ever before. Maintaining a “strong library web presence is no longer optional” (Valenza, 2011, p. 38). If a library wants to serve its teen patrons, it must be available electronically 24/7. Websites have moved beyond static information-giving pages, and many are now collaborative Web 2.0 sites where both librarians and patrons can participate (Casey & Savastinuk, 2006). The interactive nature of these sites makes it easier for libraries to connect with today’s online teens.

The possibilities for online interactions between teens and libraries are almost limitless. Library websites, social networking sites, and other Web 2.0 resources provide a variety of ways to connect with teens. Before librarians look at specific platforms and options, they should consider their audience: teens in their own communities. Involving them in the planning of any online options will dramatically increase the success of those programs (Peowski, 2010). Just like when planning in-library spaces and services, librarians should talk to teens and ask them what they would like to see the library do online (Peowski, 2010). “If at all possible, teens should be involved with designing the website and choosing the content” (Hilbun, 2011, p. 44). Young adult librarians need to work with their library administrators to determine if it is possible to have teens help with details such as site maintenance and posting content (Hughes-Hassell & Miller, 2003). For some libraries this is not feasible due to security concerns, but librarians should still be able to get teens’ input on choice of platform and type of content.
Two major challenges facing librarians who wish to create and maintain an online presence are lack of training and lack of time. In a survey of young adult librarians, Hughes-Hassell and Miller (2003) found that “most of the responding librarians described themselves as ‘self-taught’ Web designers” (p. 151). They concluded that “it is imperative that libraries provide professional development for their staff on Web Design” (Hughes-Hassell & Miller, 2003, p. 154). If libraries want to connect with teens online, they not only have to provide training, but also provide time to manage the online services (Hilbun, 2011). While other staff members, such as computer specialists, could manage some of the web services, the young adult librarian “needs to be a visible part of these technologies so that teens still feel the personal connection” (Hilbun, 2011, p. 49).

When considering various platforms and online tools, librarians must be mindful of the reasons that most young adults go online. Teens’ primary purpose for Internet use is to socialize and make connections (Ito et al., 2010; Jones et al., 2004). As primarily “friendship-driven” users of technology (Ito et al., 2010), today’s teens “are concerned about missing out on something important, and they use technology to stay in constant contact” (Lamb & Johnson, 2006, p. 55). Teens use the Internet (and cell phones) to stay in touch with friends and family, but also to reach out and meet new people (Jones et al., 2004). Teens have discovered that “they can speak and listen to a far more diverse community than they can in their own geographical neighborhoods” (Walter & Meyers, 2003, p. 53).

Teens also go online to figure out who they are and where they fit in; Ito et al. (2010) would call this “interest-driven” use of technology. For many young adults “the Web can be the ideal means for navigating the waters of self-discovery” (Rapacki, 2007, p. 28). The Internet provides places for teens to find people more like themselves, while at the same time providing anonymity for those who want it (Goodstein, 2007; Jones et al., 2004). In addition to socializing and identity-searching, teens use the Internet as a source of information and entertainment (Ito et al., 2010). The Internet also provides “opportunities for teens to express themselves and distribute their work” (Goodstein, 2007, p. 13). Libraries must find ways to harness this vast resource both to connect with and to support teens.

Many librarians believe that teens consider themselves to be Internet users before researchers, but Bishop and Bauer (2002) found the opposite to be true. Today’s teens do consider themselves researchers, but their methods are different from adults’ research. By understanding teens’ methods, librarians can help teens become better researchers and guide them to view the library as “a primary access point to information” (Flowers, 2008, p. 6). Studies have found that the Internet is the “primary tool” teens use for research, and in one survey “seventy-one percent of teens . . . reported that they rely mostly on Internet sources for their research”
Hughes-Hassell & Miller, 2003, p. 144). Many teens turn to Internet sources instead of libraries because they find it easier to locate the information they need (Snowball, 2008). Goodstein (2007) confirmed that teens find online research easier, but also like it because it is faster and they often find more information. Yet teens do not often consider that the information might be unreliable or inaccurate (Goodstein, 2007). Also, “There’s no question that students’ search skills are generally quite poor,” (Jacobs, 2012, n.p.), so librarians must work with teens to help them improve these skills (Bergson-Michelson, 2012; Purcell et al., 2012) and to learn to use libraries as research tools.

Some teens are confused by the variety of search options and do not seem to distinguish between general searches, such as ones using Google, and ones made using online databases (Evanhart & Valenza, 2004). Students may focus on general searches. For example, a 2012 Pew Internet survey reported that 94% of teachers surveyed “said that their students were ‘very likely’ to use Google or other online search engines” (Purcell et al., p. 33). The same study showed the next most popular research tool for students was Wikipedia (Purcell et al., 2012). By helping teens understand the strengths and weaknesses of the various search options, librarians make teens more proficient Internet researchers. Instead of being discouraged by teens’ heavy Internet use, librarians need to look at what makes teens turn to the Internet and try to replicate some of those features, such as single box searching, in their own online resources (Nowak, 2011). When librarians understand the appeal of resources like Google and Wikipedia, they can use that understanding to improve their own research tools and help teens decide when and where it is appropriate to use specific resources.

Connecting through Library Websites

One of the most popular platforms for reaching out to teens online is a library website dedicated to young adults. In addition to involving teens in the planning of library websites, librarians must determine the purposes of websites before building them. Librarians should base this determination on what the teens want and expect from the website (Hughes-Hassell & Miller, 2003). According to Hughes-Hassell and Miller (2003), teen library websites can provide help with school work, information about colleges and careers, and other general reference information. In addition, librarians can use websites to promote reading and library events. All of these purposes are valid, and librarians can address all of them, or some combination of them, if the librarians find they will best serve their local teens’ needs.

Once librarians determine the purpose(s) of their websites, they can look more specifically at design, content, and management. While specific platforms and design software are beyond the scope of this review, individual libraries will
need to make some basic decisions about these options. Considerations when choosing a particular type of software include librarians’ knowledge of web design, the cost of particular programs, and ease of use (Horn, 2011). Librarians should also look at other leading teen library websites, such as those from the Berkeley (CA) Public Library and the Columbus (OH) Metropolitan Library, to glean effective content and design tips (Horn, 2011). Some libraries might want to consider a blog instead of (or in addition to) a standard website because it is easier to use and keep up-to-date (Hannan, 2011). For librarians who do not have web design training, a blog offers many of the same features without requiring technical expertise (Casey & Savastinuk, 2006; Horn, 2011).

In terms of design, teen websites need to reflect the tastes of today’s teens (Hughes-Hassell & Miller, 2003). Librarians can stay current with trends and teens’ preferences by looking at contemporary teen magazines and other popular teen websites (Hannan, 2011). Librarians should make sure that the design is simple, not too full of text, and easy to navigate (Bolan et al., 2007). Teens will be more likely to use a site if they can find information quickly (Agosto, Valenza, & Abbas, 2011). If teens are inundated with too many graphics or words, they are much less likely to use a website (Hilbun, 2011; Jones et al., 2004). Since the goal is to best serve teens, the design of a website needs to enhance, not detract from, that goal.

While good design of teen library websites is essential, librarians also need to consider the substance of the websites. The content on library websites must be comprehensive. For example, the websites need to include links to the libraries’ subscription databases (Hilbun, 2011). In order to get teens to use these databases, librarians should annotate the links so that teens will understand what the various databases can do for them (Jones et al., 2004). Librarians can make suggestions about how to choose between databases based on the particular research teens are trying to do.

Libraries should consider including “homework helper” services on their websites (Agosto, 2007, p. 60). Since many teens are students, school and homework are important to them. Sometimes this homework help may direct students to appropriate research tools, but having librarians available online to help teens is also important. Libraries should consider having some form of “Ask a Librarian” available to teens (Hannan, 2011). Teen librarians could answer questions via email, instant message, or text message (Bolan et al., 2007). For a successful model of these services, librarians can look to the Public Library of Charlotte and Mecklenburg County in North Carolina, where librarians use these services. The librarians believe the services are essential in part because they help teens who “feel too intimidated to walk into a library and approach a librarian at a reference desk with a question” (Summers, Pierson, Higgins, & Woodring, 2011, p. 157). By providing these services, librarians help teens find quality
information and also help teens develop connections to the library and the librarians.

Libraries’ teen websites should also provide information about opportunities available to teens at the library. The websites can include information about special teen activities or how teens can get involved with volunteering or teen advisory boards (Hilbun, 2011). Librarians should also include photos taken at some of the libraries’ teen events (Bolan et al., 2007), with appropriate permissions. Librarians can create a photo stream using a site like Flickr and have it appear on library web pages or blogs (Summers et al., 2011). Online book clubs are another avenue librarians could explore that would connect teens to each other while promoting reading (Hilbun, 2011). An additional way to connect teens to the library would be to link teen websites to the main library’s web page and to any events held for the general public (Nowak, 2011). Librarians should also realize that parents of their teen patrons might use the teen-focused websites and should consider including resources that could help those parents (Horn, 2011).

Although libraries’ teen websites will often focus on what the libraries themselves have to offer, they should also provide access to information beyond the library; doing so will increase the libraries’ usefulness to teens. Librarians need to research what other websites teens might find interesting and help connect teens to those sites as appropriate. Librarians should select sites based on “the visual appeal of the site, ease of navigation, currency and accuracy of information, and credibility of the Website author” (Hughes-Hassell & Miller, 2003, p. 150). These may be sites that deal with issues such as “sexuality, sex education and teen pregnancy, teen violence, and suicide” (Jones et al., 2004, p. 280) as well as local resources and sites teens might not discover otherwise (Hilbun, 2011; Jones et al., 2004).

Library websites can also help teens connect directly to their favorite authors through links to authors’ blogs, websites, or social networking pages (Beaman, 2006; Hamilton, 2009). By helping facilitate direct communication with the authors of the books teens are reading, librarians enhance teens’ experiences with those books and with reading in general (Hamilton, 2009). In addition, library websites should connect teens to websites that focus on current young adult literature, such as YAContemps (www.thecontemps.com), readergirlz (www.readergirlz.com), Reading Rants! (www.readingrants.org), and Guys Lit Wire (http://guyslitwire.com) (Valenza & Stephens, 2012). Librarians can also provide connections to “fan fiction” sites where students can read and write about popular books (Braun, 2011; Burns, 2011). In creating these links, librarians need to verify that all linked websites can actually be accessed from computers in the libraries. If the library computers have filters, teens may not be able to use some of the sites (Jones et al., 2004).
Librarians also must move beyond reference information and include social and recreational opportunities on their websites, to address the primary reason that teens go online (socializing) and so that the teens will return to the library sites once their immediate information needs have been met (Hughes-Hassell & Miller, 2003). Some possible recreational links to include are those related to hobbies, popular television shows, movies, and online magazines (Agosto, 2007). Teens love to do surveys, polls, and quizzes online, so libraries could provide their own surveys or links to those already created by others (Rapacki, 2011).

Libraries should also “create a place for teens to submit their own writing, including reviews of books, Websites, video games, and computer games” (Jones et al., 2004, p. 280). In addition to space for sharing their writing, libraries can offer teens a place to share other information they create. Teens should have a place to share some of the digital projects they create in the library’s teen area. For example, librarians can post links to professional book trailers and host contests that encourage teens to create their own book trailers and share them online (Hilbun, 2011; Horn, 2011). Providing an opportunity for teens to share their creative work online helps teens develop their voices and gives them an audience for their work. This sharing also strengthens the connection between teen patrons and libraries. When libraries include “opportunities for fun and relaxation, and outlets for creativity, [they] are supporting healthy adolescent development” (Hughes-Hassell & Miller, 2003, p. 152), one of the goals of library service to teens.

Connecting on Social Networking Sites

Of course, traditional, library-hosted websites are important to libraries’ services to teens, but libraries should also maintain a presence on social networking sites where teens congregate. Social networking sites are websites that create a community of users who connect by sharing information about themselves and reading each other’s posts/pages (Agosto & Abbas, 2009). By linking library websites and social networking sites, libraries “offer increased online access points and . . . offer users multiple ways to interact online with their libraries” (Agosto & Abbas, 2009, p. 35). While some librarians might be hesitant to enter into the world of social networking, they must consider the potential positive aspects. In their comprehensive article, “Teens and Social Networking: How Public Libraries are Responding to the Latest Online Trend,” Agosto and Abbas (2009) identify three major benefits: “broadening the reach of young adult services,” “supporting adolescents’ healthy social development,” and “promoting teens’ online safety” (pp. 34-35).
Teens are immersed in social media (Lenhart, Purcell, Smith, & Zickuhr, 2010; “Social Media, Social Life,” 2012). According to recent research, “90% of all American teens have used social media, three-quarters of them have a social networking site, and nearly one in three teens visits their social networking profile several times a day or more” (“Social Media, Social Life,” 2012, p. 7). The appeal of these sites to teens is obvious: they support teens’ innate need for socialization and the desire to belong to a group (Lamb & Johnson, 2006). In order to remain current and be in touch with teens, libraries must reach teens on social networking sites where they spend time. Although teens are using these sites “mainly to further preexisting relationships with known friends” (Agosto & Abbas, 2009, p. 33), teens can also reach out and connect with others, including librarians.

Librarians will have to consider which of the available social networking sites they are going to use and how to use them. As when creating websites or in-house library services, librarians need to pay attention to what teens want and determine the library’s purpose for establishing a social networking presence (Horn, 2011). Many librarians and researchers are beginning to see the potential of using social networking sites to reach patrons and are developing best practices they can share. For librarians unsure where to start, YALSA offers a toolkit on its website (“Teens & Social Media,” 2011). This toolkit has an overview of social media, offers examples of ways to incorporate these services into existing young adult services, and offers suggestions on how to teach legislators, community members, and teen patrons about the benefits of social networking.

There are a variety of ways to use each of these sites. Librarians can post photos of new books, announce library events, and share a virtual tour of the library’s teen area (Agosto & Abbas, 2009). Librarians can also use these sites to elicit input from teen patrons and connect users to main library websites (Bolan et al., 2007). Since most of the social networking sites are based on some concept of adding “friends” or “following” users, librarians will have to consider who they will add as friends on these sites (Reynolds, 2011). Most librarians who are using social networks feel they need to friend their patrons, because if they do not, “it defeats the purpose of social networking sites” (Rapacki, 2011, p. 34).

For teens, the popularity of social networking sites changes quickly. Today’s teens are using a variety of sites including Facebook, MySpace, Twitter, and Tumblr (Hardacre, 2010; Harris, 2006; Matteson; 2011). While the formatting and language of these sites are different, they all offer their users the same thing: connections. Facebook is currently the most popular social networking site for teens (Agosto & Abbas, 2011; “Social Media, Social Life,” 2012). Therefore, an in-depth look at Facebook can serve as a model for how to use social networking sites to connect with teen patrons. Librarians need to decide if they will create a teen-focused Facebook page or a profile (Horn, 2011). If a library creates a Facebook page, other Facebook users can “like” the page. These pages are public
and are like advertisements for libraries’ teen services (Horn, 2011). A profile is a more personal approach that libraries can use to create events, post updates, and interact on an individual basis with their friends (Horn, 2011). Being friends with teen patrons allows librarians the option of responding directly to teens’ “walls” and learning about their interests and needs from the teens’ own profile pages (Miller & Jensen, 2007).

Teen librarians can use their Facebook profiles to share some of the same information they share on their websites, including new books, library events, new resources, contact information, and library hours (Miller & Jensen, 2007). In addition to rebroadcasting information found elsewhere, Facebook and other social networking sites allow users to “tag” other users when posting news or photos (Agosto et al., 2011). Librarians can use this feature to further their connections with teens by tagging their teen patrons in library posts or photos, thereby increasing the library’s visibility on those patrons’ pages. Friends of those patrons can also see the library’s posts and photos and may become interested in library activities. An important point about using social networking sites like Facebook is to make sure librarians update them frequently (Burns, 2011; Miller & Jensen, 2007). When a user updates his or her “status,” any updates become more prominent on friends’ pages (Miller & Jensen, 2007). Teens, like other users of social networking sites, are more likely to read information that is put in front of them (Agosto et al., 2011).

Twitter is another popular social network librarians should consider using. School librarian Buffy Hamilton (2009) explains that, “Twitter is a social network that asks the question ‘What are you doing?’ in 140 characters or less” (p. 14). Twitter also allows its users to tag names, ideas, and people, so that users can follow topics they find interesting. Publishers are already using Twitter to communicate with readers about upcoming events (Hamilton, 2009). Libraries could use Twitter in similar ways, such as announcing library events and new books and tagging book titles or authors (Hilbun, 2011). Another way libraries could promote reading would be to “post a compelling sentence from a new book for teens a few times a week on Twitter. . . . [and] add a link to the e-catalog” (Braun, 2011, p. 29). In an effort to provide comprehensive service, libraries should connect their Twitter accounts to their other social networking sites and library websites (Reynolds, 2011). In a comparison of various social networking sites and their appeal to teens, Reynolds (2011) asserts that “Twitter is the ultimate in electronic instant social gratification and perhaps has the most potential for engaging teens” (p. 53). While teens are currently using Twitter, librarians must regularly talk to and be ready to consider new sites, like Tumblr, which is a blog platform with social networking features (Matteson, 2011).

Several social networking sites actually focus on book sharing, including LibraryThing, Shelfari, and Goodreads. Libraries should consider using at least
one of these sites in conjunction with their regular websites and other social networks. Young adult librarians can set up their own accounts or help direct teens to groups that already exist on these sites (Hilbun, 2011). Book sharing sites are attractive to teens because users can tag and review books in addition to joining groups to talk about books (Hilbun, 2011). Librarians can use these sites to share books new to the library and then make sure this information is displayed on their other online platforms through a widget or hyperlink (Horn, 2011).

One key component of effectively using websites and social networking sites is helping teens find the sites. Regardless of how skillfully planned or how teen-friendly a site seems, if teens do not visit the site, it is not accomplishing its goal. Librarians need to make sure the sites are easy to use and that teens know the sites exist (Hilbun, 2011). Public librarians should reach out to local schools to find ways to advertise their sites to students, such as through school newsletters, school websites, posters, and signs (Hilbun, 2011). Today’s teens are targets of more media and advertising than any other generation, so marketing should be “authentic, funny, smart, and slick” (Goodstein, 2007, p. 153). In addition to sharing information in schools, libraries can seek out other community organizations that service teens and advertise with these organizations as well (Bishop & Bauer, 2002).

Once librarians establish teen websites and connect with teen followers, they must make time to keep the sites updated. Today’s teens expect their information to be current, so no matter which platform librarians choose, they must have a steady stream of information and regularly update their posts (Hannan, 2011). Librarians also need to frequently check all links to ensure that they connect teens to active websites, so that teens are not frustrated by broken links (Hughes-Hassell & Miller, 2003). In addition, librarians must consistently look for teen input and use that feedback to help determine what changes or updates need to be made (Casey & Savastinuk, 2006; Shay, 2011). Librarians should not be afraid to change tactics, platforms, or sites if what they are using is not working and/or if teens are pointing them in a different direction (Summers et al., 2011). Librarians must also spend time staying informed about the latest trends and technology issues by reading current blogs and websites (Kho, 2011). To ensure success, librarians need support from library administrators and should recognize that they may have to give up some duties they performed in the past to make room for these new online services to their teens (Kho, 2011). If libraries are using multiple platforms, all of these tasks become more time-consuming. However, this is time well spent because using a variety of platforms is essential for successfully reaching and serving today’s teens.

**Connecting through Mobile Devices and E-readers**
Technology changes quickly, and mobile devices are at the forefront of this change. While these devices have been around for a number of years, their usage among teens has grown dramatically. According to a Pew Internet study, 77% of teens ages 12-17 own a cell phone, and 87% of older teens (ages 14-17) own a cell phone (Lenhart, 2012). An update to this survey reveals that “66% of those ages 18-29 own smart phones” (Raine, 2012, p. 1). Teens primarily use their phones for text messaging and access to the Internet. Teens do not view these phones as toys, but rather as some of the most convenient tools to help them communicate with friends and family (Agosto et al., 2011). As one article noted, “far from being a source of isolation, the teen’s phone is a tether to loved ones; it is a personal object, a crucial connection” (Marwick & Boyd, 2012, n.p.)

Libraries need to find ways to tap into this technology. Currently, “among all the forms of digital communication, texting is the most ubiquitous among teenagers” (“Social Media, Social Life,” 2012, p. 17). Some libraries are already using text messaging to communicate with teens about library events and overdue book notices (Hannan, 2011; Hardacre, 2010). Teens should be able to access library resources via their cell phones and might want to contact their librarians through a “text-a-librarian” service (Agosto et al., 2011). In fact in regard to mobile access, a recent Pew Internet survey found that “13% of those ages 16 and older have visited library websites or otherwise accessed library services by mobile device” (Rainie, Zickuhr, & Duggan, 2012, p. 2). Librarians who want to reach more teens might even consider creating mobile applications that will allow teens to gain access to library services (Hannan, 2011). Librarians need to be aware that teens are reading more on their mobile devices (Zickuhr, Rainie, Purcell, Madden, & Brenner, 2012), so libraries should find ways to support this reading. Despite the prevalence of cell phones, librarians must be mindful that not all teens have access to mobile technology and that libraries, therefore, need to provide access to services in multiple ways (Agosto, et al., 2011).

Libraries must also decide how to best utilize other technologies that directly involve reading, like e-readers, e-books, and social reading applications. According to the Association of American Publishers, “as of February 2011, ‘US publishers sold more e-books than they did books in any other format, including paperbacks and hardcovers’” (Braun, 2011, p. 27). Teen e-book sales are becoming a larger portion of those sales, possibly as much as twenty percent of all sales (Braun, 2011). As many as one third of children and teens have indicated they would read more if they had access to e-books (Lamb & Johnson, 2011). Libraries are responding to these sentiments by maintaining growing e-book collections. Approximately 13,000 libraries, mostly in the United States, are already using OverDrive, a program which allows users to put e-books on e-readers, tablets, and some mobile phones (Springen, 2011). From 2010 to 2011 the number of young adult e-books checked out using OverDrive doubled from
two million to four million (Springen, 2012). The demand for e-books for teens is clear, and librarians need to be able to meet that demand. Teen patrons expect young adult librarians to be knowledgeable about the various e-reading devices teens use, so libraries should “provide a few e-readers to staff members to allow them to play with the devices and build expertise” (Kho, 2011, p. 52).

Teen librarians will face challenges in managing the e-collection and making it accessible to teens (Braun, 2011). Unlike traditional book collections, the e-book collection is not visible inside the library. As a result, librarians need to take a more proactive role in searching the e-book databases and monitoring circulation and hold numbers (Braun, 2011). Libraries should also help bridge the gap between those teens who have access to e-readers or other mobile devices and those who do not. Libraries should offer teens and other patrons e-readers to check out (Springen, 2012). According to a recent Pew Internet study, 60% of those ages 16-24 who do not currently borrow e-books from libraries say they would borrow pre-loaded e-readers if their library offered that service (Zickuhr, et al., 2012, p. 15). Libraries need to consider having e-readers available to teens and should advertise their availability through the library websites and social networking sites.

Another interesting aspect of e-books is the possibility for social reading; “with new e-reading apps such as Copia and Inkling, for example, it is possible to interact with others while reading an e-book” (Braun, 2011, p. 29). With Copia, users can track the books they have read, read new books, make notes while reading, and share those notes with other readers (“Copia,” 2010). Librarians should explore the possibilities for these new social types of e-reading so they can capitalize on teens’ desires to socialize and to use technology.

**Conclusion: Connecting in the Future**

As demonstrated in this literature review, effectively connecting with teens occurs in a variety of ways and through a variety of media, often involving technology. Public libraries can lay a foundation for making deeper connections with teens by making personal connections with teens in their communities. In addition to establishing in-person connections, libraries can take their services online where they can benefit from teens’ interest in technology. With input from teens, libraries can design, develop, and manage their websites to better serve all teens. Libraries can also use currently popular social networking sites, as well as mobile devices, to engage teens and serve their library needs.

As technology continues to change, the issues librarians must consider will change as well. In terms of in-house library technology, further study is necessary to determine how libraries can best provide teens with access to technology while addressing concerns about Internet safety and Internet filters.
(Lamb & Johnson, 2011). Libraries will need to periodically update their Internet use policies for all patrons, including teens (Jones, et al., 2004). These policies should consider teens’ interests, especially those involving social networking and emerging media. Public libraries should reach out to high school libraries and find ways to work together to help teens become competent researchers and responsible digital citizens. Also, librarians must determine the best ways to fund teen services. This includes funding the hiring and training of specialized young adult librarians as well as funding the purchase of suitable technology. The technology should not only support teens’ research needs, but also their friendship-driven and interest-driven needs. Librarians should consult YALSA’s guide “Speaking Up for Library Services to Teens” for suggestions on how to advocate for teens in their local communities (“Speaking Up,” 2011). Librarians must consider what type of technology hardware and software they will provide for teens at the library. They must also make wireless access available to teens who want to bring their own laptops and tablets to the library.

Technology and the Internet are constantly changing. To be successful in the future, librarians and researchers should stay current with advances and trends. Librarians should consider teens’ love of photos, music, and videos and find ways to incorporate these into their library services. Two social networking sites to study are Pinterest and Instagram; the number of teen and adult users on both of these sites is growing rapidly. Teens also enjoy watching and posting videos on YouTube, so libraries should consider ways to share information from the library on this site. Many of today’s teens are using their mobile phones and tablets to go online, take pictures and videos, and listen to music. More research should be done to determine how libraries can incorporate these mobile trends into teen library services. Libraries should also investigate using video conferencing tools, such as Skype, to reach out to teens. Libraries could use this technology to help connect teens not only to the library, but also to other teens and authors. By embracing changing technology and being willing to adapt, public libraries can continue to play a vital role in the lives of today’s teens. Libraries should explore these issues more fully and tailor services to fit the specific needs of their teens. In doing so, libraries will truly connect with teens and support their development into successful adults while at the same time helping them become lifelong users and supporters of public libraries.

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