Debunking the Librarian 'Gene': Designing Online Information Literacy Instruction for Incoming Library Science Students

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Information workers are not born information fluent. Like other students, incoming library science students enter graduate programs with a broad range of information and technology skills. The aim of this study was to determine if systematically designed online tutorials would be effective in preparing university students with information literacy skills. A needs assessment was conducted to identify what information and technology skills faculty expected of entering library students. A series of 46 online tutorials were used to address the required competencies. Pre-tests were designed to determine whether a particular student needed to complete a given tutorial. Post-tests and proficiency projects were used to determine whether students reached mastery. The results of the study indicated that this type of individualized instruction was effective in preparing library science students with information literacy skills. While the study focused on the library science program, the results may have applications for other types of information literacy instruction. There is a need to expand this individualized, self-paced tutorial approach to other information literacy courses in other disciplines.

Keywords: curriculum development, LIS education, instructional development, online tutorials, technology skills, information skills, information literacy

Introduction

Although it may seem to library users that librarians have information literacy skills woven into their DNA, this is not the case. Like any other university program, incoming library science students come to their studies with a broad range of knowledge and skills. While some pre-service librarians have extensive skills and experiences in information and technology, others have only basic information search skills. Although many younger students have been exposed to technology since childhood, it is incorrect to assume that these "digital natives" possess the information skills necessary to be successful in their university learning (Smith, 2012).

Background

The library science program in the Department of Library Science at Indiana University at Indianapolis (IUPUI) offers a master's degree 100% online. The program prepares graduates for a wide range of positions in school, public, academic, and special library settings. While some entering students already hold professional positions in librarianship, many incoming learners are just beginning their careers.

All students entering the program must complete an introductory course focusing on information and technology literacy skills. Like other courses in the program, the class has recently transitioned from a blended model to a totally online approach for instruction. Both students and faculty

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have voiced concerns about the efficiency and effectiveness of this introductory course. Some students feel that they do not need the course. On the other hand, many faculty members feel that even after completing the class some students are still unprepared for their coursework.

Purpose of the Study

The aim of this study was to determine if systematically designed online tutorials would be effective in preparing incoming library science students for the rigors of graduate school.

Literature Review

A review of the literature was conducted to provide a foundation for the research project.

Information Literacy Instruction

From online searching to research report writing, information literacy skills are necessary for success in graduate school and can have lasting benefits for students. Daugherty and Russo (2011) found that students applied what they learned in an information literacy course to situations such as database searching.

Many studies can be found in journals such as *Journal of Information Literacy and Communications in Information Literacy* that share successful examples of information literacy instruction. Some of these studies (Daugman, McCall, & McMahan, 2012; Gunn & Miree, 2012; Weiner, Pelaez, Chang, & Weiner, 2011) have focused on information literacy courses aimed at specific disciplines such as business, health care, and humanities. However, no recent studies could be found aimed specifically at courses for those planning careers in librarianship. Given this, there is a strong case to be made that there is a need for an entry level course for library science graduate students that provides these skills.

Learning Outcomes and Curriculum Mapping

The identification of learning outcomes is important in information literacy instruction (Lacy & Chen, 2013). These learning outcomes can be aligned with assessments to determine if students possess the required skills. Constructive alignment is a principle that stresses the alignment of learning outcomes with matching assessments and instructional activities (Biggs & Tang, 2011). This approach combines outcomes-based learning with constructivist thinking. By aligning learning outcomes with assessment learners have an understanding of their goal and how activities are aligned with assessment. This assists students in constructing meaning from what they learn.

Kaplowitz (2012) stated that educators should use a learner-centered approach to instruction that involves identifying exactly what learners should be able to do or talk about at the end of instruction. In this way, the emphasis is on whether students can demonstrate their knowledge and skills rather than on the act of teaching.

Many approaches have been used to identify the student competencies associated with information literacy and adapt information literacy standards to meet the needs of particular university disciplines. Tyron, Frigo, and O'Kelly (2010) used faculty focus groups to examine information literacy standards. They found it useful to adapt the university-wide document to address the needs of disciplines.

Curriculum mapping is an approach to identifying learning outcomes and matching them to instruction and assessment (Hale, 2008). Charles (2015) noted that an Information Literacy Curriculum Map (ILCM) provides the structure necessary for faculty to discuss specific information skills and how they will be addressed in the curriculum. By aligning information literacy competencies with specific courses, librarians, discipline-specific faculty, and accreditation bodies can see

where these skills are addressed. According to Charles (2015), this approach facilitates communication among interested parties and also assists in teaching and assessment activities. The approach is most beneficial when curriculum is being developed or revised. This process may include a wide range of stakeholders including librarians, administrators, faculty, and others.

Bester and Scholtz (2012) noted that a curriculum map is useful in designing instruction and matching assessments that meet the needs of students at particular points in their learning experience. Curriculum mapping is a useful process to bring faculty together and foster respect for the expertise brought by all instructors to the educational process (Uchiyama & Radin, 2009).

In this study, the curriculum mapping approach will be used to analyze the Library and Information Science curriculum. Through collaboration with department faculty, learning outcomes will be matched with instruction and assessment that address the information literacy needs of students.

Learners and Needs Assessment

Students enter both undergraduate and graduate programs with a wide range of backgrounds and experiences. In addition, learners have varying perceptions and understandings of the world. Learning styles and preferences, multiple intelligences, and personality constructs all play a role in student achievement. For instance in a recent study, Sachs, Langan, Leatherman, and Walters (2013) found that college students preferred interactive information literacy tutorials that relied more on visual elements than text.

It is necessary to consider diversity in learning when designing information literacy instruction (Kammerlocher, Couture, Sparks, Harp, & Allgood, 2011; Mackey & Jacobson, 2011; Russell, Ryder, Kerins, & Phelan, 2013). A wide range of tools have been used in needs analysis related to information literacy instruction including tests, surveys, interviews, observations, and focus groups. These tools can be used to identify gaps in student knowledge and skills (Gonzalez, 2009; Hoffmann, Antwi-Nsiah, Feng, & Stanley, 2008; Patterson, 2009; Silfen & Zgoda, 2008).

Some instructors use pre-tests and other assessments to measure student knowledge, skills, attitudes, and values prior to beginning instruction and adapt instructional materials based on these results (Ivanitskaya, DuFord, Craig, & Casey, 2008). This type of assessment can be built into online course materials through effective needs assessment prior to the design of instruction and also woven into the individualized learning materials (Higgins, 2010; Koneru, 2010; Kumar, Ochoa, & Edwards, 2012).

Kumar *et al.* (2012) conducted a needs assessment of incoming graduate students in online programs in education. They found differences in prior skills and experiences indicating the importance of conducting needs assessments, learner analysis, and program-specific instructional design. Specifically, they found the information literacy needs of distance learners vary widely, and that a needs analysis is useful in identifying needs and providing online support for students.

A needs assessment will an integral part of the information literacy instruction. This will allow graduate students to focus on filling gaps in knowledge and skills. Pre-tests and posttests will be built into the system.

Instructional Design and Development

Many instructional systems design models can be applied to the creation of instructional materials for teaching information literacy. A systematic approach is often used in the design and development of information literacy skills instruction (Booth, 2011; Kumar *et al.*, 2012). Most models include the same basic elements

known as the ADDIE (Analysis, Design, Development, Implementation, Evaluation) model. Popular models include Backward Design (Wiggins & McTighe, 2005), ASSURE model (Smaldino, Lowther, & Russell, 2014), the Kemp Design Model (Morrison, Ross, Kalman, & Kemp, 2012) and the ARCS Model (Keller, 2010).

The Dick and Carey Model (Dick, Dick, & Carey, 2014) is a more complex model than the others. It includes nine recursive stages: identify instructional goals, conduct instructional analysis, identify entry behaviors and learner characteristics, write performance objectives, develop criterion-referenced test items, develop instructional strategy, develop and select instructional materials, develop and conduct formative evaluation, and develop and conduct summative evaluation. This model has been revised every few years over the past four decades to incorporate new thinking about instructional design. It's focus on mastery learning and "chunks" of instruction make it particularly well-suited for this project.

When designing instructional materials, Gagné and Medsker (1995) suggested nine events of instruction including: gaining learners' attention, informing learners of objectives, stimulating recall of prior learning, highlighting key features, structuring learning, encouraging activity, providing feedback, assessing performance, and enhancing retention and transfer. These events are reflected in the development of materials produced in the Dick and Carey Model and fit well with the production of small, focused tutorials needed for this project.

Many instructional designers have created reusable learning objects. Reusable learning objects are a versatile way to address learning needs (Blummer & Kristskaya, 2009; Mardis & Ury, 2008). Russell *et al.* (2013) created online reusable learning objects to address a range of information literacy competencies. Reusable learning objects in the form of online tutorials will be built into the project.

Online Tutorial Design and Development

The number of online courses offered at institutions of higher education has grown steadily over recent years. This is particularly true in the library science area. The Distance Learning Standards of the Association of College and Research Libraries (ACRL, 2007) and the Distance Education and Training Council (DETC, 2012) highlight the need to support online students. This support for acquiring and updating information literacy skills is particularly important in online learning environments (Kumar *et al.*, 2012).

As an asynchronous method of delivering online instruction, online tutorials allow individualized, self-paced instruction. Students are able to work through the materials independently. According to Sult, Mery, Blakiston, and Kline (2013), the tutorial format allows students to increase their research skills in an authentic learning environment. Krüger (2012) notes the usefulness of using a micro-teaching approach in information literacy. She suggests the creation of very short, focused learning objects such as brief tutorials that allow for self-directed learning. These tutorials should incorporate opportunities for interactive learning and problem-solving.

While many studies have examined the use of tutorials in information literacy instruction, few have focused on the creation of a large number of tutorials as part of an entire course.A number of recent studies have demonstrated that online tutorials are an effective, efficient, and appealing way to teach information literacy skills. Best practices for tutorial creation include:

- Address diverse learning styles and preferences, intelligences, and personalities (Mackey & Jacobson, 2011; Russell *et al.*, 2013)
- Present students with clearly stated learning outcomes and expectations (Blummer & Kritskaya, 2009; Dewland, 1999; Oud 2009).

- Address different types of learning such as concepts and procedures (Dewland, 1999; McGuigan, 2001; Mestre, 2012).
- Provide students with immediate feedback regarding their performance (Dewland, 1999; Oud, 2009).
- Immerse users in an interactive environment where learners are active participants throughout the experience (Blummer & Kristkaya, 2009; Dewland, 1999; Mackey & Jacobson, 2011; Mayer & Chandler, 2001; Oud, 2009; Russell *et al.*, 2013; Weiner *et al.*, 2012).
- Provide flexible navigation and be self-paced (Su & Kuo, 2010; Russell *et al.*, 2013).
- Include practical, situational examples (Dewland, 1999).
- Be perceived as valuable learning experiences by students (Weiner *et al.*, 2012).
- Provide students access to the information they want and need to enhance their interest (Weiner *et al.*, 2012).

There is a need for tutorials that follow these best practices. For instance, although interactivity is a trait identified as important in online tutorial creation, Stiwinter (2013) found that none of the library tutorial studies evaluated in his literature review contained quality interactive features.

Challenges of tutorial development and use include the amount of time needed to create high-quality tutorials and the need for ongoing updates (Silver & Nickel, 2007; Su & Kuo, 2010). A number of studies (Alyse *et al.*, 2012; Daughman *et al.*, 2012; Gravett, 2010; Sherwill-Navarro & Layton, 2006; Xiao *et al.*, 2004) note the large time commitment necessary to produce high-quality, interactive course materials.

While many research studies explored the use of testing and tutorials in addressing information literacy instruction, few studies focused specifically on the skills of librarians, specifically pre-service librarians entering graduate school. This project will apply best practices associated with tutorial development in the creation of online instruction.

Methodology

A systematic approach was applied to the creation of instructional materials for this introductory course. The process included problem identification, curriculum mapping, instructional design and development, and formative evaluation and revision.

Problem Identification

Since the graduate program's inception, students have been required to take an introductory course focusing on basic information and technology skills. Over the years, the course has been taught by a variety of full-time and part-time faculty members with inconsistent results. Instructors indicated that students were not equally prepared for more advanced courses. For instance, while some students would have skills in creating a blog or using Excel, others would not.

In a survey of alumni, graduates indicated the importance of technology skills. A strong foundation of technology skills in the introductory courses lays the foundation for success with technology in the graduate program.

In an examination of course evaluations, some students indicated that they had many of the required skills upon entering the program and did not feel it was necessary to take the required introductory course. They noted that their time would be better spent on more advanced coursework. However, others felt strongly that the course was important in providing the foundations for other courses. These conflicting perspectives demonstrated the need for a new approach that would individualize the course materials to meet the diverse demands of learners.

Faculty were asked about their thoughts

regarding the introductory course and whether students were adequately prepared for their advanced courses. They indicated that while some students seemed well-prepared, others were lacking valuable entry skills. This lack of consistency in the ability of the introductory course to provide and prepare students was identified as a problem that needed to be addressed within the department.

The performance problem could be addressed with effective, efficient, and appealing instructional materials that were individualized, self-paced, and stressed mastery of information literacy knowledge and skills.

Curriculum Mapping

The process of curriculum mapping was used to identify and organize learning outcomes related to information and technology.

A chart identifying the learning outcomes of each course in the program was created. This was accomplished by examining the syllabi of courses currently offered in the program. The chart included each learning outcome. It also identified the course(s) the knowledge or skill was introduced, reinforced, or mastered in.

In addition, the learning outcomes were compared to the objectives found in fourteen library science introductory course syllabi found online. These courses were offered by similar American Library Association accredited library science programs. The objectives were also compared to national and international information and technology literacy standards including those from the Association of College and Research Libraries (ACRL) (ALA, 2000), the International Society of Technology in Education (ISTE, 2015), American Association for School Librarians (AASL, 2007), and Chartered Institute of Library and Information Professionals (CILIP, 2014).

The chart was distributed to department faculty who were asked about whether the chart correctly identified their expectations for student learning and whether there were additional knowledge or skills that needed to be added. In some cases, the learning outcomes were refined or clarified.These learning outcomes were organized into four categories including (1) basic technology and information retrieval skills, (2) collection development and productivity tools, (3) social media and participatory technology, and (4) advanced technology, ethics, and professionalism.

Instructional Design and Development

The Dick and Cary model (2014) was followed in the design and development of instructional materials. The process began with the development of an instructional goal stating that graduate students completing the introductory course would be able to apply information, library science, and technology skills to address problems in school, academic, public and/or special library situations. During an instructional analysis, a combination chart including both hierarchical and procedural elements was constructed for clusters of learning outcomes to ensure that no sub-skills were missed. Faculty were used as subject-matter experts to assist in examining the learning outcomes to make certain that the skills taught would meet the entry skill needs of their more advanced courses.

Next, the audience for the course was analyzed using graduate school applications and biographical sketches shared in previous offerings of the course. These sources revealed that students entering the program represented a broad range of academic backgrounds and professional experiences. It was likely that students would come to the course with varied information literacy skills and diverse needs.

Based on the instructional analysis and learner needs, performance objectives were written and matching assessment instruments developed. Two types of criterion-referenced assessment tools were created. For each performance objective,

either test items or practical demonstration items were constructed. Finally, three types of assessment instruments were generated: pre-test items, post-test items, and proficiency project items.

The instructional strategy chosen was based on the instructional goal and learner characteristics. It was decided that a self-paced, web-based approach would be used. The instructional experiences would include a series of pre-tests with prescribed tutorials, post-tests, and proficiency projects. The tutorials would include the following events of instruction: pre-instructional activities, presentation of information, student participate and embedded testing, and follow-through activities.

After testing two prototype pre-tests and tutorials, 46 instructional tutorials were designed and created using the software Adobe Captivate. The tutorials were uploaded to the Adobe Connect management system.

The computer-based management system was designed to address the diverse needs of learners. Students were only required to complete the tutorials for which they scored less than 85% on the pre-test. If they scored higher, completion of the tutorials was not mandatory and the choice about whether to complete was left up to the student. All students completed the post-test and proficiency projects.

The tutorials included active participation on each screen to meet the needs of adult learners. They also contained a mixture of text, images, audio, video, animation and other multimedia elements to address different learning styles.

Formative Evaluation and Revision

The instructional materials went through a two-step process of formative evaluation. First, department faculty were invited to explore the course materials and provide feedback. Second, a field trial was conducted with a small class of students. The results were carefully examined including their performance on pre-tests, tutorials, and proficiency projects. In addition, course evaluations were analyzed. Small errors in content, as well as typographical errors, were identified and corrected. Students indicated that they liked the approach.

Results

After offering the course for four semesters with a total of 131 students enrolled, data from the course pre-tests and post tests were examined along with proficiency project data. In addition, information from course evaluations was examined.

Pre-test and Post Test Data

The course was divided into four sections, each of which dealt with different aspects of information and technology skills. Each section contained 7–16 pre-tests depending on the number of sub-sections. The average scores from each pre-test were combined for the section mean. The mean pre-test score for Section 1 was 74%, Section 2 was 79%, Section 3 was 79%, and Section 4 was 76%. The average pre-test scores for some topics were as low as 61% and as high as 90% in others—reflecting the wide range of entry skills.

A score of 85% was required to pass the section. Students could review the course tutorials and practice pages and retake the exam multiple times if necessary to pass. All students completing the course passed the four exams.

Proficiency Project Data

In addition to the exam scores, a proficiency project was also required. Students could re-submit their project if additional information or editing was required. Few re-submissions were necessary. All students completing the course passed the project requirement.

The proficient project was divided into

four section: technology and information retrieval basics; collection management and productivity tools; social media and participatory technology; and advanced technology, ethics, and professionalism. Students were given specific tasks that required hands-on demonstrations of key competencies to show how skills apply in real-world situations. A few examples are shown below:

- Search Google by dragging an image in the Google Image Search Box. Provide the image and the search results. Also, be sure to provide a screen capture of your results. Discuss a situation when this option might be useful in a real-world setting.
- Conduct a search for your topic using a subscription database. Provide examples of how truncation, a proximity operator and Boolean logic could be used in your search with this particular database and your topic. Include an explanation along with screen captures showing your work.
- Create a book, article, and website citation using two different citation styles (a total of 6 citations). Be sure to identify the citation styles used. Use one of the online citation generators to create at least one of your citations.
- Add to the class Google Doc account a document entitled "The Value of Libraries." Add a "talking point" and short example of no more than a few sentences that will convince others of the importance and value of libraries. Use the same font as the first talking point, but change the color for your talking point. Add a comment regarding one of the other talking points on the list.
- Incorporate a video you produced into your website. Your video could be part of your introduction such as a short video welcome you uploaded to YouTube, it could focus on your ethics topic or personal interest, or it could be a short book trailer you create and upload to Vimeo. Or, something of your choosing. It doesn't need to be high quality. A smartphone generated video is fine.

Course Evaluation Data

Course evaluations indicated that students liked the approach. Of 121 students who completed the course, 107 students completed course evaluations. The results for each of the four course offerings were higher than both department and school averages (1 low and 4 high) at 3.54. Student comments reflected the appeal of the course. A sample of comments is shown below:

> "I liked that the course was asynchronous and I could work at my pace."

> "I learned how to use technologies that will help me in my career."

> "I feel like this course is going to prepare me, not only for subsequent classes in the Library Science program, but also for a career as a librarian."

Table 1 shows the course evaluation data for four classes between 2014 and 2015. The number represents the average (1 low and 4 high) for each class on a series of survey questions.

Follow-up Survey

In Fall 2016, a follow-up survey was sent to students who completed the course, but had not yet graduated or left the program. Twenty-three of eighty-five students completed the survey for a response rate of 27%. When asked about their skills on entering the LIS program, 39% indicated that they had "fewer library and technology skills" than their peers, 35% indicated they had "the same level," and 26% indicated they had more skills than their peers. Of those responding, 100% felt that the course met the goal of "leveling the playing field" for students entering

Table 1. Course Evaluation Data 2014–2015.

Survey Question	SS 2014	F 2014	S 2015	SS 2015
Goals/Objective Clear	3.77	3.72	3.85	3.85
Course Easy to Follow	3.62	3.77	3.76	3.85
Course Materials Helpful	3.69	3.68	3.81	3.58
Expectations Clear	3.69	3.70	3.79	3.77
Instructions Sufficient	3.54	3.72	3.79	3.69
Analysis Required	3.67	3.57	3.62	3.62
Critical Thinking Promoted	3.46	3.47	3.84	3.46
New Learning	3.23	3.61	3.70	3.69
Usefulness of Course	3.67	3.72	3.82	3.62
Course Average	3.63	3.68	3.78	3.67

the program and 96% felt the course was effective in establishing "the foundation for later graduate coursework" and helped prepare them for "the rigors of the LIS program".

Respondents were asked to think back on the most useful skills acquired in the course. The most frequently listed skills included webpage development, writing citations, building a blog, creating infographics, graphic design tools, open access programs, and search techniques. When asked about how they applied knowledge and/or skills learned in the course, they listed a wide range of graduate courses. Seven students stated that they felt the content was useful in most or all of their courses. Two respondents could not think of a time when they had used the information. Specific courses cited included beginning level courses such as Information Sources and Services, Acquisitions and Management of Knowledge and Information, Organization and Representation of Knowledge and Information, and Cataloging. More advanced courses listed included Marketing for Libraries, Digital Heritage, Digital Libraries, Information Architecture, Government Information, Information Systems, Information Instruction, History of Libraries, and Genealogy and Local History.

Examples of specific skills attached to specific courses included web page development for Information Architecture, Genealogy and Local History, Digital Libraries, and Digital Heritage and metadata in Organization and Representation of Knowledge and Information. Students also indicated that graphic design, digital note-taking tools, blogging, history of technology, and OPAC searching as useful in multiple courses.

When asked about skills that should be added to the course respondents suggested a number of software tools including contentDM, LibGuides, and Excel. Two respondents indicated that more search strategies would be useful and one suggested more coding.When given the opportunity to provide additional feedback, fifteen students responded. Eleven students specifically stated that they thought the course was useful, while two students indicated it was a waste of time. Two students expressed frustration that it was required in the program but did not count toward the total required courses. Three students indicated that they liked the self-paced approach. One student stated "I have been saying this since I took the s401 course two years ago: hardest class in my life, most challenging for a person not naturally technically inclined, yet the class was so beautifully set up that it was enjoyable, even the tests!"

Follow-up Curriculum Development

In the three years since faculty were asked to participate in the curriculum mapping phase of the project, other collaborations have emerged. Faculty now share their instructional development activities in a cloud-based folder and encourage others to incorporate ideas and discuss course content sequencing and overlap. For instance, a faculty member working on a Preservation course has asked for feedback regarding entry skills and overlapping course content. Part of this new openess to cooperative planning may be the availability of easy-to-use collaborative online tools. Faculty continue to make suggestions for the entry course which seems to indicate that they are invested in the curriculum planning beyond their own courses.

Discussion

Based on the results, the course was found to be effective, efficient, and appealing. As anticipated, many students entered the course with some information literacy skills.The pre-test data indicated that many students did not need to waste time completing all of the tutorials. Because many students come into the program with information and technology skills, the individualized approach ensured that students only completed the necessary tutorials unless they wanted to explore further on their own.The posttest data demonstrated that the tutorials provided instruction that assisted learners in acquiring the knowledge and skills to master the required content.

The proficiency project data indicated that students could discuss and demonstrate the required knowledge and skills. The course evaluation data show that students enjoyed the course and felt that it was worthwhile.The follow-up survey data indicates that students found the course to be effective in "leveling the playing field" at the beginning of the program. In addition, most were able to apply the knowledge and skills during their graduate program.

Limitations and Future Directions

Although only four semesters' worth of data has been collected, the preliminary results demonstrate that the introductory course was effective in helping students master the learning objectives. Because of the large number of tutorials, ongoing updating and maintenance of the tutorials has proven to be a time-consuming task. Other researchers have also identified this as a major obstacle to the use of self-paced tutorials in instruction (Alyse *et al.*, 2012; Daughman *et al.*, 2012; Gravett, 2010; Sherwill-Navarro & Layton, 2006; Silver & Nickel, 2007; Su & Kuo, 2010; Xiao *et al.*, 2004). This study examined a single library science graduate program, however there is a need for information literacy instruction across disciplines. The individualized, self-paced tutorial approach could easily be adapted to address information literacy needs in other academic areas.

Conclusions

Library and information science students are not born with information literacy skills. Instead, they come to their courses with a broad range of skills. While some incoming students only need to fill in a few gaps in their background knowledge and skills, others require extensive information literacy instruction to be ready to undertake their studies effectively. The results of the study indicated that the introductory information and technology literacy course was effective in preparing entering library and information science students. The course evaluations indicated that students liked the approach. After completing additional coursework, students indicated that the knowledge and skills acquired in the course were useful in their graduate program. Finally, faculty involvement in the process has generated interest in additional, collaborative curriculum development projects. Programs across all subject disciplines could benefit from examining the information literacy

entry skills of their students to determine what individualized, self-paced tutorials could be designed to better prepare their better students for successful learning experiences.

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