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# A Faculty–Librarian Collaboration Success Story: Implementing a Teach-the-Teacher Library and Information Literacy Instruction Model in a First-Year Agricultural Science Course

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## ABSTRACT

Teaching information literacy requires a constant and evolving paradigm shift in today's fast-changing technology era. Add to this the intricacy of agricultural science education, and it becomes clear that instructors face challenges teaching the necessary research skills to prepare the next generation of scientists. Two faculty members in Colorado State University's College of Agricultural Sciences identified a need to redesign a core agricultural science course after observing their students struggle with research and writing. These professors improved their course through a redesign program that connected them with librarians. This collaboration led to the creation of a scaffold to help students build information literacy skills through a first-year agricultural science course. In this paper the authors discuss this collaboration, including four key factors to the program's success: a) a faculty–librarian partnership through a learning and teaching institute; b) early exposure to information literacy skills in a first-year agricultural science course; c) the integration of a research guide in a Learning Management System (LMS), and a step-by-step library and information literacy instruction session with a library assignment; and d) a teach-the-teacher model using graduate students from the respective discipline. The authors also analyze student evaluation outcomes and reflect on future improvements.

## INTRODUCTION

The development of information literacy and instruction is often challenged by rapidly changing technology. In addition, information literacy competency in the sciences has further challenges that continue to become more complex. The American Library Association/Association of

College and Research Libraries/Standards for Science (ALA/ACRL/STS) Task Force on Information Literacy for Science and Technology (n.d.) developed a living document, "Information Literacy Standards for Science and Engineering/Technology," to expand on the ALA's "Information Literacy Competency Standards for Higher Education" (2000) and provide additional guidance for information literacy in the sciences. Both sets of standards address the information literacy needs of the next generation of agricultural scientists.

The authors compared the two standards to identify and highlight some of the intricacies of science information literacy. While the standards have much in common, the ALA/ACRL/STS Task Force's emphasize the complexities stemming from evolving scientific research method developments and growing sources of data, such as interdisciplinary collaborations, experimentation, and laboratory research. In doing so, these standards establish unique learning objectives for students in the sciences.

The "Information Literacy Standards for Science and Engineering/Technology" (hereafter "Standards for Science") suggest that students in the sciences, versus their nonscience peers, have search parameters heavily limited to finding peer-reviewed articles. Such articles can be more challenging to identify and obtain due to cost and copyright restrictions. Furthermore, the interdisciplinary and data-driven nature of science often results in information sources indexed in a diversity of mediums, each of which requiring particular skills and knowledge. Examples of these mediums specifically mentioned in the "Standards for Science" include multimedia, database, website, dataset, patent, geographic information system, three-dimensional technology, open file report, audio/visual, book, graph, and map. In addition, major sources of scientific information are the experiments performed by the information seekers themselves.

Probably the main difference between the two sets of standards involves the skills required to evaluate scientific literature. The "Standards for Science" emphasize the importance of students understanding the structure of scientific papers, and the proficiency needed to apply the various sections of such articles in their own papers. In *Scientific Writing: Thinking in Words*, Lindsay (2011) discusses the idea that many students do not receive formal writing training. Likewise, writing and reading scientific articles are skills that are most lacking among scientists themselves. Lindsay emphasizes that science is usually written for other scientists in a unique way that is almost opposite to what nonscientists are used to, which may be a challenge to new scientists. In addition to the skills necessary for reading, writing, and understanding scientific articles, science students need to develop the competency to understand the cycle of scientific information, as well as how the credibility of information changes throughout that cycle.

Another variation that cannot go unmentioned is the fundamental idea that scientific inquiry is objective and unbiased. The "Information Liter-

acy Competency Standards for Higher Education” (hereafter “Standards for Higher Education”) state that the information-literate student is able to determine “whether to incorporate or reject viewpoints encountered” (ALA, 2000, p. 12). However, not incorporating viewpoints found in sound scientific research would invalidate the writer’s individual research. The “Standards for Science” emphasize this skill in more detail by stating that students should include all pertinent information, even information that goes against their view, and that they include it in a nonbiased way. Thus the prescribed skill is not only to evaluate viewpoints but rather to analyze data, methodologies, and research outcomes to determine whether sufficient evidence is provided in the selected information sources in order to accurately and reliably answer the research question. It can be difficult for students to understand and engage with this core scientific concept.

Both sets of standards have been in use for some time and used and adapted by librarians to varying degrees. The authors also examined a more recent ACRL publication, “Framework for Information Literacy for Higher Education” (hereafter “Framework”) (2015) and affirmed the existence of an information literacy difference for students in the sciences. The “Framework” was introduced as a tool to guide librarians in the quickly changing world of information. Kuglitsch (2015) explains that the threshold concepts that make up the “Framework” are general in order to adapt to the varying information literacy needs of diverse disciplines. Kuglitsch emphasizes the distinct and demanding information literacy needs of those in the sciences, and the need to keep these differences in mind when using the “Framework.”

By examining the “Standards for Science,” “Standards for Higher Education,” and “Framework,” the authors build support for an initial observation that science students require a unique set of skills to help them identify, understand, produce, collaborate, and share information. This unique set of required skills adds additional layers of complexity for information literacy instruction to students in the sciences. Agricultural science is no exception to this complexity, requiring agriculture librarians to revise their information literacy instruction practices to meet these specific needs.

Faculty members often lament the research and writing skills of their students, and Colorado State University (CSU) faculty are no exception. After observing their students struggle with research and writing, two faculty members in the College of Agricultural Sciences turned to CSU’s The Institute for Learning and Teaching (TILT) for help. Ultimately, the faculty members created and then redesigned a course, and in the process began an ongoing partnership with CSU Libraries. This partnership introduced the professors to the term *information literacy*, and it continues today as a successful collaboration.

This paper highlights the indicators of success for this faculty–librarian collaboration through four key factors:

- A faculty–librarian partnership through a learning and teaching institute
- Early exposure to information literacy skills in a first-year agricultural science course
- The integration of a research guide in a Learning Management System (LMS), and a step-by-step library and information literacy instruction session with a library assignment
- A teach-the-teacher model that employs graduate students from the agriculture department

The authors also analyze student evaluation outcomes and reflect on future improvements

#### A FACULTY–LIBRARIAN PARTNERSHIP THROUGH A LEARNING AND TEACHING INSTITUTE

In 2007 new state mandates led two professors in the College of Agricultural Sciences to apply for a grant from TILT. This institute can appropriately be referred to as the campus’s lab for investigating and improving learning, teaching, and student success. Among many programs, TILT administers an annual Provost’s Course Development Competition with the goal to “enhance learning, increase engagement, and promote pedagogical innovation through the design and redesign of undergraduate courses across the University” (TILT, n.d., n.p.). Award recipients are referred to as TILT teaching fellows. As a result of being awarded a grant, the two professors created *Plants and Civilizations (AGRI 116)*—a course that met the state mandates. Two key elements that were incorporated during the 2007 course creation were an emphasis on the development of critical thinking and writing skills and the use of active learning exercises in weekly small-group (twenty-five students) recitation sections. The professors fostered the development of critical thinking skills through activities and assignments that prompted students to

- find information;
- evaluate the quality and bias present in information and information sources;
- synthesize information from different sources;
- develop new ideas or theses; and
- effectively communicate these new ideas.

Initial participants in the course creation were the two professors, two senior teaching assistants, an expert in integrating writing across the curriculum from the Department of English, and librarians.

Over the next several years the professors and graduate teaching assistants (GTAs) noted that the most common pitfall for students in the writ-

ing process was poor research practice. Among other issues, the professors and GTAs felt that the students did not have the research skills associated with natural sciences research and writing; they also discovered that the use of academic sources in scientific writing was not understood by the undergraduate students, and that the greatest challenge the students faced was finding the information they needed to write their papers. Too many students did not get past a simple web search (via Google) and relied upon sources like Wikipedia or About.com, with or without attribution. Papers that relied upon these “lowest common denominator” sites were at best unoriginal and at worst contained substantial amounts of plagiarized material. Meetings with students who sought help with their assignments often confirmed these observations. A common complaint was that “I can’t find anything about my plant.” When discussing the need to come up with a more interesting or novel thesis, many students did not know about sources beyond Wikipedia.

To address these issues, instructional designers at TILT recommended that the professors seek a librarian’s advice. Learning and teaching institutes are ideal places to connect librarians with faculty. Instructional designers at TILT created an internal document, “The Learning Ecologies Framework,” as a model focused on incorporating existing programs and resources on campus to support courses (Beaty & Chapman, 2012). Through this model, TILT has fostered partnerships with a variety of campus agencies. Librarians are included in this learning ecology model and are identified as a vital resource for their knowledge and experience in successfully integrating library resources and research skills into class assignments. Furthermore, CSU librarians have a long history of collaborating with TILT (Hoseth, 2009). Librarians have contributed to TILT by compiling information sources, designing research guides, participating in resource fairs, teaching short courses, providing workshops about designing effective library assignments, and teaching critical thinking skills.

The amount of librarian participation in the course creation or redesign process depends on the needs of faculty members and their inclination to work with librarians, and librarians’ fluency in communicating ways in which they can be an asset to the process. The TILT teaching fellows may or may not have an idea of the resources they will need in order to carry out their vision in creating or redesigning their courses. They may or may not choose to work with a librarian due to possible preconceived notions. If a librarian is requested, it is up to him or her to accurately express the potential for collaboration. In other words, while it is important to ask faculty about their research and library service needs, it is equally important for the librarian to assess those needs and communicate how the librarian can assist. This skill is necessary, because often times faculty members are not aware of the types of input librarians can offer, and furthermore may not know how to ask. For example, faculty may naturally

request a list of resources to support student research, yet may not know how to ask for research-assignment consultation, library and information literacy instruction, or a multifaceted research guide. Librarians can bring a wide spectrum of skills to improve course development and design, and communicating these skills comprehensively is vital to both the faculty-librarian collaboration and the partnership with the learning and teaching institute.

Based on the student's research challenges and conversations with librarians, the professors recognized the need for a new approach to teaching research skills. They returned to TILT and the Provost's Course Development Competition and applied for the grant for a second time to redesign the AGRI 116 course and improve information literacy. A second grant was awarded, and changes were implemented in spring 2013 (see fig. 1).

### EARLY EXPOSURE TO INFORMATION LITERACY

From the start of the faculty-librarian collaboration, both parties recognized the added value of redesigning a first-year course such as AGRI 116. As mentioned above, students need to know how to assess new information and acquire new research skills, whatever their major, and will need to be able to do so at an increasing rate. Many students do not learn these skills in high school, and they often do not realize their deficiencies in this area (Julien & Barker, 2009; Varlejs & Stec, 2004). Since these skills could benefit students throughout their entire university career and beyond, academic librarians attempt to connect with early career students in order to best prepare them for academic success. In addition to exposing students to these important skills, another benefit of early exposure is that they can develop relationships with the library and its resources (Murphy, 2014).

First Year Experience (FYE) information literacy instruction, targeting students in their first year of college or university, is a common practice that has been around for many years. The programs differ from institution to institution, but they mostly serve as an introduction to the library and/or university and provide students with basic research skills (Jamelske, 2009). At CSU the principal FYE instruction takes the form of one-shot introduction sessions as part of the CO 150 College Composition course. Furthermore, embedding an information literacy program in an English or writing course has been a longstanding practice at CSU and has the benefit of reaching many students early in their studies. AGRI 116 has provided librarians another opportunity to reach early career students within their academic disciplines.

AGRI 116 is a large (270 plus students), lower-level course. It is not a prerequisite for any other course at CSU; instead, it is one of approximately two-dozen courses that can be used to fill the university's All University Core Curriculum requirement of three credits in a course that addresses global and cultural awareness. The course uses a multidisci-



Figure 1. Timeline of the AGRI 116 course's creation and redesign.

plinary approach to examine the relationship between humans and plants across cultures and through time. As mentioned earlier, an explicit goal of the course is to improve students' critical thinking skills, and specifically written communication and information literacy skills. These skills are fundamental to success in any major and lead to a second goal: to increase first-year student engagement and lower drop-fail-withdraw rates in this and subsequent courses and increase student retention and success.

The goals of this course provide opportunities for an embedded librarian to expand on early exposure to information literacy, which also allow for the introduction of research skills with a scientific focus to a wide range of students, including those with a limited scientific background. The following section in this paper will describe the learning objects (for example, assignment, research guide, and instruction) created to address the information literacy goals for this course—the third factor in our faculty-librarian collaboration achievement, and a palpable result of the collaboration.

### LIBRARY RESEARCH GUIDE AND INSTRUCTION WITH ASSIGNMENT

The goals of AGRI 116 are most fully realized in a term project, where students pick a plant and investigate, analyze, and present the interactions between their plant or plant product and human civilizations. They explore its history (social, cultural, natural) and biology, along with any economic, legal, or policy issues in a seven-to-eight-page academic paper. The paper is assigned the second week of the semester, and students receive credit for completing three steps prior to turning in the final version:

- A library assignment where students are tasked with finding, evaluating, and annotating potential sources for the paper (due in week 5)
- A one-page title and prospectus that contains a thesis statement and enough background information for the instructors to determine if the paper is viable (week 8)
- An in-class peer-review session in week 11

During the course creation a library assignment was designed. It requires students to conduct preliminary research before they are introduced to library resources in a fifty-minute instruction session taught in a

library's computer classroom. Then they are required to finish the library assignment after the library session by providing eight-to-ten citations that could be relevant for their project, and annotating and evaluating these sources.

This approach, designed in the initial course creation, has been largely successful. However, as stated earlier, there were areas needing improvement. During the course redesign three projects were identified to address the information literacy issues noted by the professors and GTAs. The first project was to refresh both the content and layout of the research guide to support the three steps mentioned above. The second was the redesign of the library instruction session to better address common problems that the professors were noticing in the students' research. And the third project involved embedding the library research guide into an LMS.

Before the course redesign, the library research guide was based on resource types (that is, a bibliography). For example, the research guide tabs were based on "finding articles," "finding books," and "web links." The new research guide is based on a process that presents library resources as the students complete their term project (see fig. 2). Supplementary to library resources, the guide includes video clips borrowed from other university libraries to explain fundamental concepts, such as "What are library databases?" The research guide also showcases a table that assists students in evaluating different types of sources, along with a guide to evaluation using the CRAAP test, which looks at the currency, relevancy, authority, accuracy, and purpose of information. The CRAAP test was originally developed by librarians at California State University's Meriam Library. Although professors at the college level expect students to know how to write a thesis statement, it is clear that not all students have this skill. To aid in this problem, a PowerPoint presentation from Oakton Community College in Des Plaines, Illinois, was rebranded for CSU and used to establish how a thesis statement should read. The research guide lives in the library's website. However, a link to the guide is embedded directly on the homepage of the LMS course website (see fig. 3). Embedding a link in the LMS provides a single location where students can get all the information they need for the class and assignments.

Similarly, the former instruction session was also based on information source formats. First, pointing out the difference between using Wikipedia and library databases, then showing the library's catalog, and finally teaching the students how to use Academic Search Premier, CAB Abstracts, and Web of Science. The purpose of the new library instruction session is to deliver another step-by-step process that emulates the information-gathering process that agricultural scientists would most likely follow (for example, including exploring a variety of sources and critically evaluating the information found), and provide a model that students could follow as they conduct their own information-gathering process. The instruction session



Figure 2. The AGRI 116 research guide, designed to assist students as they complete their term project through the research process.



Figure 3. Screenshot of the research guide embedded in the LMS.

is modeled after the research guide so that the process ties into the layout of the guide (see fig. 4). Furthermore, the new instruction is responsive to the students' likely general research skill level in order to "meet them where they are." The session begins by highlighting the benefits of using Google and discussing why it works so well; this section is called "Starting your search." The conversation then transitions to "Taking your search to another level" by discussing the challenges of using Google and how library databases help overcome those challenges.

During this second step of the instruction, another process is introduced that students can follow when navigating library databases. This five-step process is used to teach search skills in three library databases

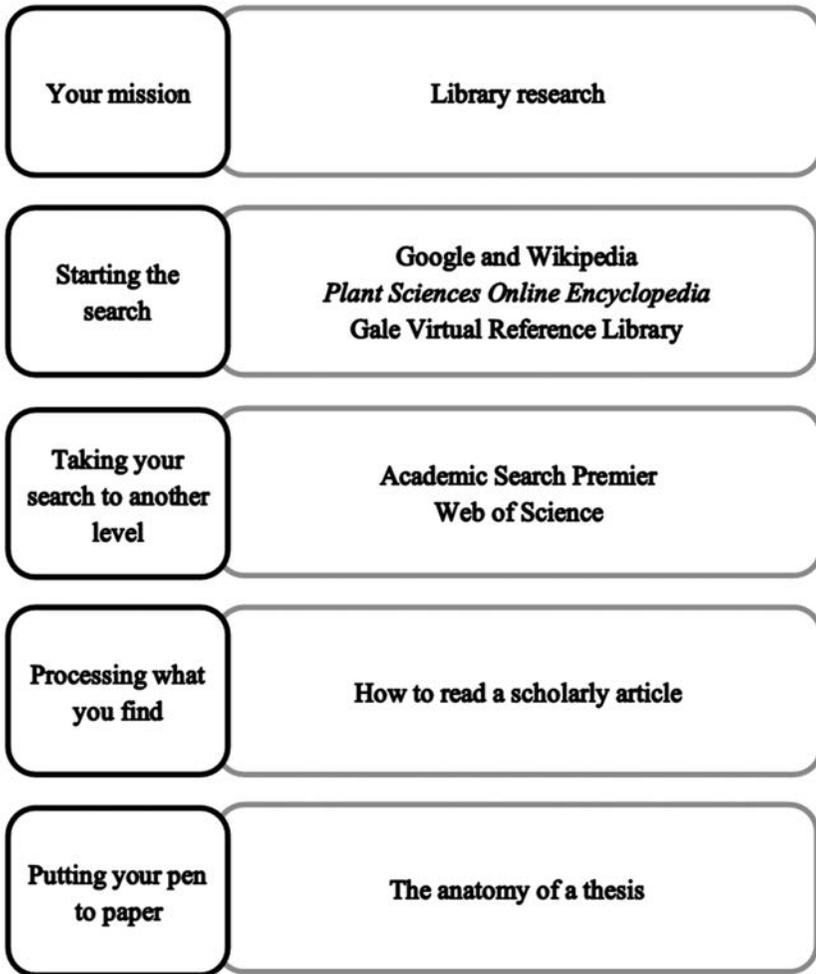


Figure 4. The step-by-step process shown during the instruction sessions.

(Academic Search Premier, CAB Abstracts, and Web of Science). The process was developed by the librarians for this course and offers students a tool they can use with any library database, regardless of the interface. The five steps of the process are:

- Step 1: Start with a broad search.
- Step 2: Refine the search by using limiters.
- Step 3: Retrieve the articles by saving, printing, or emailing.
- Step 4: Evaluate the credibility of the article.

- Step 5: Use the citation tools to aid with proper attribution.

The librarians created an acronym, SRRCC (Search, Refine, Retrieve, Credibility, Cite), in hopes of making it easy for students to remember the process. When pronounced out loud, the initials sounds like the abbreviation *circ.*, alluding to the circular process of using library databases. An infographic to illustrate this process was created and included in the research guide (see fig. 5).

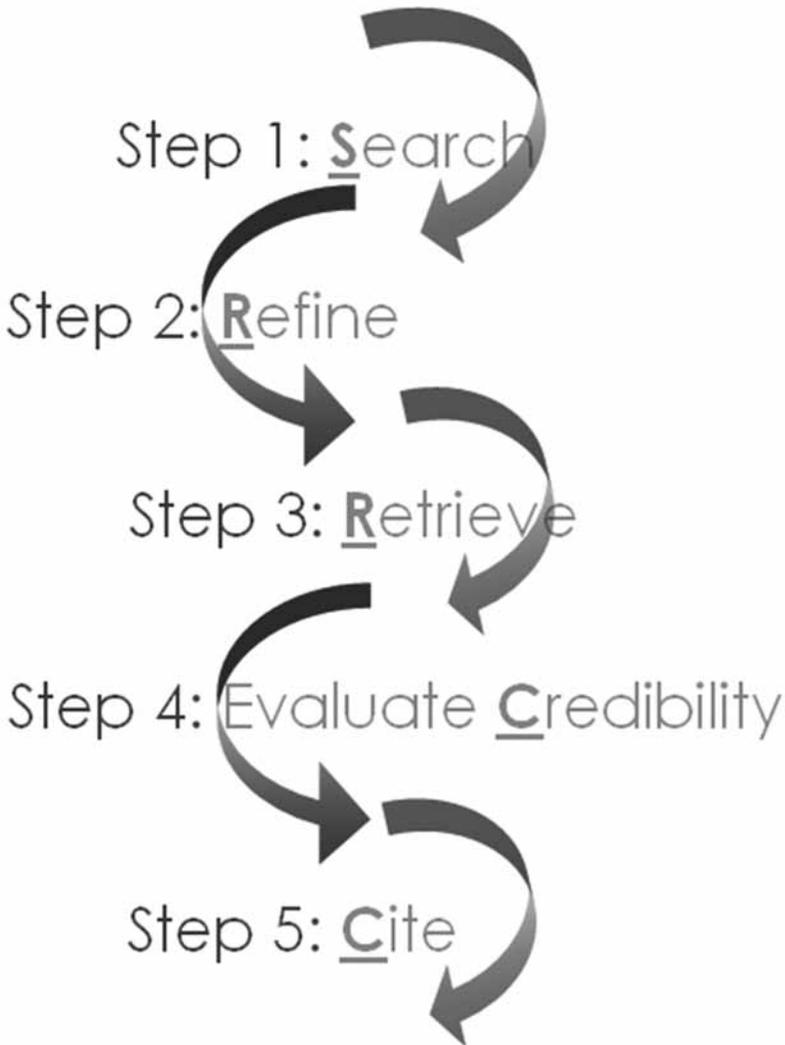


Figure 5. The five-step process used to teach students how to navigate library databases.

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The last two steps of the library instruction, “Processing what you find” and “Putting your pen to paper,” review basic skills that students need in order to write a quality paper and address common problems perceived in past research papers submitted by students. For example, trying to read the scientific articles gathered can be overwhelming to students. To address this common issue, the video “How to Read a Scholarly Article” by Western University in London, Ontario, is used. The instruction session ends with fifteen minutes of hands-on time for students to practice the processes taught and to ask questions.

This process-based research guide, instruction, and assignment offers an alternative approach to a traditional library session and has been well-received by both the course professors and TILT. An unforeseen outcome of this positive reception has been the use of this model and course as an example for other TILT redesign courses.

The next section will reveal how library instruction is incorporated into the course.

### THE TEACH-THE-TEACHER MODEL

After trying several different models of library instruction for AGRI 116 (for example, one librarian teaching all recitation sections; all available librarians rotating to teach recitation sections; and so on), the teach-the-teacher, or train-the-trainer, model (TTT) was finally determined to be the most effective. This model involves training nonsubject experts in order to have them teach others. It is often used when a large number of individuals, such as in a large enrollment class, need to be reached. The TTT model provides librarians with a solution to reaching a large number of students without incurring a huge increase in time commitment. A literature search suggests that this model is not yet widely used by academic libraries for undergraduate information literacy instruction, although it is the model used at CSU for the FYE core-required College Composition course. A good example of TTT outside of an FYE course is the model developed by librarians at the University of Kentucky (UK) for a biology class that uses library science (MLIS) students as teachers (Hartman, Newhouse, & Perry, 2014). The UK librarians train the MLIS students, who then teach three information literacy sessions in the laboratory sections of the biology class. The TTT model that is implemented at CSU for the AGRI 116 course has similarities, but differs in various ways, including the fact that agricultural sciences GTAs are used as teachers rather than MLIS students.

#### *The TTT Model Used at CSU*

Upon the initial creation of the AGRI 116 course in 2007, there was a series of weekly recitation sections in addition to the large weekly lecture. These recitation sections allowed the library instruction to occur in smaller

classes, but it also meant that more classes needed to be taught. Initially, the library instruction responsibilities were shared by several librarians. This allowed the students to be reached in smaller and more intimate class sessions, while not burdening one librarian with all the sessions. Most of the librarians only had to teach one, or occasionally two, sessions each. As in many academic libraries, the duties of the librarians keep mounting, often concurrently with decreased staff size. With these events occurring at CSU, using multiple librarians was proving to be inefficient and not the best use of resources. In the spring 2013 semester, as part of the course redesign (second grant from TILT), the librarians and professors decided to implement the TTT model for AGRI 116 in an attempt to lessen the load on librarians. In the first trial of the model, one designated librarian met with the professors and GTAs in order to provide information and discuss the desired outcomes and instruction plan. The GTAs were trained by the librarian in a one-hour session a few days before the library instruction sessions. On the day of the library instruction, the librarian would teach the first of three recitations led by each GTA. Most of the GTAs then taught their remaining two recitation sessions while the librarian observed and assisted as needed.

To further decrease the burden on the designated librarian, the TTT model was adjusted slightly again for the fall 2014 semester. The GTAs continued to be trained in a one-hour session; however, they were given the option to teach all three of their individual sessions themselves while the librarian observed and remained available. At this point many of the GTAs had been involved in the library instruction for at least one prior semester, and as a consequence all opted to teach all of their own recitation sessions. The librarian continued to sit in on the classes in case there were other questions and to assist as needed. Due to increased pressure to spend less librarian time teaching in this course, the following semester the designated librarian sat in only on the first of the three recitation sessions for each new GTA, and in no sessions for experienced GTAs who were comfortable with the material. The librarian was nearby and “on call” when not in the classroom, and checked in after at least the initial session for each GTA. This method allows for any errors or concerns of the GTAs to be addressed while further decreasing the time commitment of the librarian; additionally, it also allows for each GTA to have more flexibility. In discussions with the GTAs over the years, it became apparent that some of them knew the content and felt more comfortable without the librarian observing, while others felt more comfortable with the librarian being around. In the most recent semester, one GTA expressed concerns and requested the librarian co-teach the sessions. Since the other GTAs were experienced and comfortable without the librarian, it was not an excess burden to accommodate this GTA and provide the time needed to co-teach.

*Outcomes of the TTT Model Use*

Initially, GTAs were trained as the information literacy teachers simply because they were already leading the recitation sessions. However, training them provided multiple unintended benefits beyond freeing up the librarian's time. To begin with, the GTAs are subject experts in agricultural sciences and most likely have had some exposure to information literacy. Additionally, the GTAs have direct and frequent contact with the professors, who can reiterate the importance and purpose of the library assignment and instruction, as well as with the undergraduate students who may find themselves with research questions throughout the semester. Their experience with agricultural research and education, combined with their previous and continued exposure to library research skills, allows them to teach the skills in a way that may be more relatable to undergraduate students in an agricultural science class. Being scientists themselves, they model research and information-seeking skills as scientists. Furthermore, the undergraduate students are more familiar with the GTAs and thus likely to be more comfortable learning these skills from them. This familiarity also allows the students to obtain early exposure to libraries from someone they trust and positively reinforces any early exposure they may have had to the library through other FYE information literacy courses.

Students may be reluctant to engage in a library instruction session because they may feel that they already know how to engage in research and do not realize that they could learn new beneficial skills. If they do find themselves needing assistance, students tend to go to people they know and trust before coming to the library (Murphy, 2014). Having someone they already regard as a knowledgeable instructor, such as a GTA, lead the library instruction session makes the lesson seem more valuable. The trusted and familiar GTAs not only teach the information literacy skills, but they also become another ambassador for the library. Winterman (2009) makes the point that employing GTAs helps the undergraduate students feel more confident that the skills being taught are skills that they can master, since the GTA is regarded as a "near-peer," while the professor or librarian is seen more as an expert, with years of experience and unfamiliar priorities.

A similar TTT model to the one used in the AGRI 116 course is used at the University of Colorado, Boulder (CU-Boulder) in a large-enrollment arts course using disciplinary (art history) graduate students (Watkins & Morrison, 2015). Watkins and Morrison utilized a TTT model for similar reasons: to provide information literacy sessions to more students, in smaller, more intimate classes. The CU-Boulder TTT model implemented library instruction scaffolded over two semesters in two art history courses, which, in addition to being a different discipline, means that their outcomes and strategy differ slightly from the AGRI 116 TTT model. Even with these differences, however, there are many similarities, and both in-

stances of using the TTT model found positive results not only for the target undergraduate students but also for the GTAs, in addition to the obvious time benefits for the librarian and professors.

Likewise, in 2000 the University of California, Irvine (UC-Irvine) compared a variety of library instruction models, including a TTT model (Palmer & Ford, 2000). This trial also found that there were benefits to the GTAs, as well as to undergraduates. However, the TTT was not continued at UC-Irvine due to time constraints involved in training the constantly changing and often first-year graduate students.

The benefits to the GTAs in all of these instances include their own improved research and information literacy skills. A 2013 study conducted by Mbabu, Bertram, and Varnum showed that the use of library databases decreased as the level of study increased (that is, freshmen and sophomores used library databases more than juniors and seniors). The graduate students involved in TTT models not only have to refresh their own skills well enough to teach undergraduates, but the act of teaching itself and questions asked increase their levels of exposure and expertise.

### STUDENT EVALUATION OUTCOMES

In the spring and fall 2015 semesters, student perceptions of the course were measured via the Student Course Survey, an anonymous survey given at the end of each course to all students at CSU. Students were asked how they perceived the value of six different activities or resources applied in the AGRI 116 course. Each activity was designed to improve student research and writing skills to meet the goals of the course (see table 1). Of the activities and resources presented, students perceived the meetings with their GTA the most useful, followed closely by the online library research guide. However, far more students used the library research guide (more than 65 percent in the spring, nearly 83 percent in the fall, based on the percentage of students that responded to the question) than took the time to meet with their GTA outside of class (33 percent in the spring, 62 percent in the fall). The library instruction session did not score highly with the students. It would be interesting to determine if these lower scores reflect the true value of the presentation, or if they represent a preference for active learning exercises over a more traditional lecture format.

The impact of the course changes was also explored by examining how the percentage of students who complete the final paper has changed through time. So far, there is no evidence that there is a strong effect: in both spring and fall 2012 (pre-course redesign) the percentage of students that completed the required term paper was 92.9 and 94.2 percent, respectively. The two semesters immediately following the course redesign had completion rates of 98.2 and 94.9 percent, respectively. Due to the variability of GTA grading styles and grade curves, the grades of the final papers have not been compared.

Table 1. Student perceptions of the value of six different activities or resources designed to increase their research and writing skills.

<i>Supplemental questions</i>	<i>Spring 2015</i>			<i>Fall 2015</i>		
	<i>Mean</i> <sup>1</sup>	<i>Rank</i>	<i>% responding</i> <sup>2</sup>	<i>Mean</i>	<i>Rank</i>	<i>% responding</i>
The library research assignment helped me to improve my research and writing skills	3.63	3	85.44	3.444	5	92.47
The title and prospectus assignment helped me to improve my research and writing skills	3.49	4	83.54	3.54	3	91.78
The peer-review process helped me to improve my research and writing skills	3.38	5	82.28	3.51	4	92.47
Working with my recitation instructor during office hours helped me to improve my research and writing skills	3.74	1	32.91	3.82	1	62.33
The library instruction session helped me to improve my research and writing skills	3.33	6	79.75	3.31	6	89.73
Visiting the course library guide helped me to improve my research and writing skills	3.68	2	65.19	3.6	2	82.88

Notes: <sup>1</sup>Mean: mean response to each question on a five-point Likert scale; <sup>2</sup>% responding: percentage of students that answered the question with a response other than "not applicable."

The student surveys suggest that the research guide is a valuable resource. Evaluating usage stats seems to corroborate this conjecture, and to indicate that students are following along during the library instruction sessions. For the fall and spring 2015 semesters, the highest use of the research guide was on the days of the library instruction sessions, totaling around 1,500 views each semester during those two days. Although its use dropped off after the sessions, it did not vanish altogether. The guide's use has been steady, with peaks during the week before the library assignment is due, the week of the peer-review session, and the week before the final term papers are due.

Anecdotally, both the professors and GTAs for the course have stated that they have seen improvements in the student term papers, especially in regard to plagiarism and citation issues. Current research data are unable to prove or disprove a direct correlation among the key factors covered in this paper and the improvements observed by the professors and GTAs. The professors have expressed great satisfaction with the partnership with the library, and have stated that regardless of the direct impact, they themselves have learned a lot about information literacy. The GTAs involved have also expressed appreciation for the opportunity to work directly with librarians and provide the library instruction to their students. All involved

feel that the partnership and involvement of the library are beneficial. Going forward, the authors hope to be able to further investigate the direct effects, if any, that the different aspects of the library assignment and instruction have on student success.

## CONCLUSION

At CSU a general library instruction session is provided to a majority of the students through a college composition course. Adding to that, a smaller group of students gain early exposure to science-focused information literacy skills through an agricultural science foundational course.

The process of creating and redesigning this course to address common undergraduate-student research challenges was facilitated by a learning and teaching institute. The librarians found that using the learning and teaching institute as a facilitator for collaboration has been effective for two principal reasons: first, the professors who are involved with the institute already have a vested interest in improving courses through collaboration; second, the institute provides expertise and resources to conduct a productive collaboration, and serves as an accountability agency for all participants. The professors involved in this specific partnership expressed that they likely would not have approached librarians on their own to redesign their course, and as a result would have missed out on librarians' knowledge, perspectives, and expertise.

Early exposure to library and information literacy skills has long been a goal for CSU's libraries and played a pivotal role in the benefits of this agricultural science course. If this type of information session were to be offered for the first time in a higher-level course, it would be less beneficial to the students during the length of their university career.

Embedding the library research guide into the LMS course website proved to be more helpful to the students than initially predicted. More of them self-reported using the research guide than anticipated, indicating that its usefulness was second only to their recitation instructors. This benefit may have resulted from the guide's step-by-step design, which corresponded with the step-by-step library instruction design (versus resource-format type). Furthermore, a link to the research guide is provided on both the front page and the assignments page of the LMS course website, as well as on the presentation slides for each week's recitation sessions. This was done in order to meet the students at their point of need, and it may have influenced the greater use of the research guide.

The TTT model proves to be effective from several perspectives. First, it relieves librarians from the time commitment of teaching nine to twelve individual library sessions, instead dividing it among three to four GTAs. The librarian in charge could then spend time focusing on improving the library instruction and research guide, as well as to properly train the GTAs. Second, it allows the GTAs to gain further experience and re-

fresh their own information literacy skills. Third, this model allows for the undergraduate students to learn information literacy skills in a more personal and continuous manner. Rather than receiving one fifty-minute library instruction session with a librarian, who may have to spend time breaking through stereotypes from a lack of connection, the familiar GTAs can conduct the sessions and continue to share information literacy skills throughout the semester.

There is not a great deal of literature discussing the employment of GTAs in a TTT model for undergraduate instruction. As the nature of information and the role of libraries have changed, information literacy as a pedagogical concept has come to be associated with librarians as instructors. A review of the literature and the near interchangeability among the terms *information literacy*, *library instruction*, and *research instruction*, and so on, seem to confirm this belief. Some librarians, such as Vecchiola (2011) at Washington University in St. Louis, provide the option of the TTT model, but the teaching faculty preferred the librarian to do the actual instruction. Watkins and Morrison (2015) at CU-Boulder were also aware of this idea when they began their TTT model experiment, and concluded that it may be time to reexamine how librarians think about information literacy instruction. Librarians undoubtedly have the skills, abilities, and knowledge to provide a higher level of information literacy instruction to students, but that would come at a cost of both the time and number of students reached. When possible and if applicable, it may be better for librarians to act as information literacy pedagogy facilitators, trainers, and advisors rather than front-line instructors. When using graduate students, the loss of information literacy expertise may be worth the potential benefits of increased reach, improved relationships, and integration throughout courses rather than individual, one-shot sessions. These experiences and findings correlate with those from CU-Boulder, and the authors consider that even if the time commitment was not a concern, the TTT model would still be applied, given the comprehensive benefits.

The success of this model is evident from the continued collaboration and strong relationship cultivated between the Department of Agricultural and Resource Economics and the library, as well as the high student use of library resources. Although the course-redesign program is completed and TILT is no longer involved, librarians continue to meet with the professors and GTAs each semester, not only to train the latter, but also to discuss previous successes and failures. Goals for improvement include maintaining, or even increasing, the use of the research guide; improving the quality of the training for the GTAs so that they feel more confident in their own knowledge and skills; and better equipping GTAs to be valuable library ambassadors for the undergraduate students. The authors hope that these conversations, in addition to future focus groups and continuous updates from those who work closely with the students, will help with

the overall goal of improving the information literacy skills of students. For those who strive to improve library and information literacy skills at their institutions, applying all the key factors described throughout this paper may prove to be challenging, but applying any single factor may also have beneficial results.

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