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How the ACRL Research as Inquiry Frame Informed Library Instruction at a College of Medicine

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Abstract

In recent years, librarians have begun to consult the Association of College and Research Libraries' (ACRL) Framework for Information Literacy for Higher Education to inform their library instruction and respond effectively to an ever-changing information ecosystem. This article describes an academic medical library's experience with framing scholarly research as a discovery process of asking questions and finding answers; in essence, following the basic premise of the ACRL's "Research as Inquiry" frame. The authors' development of instructional sessions for undergraduate interdisciplinary medical students has also encouraged their integration of Framework concepts with medical education standards and previous active-learning initiatives.

Introduction

Medical knowledge evolves through the contributions of researchers throughout the world, who pose questions, find answers based on experimentation, data gathering, and analysis, and document their learnings in the medical literature. Contributors to this pool of knowledge can add new information, confirm previously-learned information, or refute widely-accepted information. When researchers review the literature to determine how their research questions and findings can contribute to the whole of medical knowledge, they exemplify an understanding of information literacy. In its 2016 Framework for Information Literacy for Higher Education, the Association of Research and College Libraries (ACRL) defines information literacy as "the set of integrated abilities encompassing the reflective discovery of information, the understanding of how information is produced and valued, and the use of information in creating new knowledge and participating ethically in communities of learning" and emphasizes the need

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for this type of conceptual understanding, to "organize many other concepts and ideas about information, research, and scholarship into a coherent whole" (American Library Association 2015, 2-3).

The concept of information literacy has itself been a research topic in professional literature, primarily in the fields of information and library science, education and educational research, and computer science. According to a Web of Science: All Databases title search on "information literacy" on August 27, 2018, research interest in the topic within the information and library science profession began in the late 1980's and steadily increased to 2017, the latest complete year of data. A similar title search in the library literature, using EBSCOhost databases Library, Information Science & Technology Abstracts, Education Full Text (H.W. Wilson), Education Index Retrospective: 1929-1983 (H.W. Wilson), Education Source, ERIC, and Library Literature & Information Science Full Text (H.W. Wilson), confirms this research trajectory. Information literacy has also been discussed in the medical literature – a recent search in PubMed on "Information Literacy"[Mesh] OR "information literacy"[ti] results in 4344 citations from 1989 to the present -- and in fact, the term was introduced into the MeSH (Medical Subject Headings) thesaurus in 2011.

Information literacy initiatives in higher education have referenced a variety of methods and theoretical premises through the years to improve student knowledge and academic performance; since its first version was released in 2014, the ACRL Framework has provided an additional option tailored to librarian instructors. Indeed, the library literature has reflected librarian interest in using the frames to address information literacy in library instruction, evidenced by results from a title search on the terms (frame OR framework) AND (acrl OR "association of college and research libraries") in the databases Library, Information Science &

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Technology Abstracts and Library Literature & Information Science Full Text (H.W. Wilson) on

August 28, 2018. The search results demonstrate that 14 distinct scholarly library-related

journals have published articles specifically on the Framework. The journals' specializations

ranged from general higher education librarianship to medical, music and theology. Most

originated in the United States, but also included representation from Canada, South Africa and

Singapore.

Unlike the library literature, the medical literature does not currently reflect significant

interest in using the ACRL frames to address information literacy. A search in PubMed on 9-4-

18 with the keywords (frame OR framework) AND (acrl OR "association of college and research

libraries") results in only 3 articles, from two unique journals and four unique authors (Schulte

and Knapp 2017; Willson and Angell 2017; Knapp and Brower 2014). The Schulte article

focuses on whether health sciences librarians knew of the Framework and have used it to modify

their instruction or communication with faculty, and found that "there is room to improve

awareness and application of the Framework among health sciences librarians" (Schulte and

Knapp 2017). The Framework's "Research as inquiry" frame, though, does resemble a method

used with several undergraduate science classes and one anatomy course to teach information

literacy through the process of inquiry (Rangachari and Rangachari 2007; Gehring and Eastman

2008; Russell et al. 2008; Bentley, Robinson, and Ruscitti 2015; Resendes 2015). This type of

initiative, also known as inquiry-based learning, can improve student engagement, as described

in the 2016 article "Evaluating the effectiveness of a practical inquiry-based learning

bioinformatics module on undergraduate student engagement and applied skills" (Brown 2016).

The present article describes a case that illustrates the "Research as Inquiry" frame's

basic premise of how research is conducted: it "is iterative and depends upon asking increasingly

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complex or new questions whose answers in turn develop additional questions or lines of inquiry in any field" (American Library Association 2015). The case also incorporated elements of the "Searching as Strategic Exploration" frame, as "the act of searching often begins with a question that directs the act of finding needed information" and encompasses "inquiry, discovery and serendipity" to identify and access relevant sources (American Library Association 2015). Asking questions and finding answers can inform the research process used by beginners to experts, and having students ask and answer questions in instructional sessions can encourage their participation and engagement in the class content. For undergraduate students in the FSU College of Medicine's Interdisciplinary Medical Sciences (IMS) program, who are beginning to learn how to find credible medical information, documenting answers to a series of questions may increase their awareness of and confidence with conducting literature reviews.

Case Background

In the fall of 2017, the authors received a request to provide research instruction in four IMS classes. The course director wanted students to use the library's medical headlines site at http://med-fsu.libguides.com/MedNews as a starting place for ideas for their research projects, and, depending on the class level, become familiar with using appropriate databases, key words, and citation management software/APA style. She also requested that the class contain a hands-on activity with a tangible outcome for students' later use. From the librarians' perspective, the concepts of fostering an ability to recognize "fake news" by finding original research articles in the medical literature was equally important to cover with the students. To meet both needs and maintain student interest and engagement in the class, the authors took inspiration from an

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instructional workshop developed for biomedical PhD. students in 2013, and a discovery-

learning activity developed for first-year medical students in 2014.

Individual consultations with students consist largely of asking a series of questions to gauge

their ability to conduct literature reviews and help them develop a viable research topic. The

process is very interactive and student engagement is very high; therefore, the biomedical

workshop emulated as much as possible an individual consultation. This was based on one

author's years of both presenting workshops on how to conduct literature searches and working

with students individually to learn about databases and formulate search strategies for their own

research projects. For the presentation, she identified a research topic and conducted an

abbreviated literature search process of asking and answering a series of questions. In 2015, she

updated and presented the workshop as an instructional session for a "Tools of the Trade"

biomedical student class. For both presentations, the inquiry process began by stating the basic

questions researchers implicitly ask and answer when starting a research project, then focused on

selected databases. Following are examples of the questions and answers:

- "Why did I choose this topic?"

  "I am personally interested in how rose hips might help my hip osteoarthritis, the topic is

  feasible in the time I have to research it, and complementary/integrative medicine (CAM)

  is a timely topic -- which will hopefully facilitate locating funding for my project."

- "Which literature databases will provide the background I need to know for how my

  research fits into current medical knowledge?

  "I'll start with PubMed (a subject-specific database), and then expand my search to

  broader databases such as Web of Science and ProQuest SciTech Premium Collection,

  and then I will check Google Scholar to see what the other databases might have missed.

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- "Why am I getting all of these unrelated citations?

  "I need to improve my search strategy, and one way I can do that in PubMed is to use

  MeSH (Medical Subject Heading) terms and limit my keywords to article titles. Maybe I

  should go visit one of the librarians because they have expertise in crafting search

  strategies for different databases."

The medical student activity in 2014, not a classroom presentation but a discovery-learning

initiative to encourage critical thinking, evolved due to a request for assistance in preparing

medical students for a trip to regional rural sites during their first week of medical school.

Instead of directly teaching students how to research the counties they were to visit, two of the

authors provided the structure for students to work together in small groups to discover answers

to questions they posed about their rural counties. Although the students did not conduct

literature reviews, the activity introduced similar concepts, such as asking well-defined research

questions, using appropriate information sources, determining authority, and creating effective

search strategies.

The librarians developed the discovery activity based on the following learning objectives:

- Identify online information sources to answer questions about a specific rural county

- Access the needed information effectively and efficiently

- Evaluate the collected information and its sources critically

- Incorporate information into personal understanding of rural communities

- Use information to expand knowledge of potential patient needs in rural communities

They created a facilitator guide and a student worksheet, which both contained the following

questions for facilitators to guide the students' online information gathering and analysis:

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- What information do you need to answer your questions about your county, and what

  keywords will you use to find the information?

  o How do you search for a specific phrase, such as Jefferson County or public

    safety?

  o How can you narrow or target your search results?

  o What can you add to your search to get current information?

- Where could you start your online county information discovery process?

  o What type of information can you get from that resource?

  o Is that the only source you want to use?

- Who produces the type of information you need?

  o Who do you think publishes information about specific Florida counties?

  o How many different levels of government produce statistics?

  o Which federal government organization gathers population data?

- Which results from your search can help you answer your questions?

  o Does that website offer primary or secondary data?

  o Can you find confirmation of that information in another source?

- Why is this type of information produced?

  o What is the goal of the website?

  o What type of organization is providing this information?

  o What economic reasons might there be to provide information about Florida

    counties?

- When does this information become available online?

  o How often is the content on the website updated?

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- o Does this website tell how frequently data is collected and/or published?

- o How can you determine if the website's information is recent or outdated?

- How do you know that the information you have gathered is quality information?

  - o Does having .edu or .gov or .org at the end of a URL absolutely guarantee that the website content is valid?

  - o Can the information be confirmed in at least one other independent source?

  - o Are there any references to support the website's information?

  - o What methodology was used to collect data and is it easily reproducible?

  - o Are there enough details about how the information was produced so that it could be replicated?

  - o Where does the website/organizational funding come from?

  - o What independent bodies provide information about organizations?

  - o Was website data reviewed, and if so, by whom and what are their credentials?

  - o Does the information producer have the education and/or experience to provide quality information?

  - o What is the motivation of the authors or researchers in providing their information?

  - o What are the possible intentional or unintentional biases of the providers of the information?

  - o Does the information producer/user have a particular political or economic agenda?

After soliciting and incorporating feedback from faculty on the rural trip preparation team, conducting a train-the-trainer session with second-year medical student teaching assistants, and soliciting and incorporating feedback from the TAs on the facilitator guide and student worksheet, the librarians submitted the learning packet to the Director of Clinical Foundations. The materials were used as originally submitted in 2014; however, as might be expected, rural trip preparation activity materials in successive years were updated and modified, using more abbreviated lists of questions. The learning objectives and main questions of the discovery activity nonetheless have stood the test of time, and the first-year medical students most recently used them to prepare for their June 2018 rural trip.

Both the biomedical and rural trip experiences provided a strong basis for two medical librarians to guide students through an inquiry process of identifying, locating, and analyzing information they needed for their research projects. Thus, when development of content began for the fall 2017 IMS classes for undergraduate students, the three authors could draw upon the knowledge gained from those earlier experiences to meet the objectives of the IMS presentations.

Management and Outcome

Students in the IMS program at the FSU College of Medicine must complete an experiential seminar series, which culminates with the capstone project "that will require research and/or analysis of health care venues and delivery" (Florida State University College of Medicine). The capstone course encourages students to synthesize their research findings, consider health solutions and outcomes, and potentially engage in public dialogue. Freshman, sophomore, and transfer-student (augmented) seminars provide students with the foundations of health careers and introduce them to medical news and information so that in their junior year

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they can "develop a preliminary prospectus or proposal, based in the literature, for their senior

capstone project" (Florida State University College of Medicine).

When students embark on research projects, they sometimes know they should conduct a

literature review, but often don't know the greater context and the reasons why searching the

literature is necessary. The authors' experience has been that student information literacy is poor

to non-existent, and students must be taught to understand what medical knowledge is, who

creates it, and how it evolves. Specifically, their deeper comprehension depends on an

understanding of how their own research project fits into the broader category of medical

knowledge, learn the steps they need to take to assure their research questions are appropriate,

and conduct literature reviews that substantiate their research projects' contributions to medical

knowledge.

Individual consultations with students lend themselves very well to learning the process

of formulating a research question and conducting a literature review in appropriate databases

with a well-developed search strategy. Typically there is time to scan the search results, after

which students then ask additional questions about their research. Time limitations in one-shot

group instructional sessions, on the other hand, can disrupt the typical student learning process

for reviewing scholarly literature for an individual project. Student participation, especially in

lower-level and large classes, depends on using active-learning approaches to instruction. If

students become engaged with the content of instructional sessions, they can feel empowered to

conduct literature reviews on their own after the sessions.

The IMS course director who requested library instruction for the fall 2017 IMS classes

had also asked that the librarians use an active-learning approach to instruction, which she felt

would encourage the students to be proactive in the research process for their capstone projects.

One way to engage students in class is to ask questions -- but after class, will they internalize and implement the answers on their own? To address this need, the authors developed a guided questions form for the students, on which they would take applicable notes during the class and create a "personal cheat sheet" for themselves. Ideally, the students would then use these later to guide their literature search processes. From the generic guided-questions form, the authors developed outlines for their respective sessions and tailored the forms to their particular class levels. In general, they led students through an abbreviated research process, from identifying potential medical topics for their research projects from the library's medical news site, to looking at one article in particular and asking questions until they could find the original research in the medical literature.

The IMS Class Worksheet created for the sophomore and transfer-student classes provides an example of the type of questions that can encourage student participation and engagement in the class content (see Figure 1). Students in one of the author's classes were initially confused, thinking that the questions on the form were to be answered and turned in for instructor evaluation. The author was unsure if, once they understood that the sheets were for their personal use, the students would still use them during class – and was gratified to see that most of the students did actually take notes on them and presumably would use them later when reviewing the medical literature.

After each class session, the authors gathered informal feedback through paper or online surveys consisting of four general items:

- What information did you find most helpful?

- What information did you find least helpful?

- What would you like to learn more about?

- Please provide suggestions or comments for improving this presentation.

One of the author's classes had feedback participation of close to 100%, most likely due to the instructor providing class time for students to complete the survey; the other class had only two responses, from the instructor and teaching assistant. Another author also obtained feedback on paper forms she distributed at the end of her presentation, and the third author received verbal feedback from the class instructor and four of the 220 freshman students. In debriefing after sessions had been conducted, the authors discussed what worked and what didn't, and also looked ahead to take steps for future instructional opportunities. They agreed that the evaluation process needed to be more formalized to demonstrate that the medical library was successfully incorporating active-learning strategies in library instruction and getting positive outcomes from the students. Ideally, in order to gather a substantive amount of evaluation data, students would have dedicated class time from the instructor if they chose to provide feedback.

In the midst of the authors' discussions on addressing curriculum needs for library instruction content that was both effective and engaging, the Framework lightning-round session at the SLA annual conference in June 2018 provided an opportunity to initiate their formal evaluation of active-learning approaches to library instruction. One author had seen the call for Framework session presenters in an SLA Connect email at the end of October 2017, and realized that the IMS instructional sessions earlier that month exemplified the Research as Inquiry frame. She contacted the presentation co-moderator regarding the feasibility of retrospectively relating instruction to the Framework, and learned that other librarian researchers had also connected their instructional approaches to various tenets of the Framework after teaching. This encouraged the authors to verify their previously collected informal student with formal data in spring 2018 IMS classes in case the lightning round proposal was accepted.

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Before submitting a human subjects proposal to FSU's Institutional Review Board (IRB), the authors requested permission from the IMS course directors to evaluate students in the IMS program. After obtaining confirmation of IMS support for the project, the three authors submitted an application to the FSU IRB in January 2018. It was approved in February 2018, well in time for spring library instruction sessions. Unfortunately, the library received only one request for IMS library instruction in spring 2018, which may have been due to the IMS program's relative newness and lack of a dedicated curriculum coordinator. The author who conducted the class received no responses to the student questionnaire despite providing the questionnaire URL to the instructor to share with the students.

Discussion

Medical knowledge evolves through documenting and sharing reproducible, substantiated and collaboratively agreed-upon data and analyses, including sidetracks and backtracks with alternative or rejuvenated evidence and perspectives. This process can be followed through medical literature reviews, which summarize "what is known in the research area, the strengths and weaknesses of existing research" and also "identify areas of controversy." (Forister and Blessing 2016, 33-34). As stated in the "Research as Inquiry" frame, "[experts] recognize the collaborative effort within a discipline to extend the knowledge in that field. Many times, this process includes points of disagreement where debate and dialogue work to deepen the conversations around knowledge" (American Library Association 2015). Researchers from beginning to expert levels, in reviewing scholarly literature to determine the current state of

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knowledge in a particular field, must determine which research questions have already been asked and answered, and which have yet to be asked and answered.

As research practice is iterative in nature, knowledge of instructional best practices for conducting research also evolves in a continuous but nonlinear fashion in the librarian profession and many other disciplines. And it can even be observed at the institutional and personal level that knowledge of certain concepts, best practices, and instructional techniques follows a circuitous path to conscious awareness and implementation. At the FSU College of Medicine, for example, faculty have been using discovery learning, case-based learning, and activity-based learning to some degree in various classes for over 10 years; however, for the past 4 years, the College has formalized these initiatives and is making a concerted effort to provide active-learning training opportunities for all faculty. Much of this formalization has been driven by the College's curriculum redesign, as well as the current Standards for Accreditation of Medical Education Programs Leading to the MD Degree, issued by the Liaison Committee for Medical Education (LCME). The 2018 LCME Standards document states in section 6.3 (Self-Directed and Life-Long Learning) that faculty need to ensure that medical students develop skills that include the "independent identification, analysis, and synthesis of relevant information; and appraisal of the credibility of information sources" (Liaison Committee on Medical Education 2018)

Like other faculty at the FSU College of Medicine, medical librarians had incorporated active-learning strategies into instructional sessions for many years, but the authors' approach to library instruction became more purposeful in late fall 2017. They made connections between the "Research as Inquiry" frame and past question-based library instruction, and learned that the Framework's emphasis on student participation and creativity complemented what they already

knew of the LCME standards. Thus, the authors realized the benefits of using the ACRL frames

to inform future library instruction and evaluate the instruction by mapping learning outcomes to

Framework concepts.

In order for the authors to formally document the library's contribution to the College's

active-learning initiatives, they decided to conduct their own research. The human subjects

proposal they submitted to the FSU IRB posed the research question "Will using an interactive

teaching approach to library instruction lead to high levels of participant self-efficacy for

initiating and conducting their own clinical and scholarly research?" and the authors

hypothesized that systematic, comprehensive feedback would demonstrate high student

confidence in "using library resources, finding health data, conducting literature reviews, and

other information literacy activities." As of this writing, the authors have confirmed several

library instruction sessions for the fall 2018 semester, and will incorporate the Research as

Inquiry, Authority is Constructed and Contextual, Information Has Value, and Searching as

Strategic Exploration frames as appropriate. For the IMS sessions, the authors plan to conduct

two sections each for the same upper-level IMS students, which should be especially suited for

comparing evaluation data received from the students.

The spring 2018 experience and subsequent conversations among the authors have also

resulted in a variety of lessons for improvement and their future application in library instruction:

Class management

- Improved timing, particularly with classroom logistics, direction, and administration of

    group activities with multiple-level learners

- Use of flipped classroom strategies to apportion more class time for synchronous active

    learning

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- Incorporating asynchronous strategies, such as online learning modules with library instructional software (Springshare's LibWizard) and Canvas, the university's learning management system

Evaluation strategies

- Dedicated class time for post-instruction data collection

- Continued self-efficacy feedback from students on their confidence levels with information literacy activities

- Formative and summative assessment of library instruction to assess student understanding; will depend on feedback from course instructors, which can be inconsistent and delayed

Engagement with faculty and curriculum leaders

- Consistent communication with curriculum leadership for various academic programs to define goals, formally integrate library instruction into the curriculum, and respond to evolving instructional needs and learning outcomes that are tied to the ACRL Framework

- Leadership in the library to respond to requests for instruction and increase both faculty awareness of the type of instruction medical librarians can provide and how to request this service

- Refined scheduling of instruction to better connect to relevant content for learners, such as research projects or class assignments

One major challenge in providing library instruction for new academic programs is that they can be dynamic and unpredictable. Because of this, the authors have not yet been able to create standardized library curriculum to be shared among other librarian instructors; however, as academic program instructional goals mature and stabilize, an established library curriculum for

these user groups can be developed and shared among the medical librarians. Another future goal, in which the medical librarians provide train-the-trainer sessions for library instruction, will also be more feasible when new programs have matured and stabilized.

Curriculum development and structural changes occur as academic leadership responds to student needs; librarians likewise address their needs, responding to challenges of engaging and empowering students to participate fully in library-related learning activities. Library instruction in group settings, like any other type of higher-education classes, can be either passive or active-learning experiences for students. Passive learning does not set the stage for students to ask questions and become participants in the development of knowledge; therefore, group instruction needs to promote student engagement in whatever ways possible. Because students in any group will have varying levels of familiarity and confidence with researching a topic, providing opportunities and activities for them to teach and learn from each other can be an effective way to keep everyone engaged in the class content. Providing opportunities and activities for students to practice asking and answering questions about various aspects of the research process can empower them to act on the information they have learned and eventually encourage them to question current knowledge and contribute to further research.

Ultimately, medical library instruction should foster in students a life-long ability to be critical thinkers who can search for the "truth" of medical knowledge and find answers in authoritative sources. The Framework supports this notion, including the concept of metaliteracy, an "overarching set of abilities in which students are consumers and creators of information who can participate successfully in collaborative spaces" -- and also focuses on metacognition, where students critically self-reflect to become more self-directed in a rapidly-changing information ecosystem. (American Library Association 2015). A firm understanding of the nature of medical

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knowledge and its development through the medical literature can facilitate student participation

in the medical information ecosystem.

The Framework's core concepts provide a rich and complex source for guidance and

inspiration in the pursuit of effective literacy instruction. The authors recognize that the six

frames, and the knowledge practices and dispositions for each frame, describe learning

objectives that previous library instruction had attempted to achieve. Referencing the Framework

as a guiding document will greatly facilitate the medical library's current initiative to evaluate

the effectiveness of library instruction and authenticate the library's contributions to the active-

learning goals of the College of Medicine.

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Figure 1: IMS Class Worksheet: As we cover each of these questions in class, write your personal answers to use for future reference:

Who determines if information is of good quality?
Where do I prefer to find out about medical news and information?
When I hear or see a news item of interest to me, what is the bottom-line question it's asking?
How can I evaluate if the answer is credible or not?
Where can I find credible medical literature and statistics?
How do search tools differ from each other?
What are some effective ways to search databases?
What is the best search strategy for my topic?
How can citation management tools help with my research?

Supplemental Material

We Inquired Before We Framed: Timeline for Incorporating the ACRL Framework into Library Instruction at the College of Medicine

2013

- Susan creates workshop for biomed graduate students
  - Decides to choose a topic of interest (rose hips for hip osteoarthritis)
  - Follows "real-world" research process

2014

- Robyn and Susan create guided questions and examples for the rural trip preparation session for first-year medical students
  - Conduct a TA training w/student worksheets
  - Gather and incorporate feedback from stakeholders

2015

- Susan updates 2013 biomed workshop content
  - Presents instructional session for the Tools of the Trade class for biomed graduate students
  - Uses the topic of rose hips for hip osteoarthritis again, following the "real-world" research process

2017 (Fall):

- IMS class instructors request presentations using the medical headlines site
  - Susan, Robyn, and Erica develop class outline with series of questions

- o Conduct 4 IMS classes

- o Gather informal feedback

- Call for SLA 2018 conference proposals using ACRL Framework

  - Susan realizes that they have been using a "Research as Inquiry" approach to instruction since 2013

    - o Confirms that inquiry can precede using an ACRL frame

    - o Submits lightning-round proposal; proposal is accepted

2018 (Spring)

- Susan collaborates with Robyn and Erica on active-learning project based on the Fall 2017 IMS classes

  - Submit a human subjects proposal to the FSU IRB

  - Proposal is approved after minor edits

2018 (Summer)

- Susan presents lightning round at SLA conference in Baltimore

  - Tony solicits article for his journal

  - Susan, Robyn and Erica agree to write article

- IMS curriculum coordinator requests library instruction for all Fall 2018 class sections

  - Robyn, Erica and Susan plan and conduct upper-level IMS classes

    - o Set up formal evaluation processes with instructors

    - o Include Research as Inquiry and other frames to varying degrees as needed/appropriate