abstract: While the Association of College and Research Libraries (ACRL) Framework for Information Literacy in Higher Education has prompted important new scholarship, Jan Meyer and Ray Land’s related theoretical work has received less attention from librarians. The study described in this article is based upon 20 in-depth interviews with undergraduates about their experiences with research assignments. These students’ accounts of their research offer insights into Meyer and Land’s foundational ideas about troublesome knowledge and threshold concepts. Based upon the interviews, the authors suggest that research assignments might be viewed as a kind of threshold concept practice, where students grapple with not knowing and finding their way through the difficulties of research.

Introduction

Research assignments can be deeply challenging for university students. In the terminology of Jan Meyer and Ray Land, these types of assignments might also be referred to as “troublesome.”1 For undergraduates, research papers may involve great uncertainty, conceptual difficulty, and a process that seems not only unfamiliar but also perhaps impossible. How do students make it through this undertaking? And what kind of learning might occur as they encounter such challenges? This article, based
upon 20 interviews with undergraduates, takes an in-depth look at how students talk about their research experiences, especially in terms of how they navigate difficulty. In addition, the study provides a student-centered perspective on the growing literature about threshold concepts—deep learning about foundational concepts that Meyer and Land describe as allowing one to “see things in a new way.” This new way of seeing is “akin to a portal, opening up a new and previously inaccessible way of thinking about something.”

This article was inspired in part by the discussions within librarianship about applying a threshold concept approach to information literacy instruction. However, the central aim of the article is to delve deeper into the original, interdisciplinary premise of threshold concepts developed by Meyer and Land. Student interviews seemed appropriate for this type of in-depth analysis, and the interviewees span a range of disciplines and types of research assignments. In addition, the study’s qualitative methodology provides context about students’ research experiences and allows the authors to investigate such questions as: What is it like for students to interact with conceptual knowledge as they conduct research? And, what is the relationship between research assignments and the kind of deep learning that threshold concept learning aims to invoke? Based upon an exploration of such questions, the authors argue that research assignments might be viewed as a kind of threshold concept practice that encourages students to wrestle with puzzling content and to become more engaged with deep learning across the curriculum. By using the phrase threshold concept practice, the authors suggest a shift in emphasis from concepts to that of practice, especially in the strategies and methods that students develop to persist through the research process.

**Research assignments might be viewed as a kind of threshold concept practice that encourages students to wrestle with puzzling content and to become more engaged with deep learning across the curriculum.**

**Literature Review**

Threshold concepts have received growing interest both within librarianship and across an interdisciplinary literature focused on teaching. Meyer and Land’s multiple volumes on threshold concepts have drawn from a range of disciplines, including engineering, computer science, education, and business. Examples of threshold concepts identified within various disciplines include opportunity costs (in economics), complex numbers (in mathematics), energy transfer (in biology), and precedence (in law). However, only occasionally have research assignments or librarianship been included in this cross-disciplinary work. Three examples which do address research assignments are Virginia Tucker’s investigation of transformative learning experiences for expert online searchers; Linda Martindale, Ray Land, Julie Rattray, and Lorraine Anderson’s exploration of research assignments and troublesome knowledge for nursing students; and Margaret Kiley and Gina Wisker’s study of doctoral candidates’ research. Within the field of librarianship, inquiry into threshold concepts has focused on the Association of

With the adoption of this Framework by the ACRL Board of Directors in 2016, the frames (that is, threshold concepts) quickly had a significant and far-reaching impact on how librarians think about their teaching. For example, Larissa Garcia and Jessica Labatte describe how an art librarian and a photography faculty member designed instruction based upon two ACRL frames, “Scholarship as Conversation” and “Searching as Strategic Exploration.” Similarly, Meagan Christensen reflects on an information literacy session about evaluating sources structured around the frame “Information Creation as a Process.” Samantha Godbey, Susan Wainscott, and Xan Goodman offer 25 applications of the six frames across a range of course topics, and collections by Patricia Bravender, Hazel McClure, and Gayle Schaub as well as one by Joanna Burkhardt provide lesson plans structured around the Framework. In addition, in an interview-based study of faculty members, Lorna Dawes found that some disciplinary faculty already teach concepts that overlap closely with the ACRL Framework. While the Framework has also received criticism, ACRL’s threshold concepts have clearly prompted both experimentation and innovation in librarians’ pedagogical practices.

One challenge with threshold concepts across the disciplines is the potential difficulty of identifying a fixed set of threshold concepts for any one area of study. In one case, Beth White, Tami Olsen, and David Schumann describe how a team of writing instructors identified 20 potential threshold concepts for a single first-year English composition class. Similarly, Sarah Barradell discusses several different disciplinary methodologies for selecting threshold concepts. For example, a group of 29 economists selected 42 potential threshold concepts, but only 8 of these concepts were chosen by 5 or more of the economists surveyed. In addition, this process of identifying threshold concepts has been mostly expert-driven, and this raises questions about how students might describe and experience difficult content and threshold concepts. In addition, a number of authors have investigated students’ experience with the research process. However, these studies have not raised questions directly related to Meyer and Land’s work on troublesome knowledge and threshold concepts. The student-centered study presented here addresses troublesome knowledge and threshold concepts directly by focusing on undergraduates’ depictions of their research process.

Methods

The authors’ motivation for the study was to develop a deeper understanding of students’ research experiences. To accomplish this goal, the authors used a retrospective interview method, where students were invited to reflect on research they had recently conducted for an assignment or project. The interviews began by asking students about their research process for a single assignment, and the remainder of the interview was
spent on follow-up questions prompted by this initial narrative. In some cases, students would include reflections on other research papers as well, including assignments across multiple years of students’ college career. One advantage of this method was the opportunity to ask questions grounded deeply in students’ own experiences and perspectives.\textsuperscript{27} The interviews, lasting from 20 minutes to about one hour, were conducted between 2016 and 2018 with 20 undergraduates at Purdue University Fort Wayne, a midsize public university in Indiana.

The study, which received exempt approval from Purdue University’s Institutional Review Board (IRB), relied on several recruitment strategies. Students were enrolled in the study by snowball sampling, in which research participants recruit other participants; recruitment fliers; and an e-mail invitation distributed by several writing instructors. Using these various recruitment approaches, students from different class years and majors were enlisted to participate. The interviewees consisted of 9 first- or second-year students and 11 upper-class students. Student accounts of research assignments came from the disciplines of biology, communication, education, history, human services, physics, psychology, and writing, among others.

During the analysis of the interview transcripts, the authors noticed passages that seemed to point to students’ evolving understanding of their own research practices. These interview excerpts reminded the authors of the ongoing discussions about threshold concepts, and the authors experimented with mapping some of the ACRL frames to the student interviews. While such an approach might have been feasible,\textsuperscript{28} the interview transcripts instead inspired the authors to look closer at Meyer and Land’s original theoretical work.\textsuperscript{29} The authors never directly asked questions about threshold concepts or tried to explain the idea of such concepts to the interviewees. Nevertheless, this retrospective interview method, and the context it provided, seemed well-suited for bringing a student-centered perspective to bear on Meyer and Land’s work. In addition, the goal of both the interviews and the analysis was to maintain, as much as possible, an ethnographic approach that allowed new themes to emerge and enabled the authors to discover how students made sense of their research activities.\textsuperscript{30}

**Discussion**

**What Is Hard about Research**

Every student interviewed for the study identified things that were hard about research. For some students, the challenges seemed to come from many directions. For example, a senior who was about to graduate reflected on his first research assignment, stating, “I was completely lost” and “I had no idea what I was doing. Not at all.” Some of these depictions of research difficulty seemed closely related to issues of conceptual challenges. For example, one upper-class student reported that “one of the trickier parts” of doing research assignments was encountering academic texts with “a lot of language that undergraduates and even a lot of other individuals who don’t hold doctoral degrees in that field don’t really understand very well.” While this person clearly felt challenged by difficult language, she also expressed some savviness with this difficulty. The student was aware of specialized content that she had not mastered, even as a graduating senior.
This example of being challenged by scholarly language seems to align with Meyer and Land’s description of troublesome knowledge. Drawing upon David Perkins’s work on active and creative learning,31 Meyer and Land describe troublesome knowledge as that which is “counterintuitive,” “alien,” or “incoherent.”32

In addition, students talked about their experiences of difficult knowledge and knowing in a variety of ways. For example, prior knowledge limited how one first-year student decided on a research topic. This person said, “You try to pick a topic that you know about,” adding that he tried to choose a subject he could be “sure about.” For this first-year student, the unknown seemed particularly precarious. Other students talked about challenge less with respect to scholarly content but instead in terms of inner knowledge or awareness. For one undergraduate, the most difficult part was trying “to convey my overall message clearly.” Another stated that “just convincing myself that I’m interested is the hardest part.” A number of students also talked about difficulty with the sheer quantity of knowledge they encountered. One explained, “I just think of this big, large, piece of a million, gazillion other pieces.” Another student said, “You lose track. Like, it is gone. Like, I found this and where did it go.” The challenge of accessing knowledge could also prove difficult; one student said, “The interfaces are hard,” adding, “I swear, that [database] was the hardest thing for me to find a primary source on.” In other cases, the difficulty goes beyond use of an online search tool. One interviewee said, “Searching the sources . . . I know how to do it, but it’s very difficult.” This comment suggests that, even after one masters a research tool, the process may remain hard. These examples point to the nuanced ways in which “knowing”—whether engagement with knowledge, accessing content, or dealing with the sheer quantity of information—can prove daunting to students as they conduct research.

Not Knowing and Sifting

For many research assignments, students have at least some freedom to choose the direction of their own learning. As they make decisions, some refer to a process they call “not knowing” and “sifting.” In the context of Meyer and Land’s work on troublesome knowledge, students need to make their own decisions about which conceptual content is most important. This lack of direction, especially this feeling of not knowing, presents many challenges. For example, one junior stated:

I know where to find things, but I’m just . . . I didn’t really know how to navigate my way. Like I said, the biggest problem is not knowing what you’re looking for . . . So, to just go out and research something is difficult for me. It gives me anxiety. It stresses me out.

If we consider that scholarly literature is likely filled with disciplinary threshold concepts and manifestations of troublesome knowledge, it seems inevitable that students will confront challenging conceptual content as they encounter the voluminous amount of available information. For example, a junior said, “I took a lot of time trying to find the right articles because I didn’t really know what I was looking for. And I also didn’t
know how to summarize them and what information to take from them.” Another student reflected, “It seems like it should be easy because you could narrow it down, but it felt like it took forever because there were so many.” While this “not knowing” may be troubling for students, uncertainty may be unavoidable as students take on a wide range of potentially difficult content.

In addition, several students described their approach to wading through voluminous content as “sifting,” a word also used by students in Alison Head and Michael Eisenberg’s study.33 A freshman reflected on the importance of “having to know what to sift through.” Another student echoed this sentiment, stating, “There is so much sifting, [including] even just the good things.” Still another talked about multiple stages of sifting through sources, saying, “I’ll look up some articles generally about it . . . and, once I sift through those, then I’ll probably more specifically look for articles.” Students’ comments point to an inevitability of this sifting process and to the high level of thinking it demands.

This process of not knowing and sifting may also have relevance to the analytical process of composing the actual research paper. For example, this student talks about using search keywords throughout the process of writing a draft of a research essay:

I’ll have the intro, and they’ll be just blah. It’s not because I don’t know, [it’s] because I haven’t got the paper yet, and I try to correlate the intro with the rest of the paper, the introduction. And then for the thesis, I have like a couple of keywords I always want to include. So, I write those keywords always off to the side . . . And then as I go through my paper, I try and hit those keywords throughout the papers continuously but not overuse them but just use them enough. So, it continually ties back to the thesis, and then once I get my body part done, I then go back to constructing the thesis.

In this example, the student makes a connection between the initial work of navigating the literature with keywords and the labor of finalizing a written draft. The student’s technique of using keywords to find a way through the immense amount of research early in the process also seemed to help shape the final content of the paper. In addition, the interviewee’s language about knowing is interesting. The student claims that, at this point in the process, he does, in a sense, “know.” Yet, the paper itself and the process of mulling over important terminology were critical for helping the student articulate his argument.

Of course, faculty may choose how much freedom they give students, and, across the 20 interviews, students reflected on a range of assignments. For example, one interviewee said that the professor made it “a little bit easier to find articles” because the topic had to relate to brain physiology. Another student also appreciated such guidance, stating, “Just some type of direction is what will help me ease the stress about it.” In contrast, a science major discovered that the “fast, easy solution so I could move on with my life” did not work because the professor created a unique research problem that did not correlate with a simple Google search. In another instance, the student had to do a
research-informed critique related to one of 12 textbook chapters. Yet another student told of picking a topic she “literally knew nothing about” from a list. For one undergraduate’s favorite paper, the “one I can always remember,” the class had free reign to choose any topic. Given these diverse assignments encountered by just 20 students, it is clear that faculty can craft their course design to meet larger curricular objectives. They may or may not nudge students toward specific disciplinary threshold concepts and may create assignments that are either highly structured or that offer much flexibility and choice.

A Way Through: Threshold Concept Practice

This section focuses on students’ descriptions of their research methods. Overall, the approaches seemed highly individualized, with some students expressing a high degree of ownership about their own way of doing things. In addition, while undergraduates used these methods to negotiate knowing and knowledge, these techniques also emphasized the “how” of practice. In other words, while the research certainly involved important conceptual content, more notable were the strategies and practices students used to maneuver their way through difficulty. Therefore, the authors explored whether student research might usefully be considered a kind of threshold concept practice. While this approach might not align perfectly to Meyer and Land’s definition of threshold concepts, the authors’ emphasis on practice draws attention to how students grapple with not knowing and with the messiness of both familiar and unfamiliar conceptual terrain. In other words, what strategies do students use to figure out for themselves which content is important and why? This section focuses on three examples from upper-class students, one from biology and two from history, each focusing on the students’ sometimes novel ways of getting through the difficulties of research. In the words of a senior human services major, “You got to find your own way . . . People can lead you to certain places, but it’s really up to you in the end.”

First, a junior biology major talked about finding his own ways of doing empirical research through an intensive laboratory environment. The student talked about repeatedly making mistakes as a new lab assistant, commenting, “There was plenty of room for me to mess it up, which I did . . . where I got all kinds of weird data . . . [but] I kind of had the buffer to learn.” The student explained that the data often “showed opposite things,” which required a “meticulous” process and “doing [the experiments] over and over and over.” Not until after about two semesters did the student become more self-confident: “Like finally I could make my own decision, change what I’m doing so that everything is working well.” For this undergraduate, proficiency came from immersion in the empirical procedures of lab work, such that “once you kind of get into the habit of doing it every day and you’ve been doing it for two years,” you finally have “a finished product.” While laboratory research in the sciences may differ from methods in other disciplines, the lab tolerated the student’s mistakes, and the rigor of the lab environment helped the student become adept at making research decisions.

An upper-class history student developed a way of managing research with the use of whiteboards. The interviewee explained that he would “fill up that entire whiteboard first of just ideas I had in my head, just to get them out there so I wouldn’t lose them.” Interestingly, the student also used a whiteboard at home, explaining that the “white-
board at home never gets erased until I’m done with [the paper].” The whiteboard was also this student’s strategy for doing analysis:

And then from there I would start correlating how I can get sources to match those ideas I had, and then also from that I started to learn some new stuff. So, I would start to see how I could fit topics together, erase topics, or have something completely new jump into the paper.

Perhaps most interestingly, the whiteboard also helped this student manage ambiguity. In the interviewee’s words, “I like the erasing aspect because it’s a lot easier to move [things around].” The approach became the student’s way of doing every paper: “For me, that’s all I use.” Even though a lab setting differs from a research paper in the humanities, both students became adept at methods for managing difficulty and ultimately made their own choices about their research analysis.

The third example, also from an upper-class history student, is both similar to and different from two other examples. This student talked about an article annotation method that she ultimately adopted for all her research papers. Like the student using whiteboards, this undergraduate used explanatory notes to brainstorm ideas and manage information: “After I highlight a section, I’ll drop in an annotation, and I will type everything that I can possibly think of into the annotations.” The student explained that the annotations could reach one or two paragraphs in length and that, “After I’ve done that, my paper is written in these annotations, very much. It tells me where I need to go . . . and it tells me what my analysis is.” Yet, like the second student’s approach, this strategy accommodated change and new ideas: “And of course, I’m not married to the annotation, if my analysis changes then my analysis changes.” Like the whiteboard method, the student came up with this technique by her own volition. In the interviewee’s words, “It’s one that I formulated independently” that “slowly developed” into “probably the method I will continue to use, because it’s tried and true, so to speak.”

These three examples demonstrate the varied ways that students managed the difficulties of research—approaches that seem to reflect both their area of study and their own creative approach to research. Some themes were apparent across all three student strategies, such as the importance of creating meaning and order while also tolerating messiness and uncertainty.

Some themes were apparent across all three student strategies, such as the importance of creating meaning and order while also tolerating messiness and uncertainty. However, students engaged in practices that helped them negotiate difficult research contexts and organize complex data. From the way that students depict these strategies, one can see the potential relevance of these techniques for working with foundational disciplinary concepts. In addition, these research practices may be important in and of themselves, as a means for students to work through difficulty and through the process of not knowing and sifting.
Transformative Learning and Threshold Moments

The previous section focused on the sophisticated strategies that some interviewees developed while doing research. An important takeaway from these stories is that such assignments may be troublesome, at least in part, because of challenges inherent to the research process. Yet, this also prompts an important question—to what extent are students transformed in a meaningful way by their research experiences? For Meyer and Land, the transformative aspect of threshold concepts is critical. Such a change requires “seeing things in a new way”—that is, altering how students “think’ in a particular discipline, or how they perceive, apprehend, or experience particular phenomena,” and it represents a “qualitatively different view of the subject matter.”

Given the relative freedom involved with research assignments, some students reflected on how they tried to avoid difficulty. For example, one science student offered this advice to incoming students:

Spend more time on it. Because I kept trying to get by on the very minimum that I could, so I would just do enough to finish the lab, and then once I finished the lab, and once I did whatever I needed to do to get the grade locked down, then I was like, okay, time to do whatever I want to do.

If undergraduates try to complete a research assignment based on the “very minimum” of effort, some may also bypass challenging content and instead resort to what they think they know and find easy to navigate. Consider, however, this statement from an upper-class student: “So that [paper] was the first time I actually kind of really fought trying to figure out what sources meant on an intellectual level rather than just strapping them together just to get a paper done.” This student, like the first, had applied a “just get it done” attitude to doing research but also spoke of transcending this earlier approach to more deeply engage with difficult intellectual content. This interviewee seemed to depict a trajectory across research assignments, such that the paper described marked a significant shift in how she thought about research. In addition, this student’s early research papers, even if less sophisticated, may have provided a foundation that helped her become more analytical with later assignments.

Therefore, in some instances, research assignments may be a form of threshold concept practice as students struggle with difficult discipline-defined concepts. In other cases, however, undergraduates may engage in threshold concept practice because the research itself helps prepare them to struggle with more difficult content in future assignments. For example, one first-year student described procrastinating on a draft of an English composition paper, saying, “I thought I would be able to bust it [the paper] out real fast one night. I was up this morning ‘til like two in the morning probably.” This, of course, is not how librarians or faculty want students to approach their assignments. While the student encountered much more difficulty than she anticipated, however, this challenge may have also opened her eyes to what was demanded by such assignments.
Meyer and Land also discuss a state of being “in the threshold,” what they describe as a “stuck place” where students have “glimpsed the outline of a threshold portal” and are “perhaps only vaguely aware of what lies beyond it.” They add that, in this “liminal” state, students may seem to regress, where their learning lacks authenticity or seems to oscillate between states of understanding. Meyer and Land’s application of liminality to troublesome conceptual content also seems relevant to students’ research experiences. For example, one student talked about the research topic, stating: “But I forget . . . something about whether he was this leader. I forget this certain word, it was a fun word. It was a big word that I learned. I forget. I was trying to prove whether he was or was he not. And I said he was.” Similarly, a second student reflected on the use of library research databases: “It was just a library research database. It wasn’t anything particular. I can’t remember which one, but he strongly suggested one of them. I can’t remember what it was. There’s too many of them. I can’t remember.”

Such comments may be frustrating for instructors as students seem unable to articulate even the most basic understanding of their topic or research tools. Yet, within the context of a highly challenging research process, such forgetting may be common and even a sign of student progress. Both students may be “in the threshold” and struggling with what is troublesome about doing research. In fact, in both examples, the interviewees express a complex level of engagement with their research. The first student could not remember the name of the theoretical focus but has clearly worked at applying an analytical approach to the subject. In the second, a student has forgotten the name of a critical research tool and yet has nevertheless successfully navigated sophisticated research and immersed himself in scholarly content. Both also seem to have transcended some degree of intimidation with the research process; it was, after all, “just” a research database and, even if it was a “big word,” it was also a “fun word.”

While this study did not set out to identify threshold moments in students’ learning, several interviewees described experiences that seemed to shed light on research as a form of deep learning. For example, a biology major, whose research practice was described earlier, talked about the experience of training a new lab assistant:

So, I had to explain to them like every single thing like [in] super detail. That’s when I was like, “Wow, I know so much.” Because to me it comes to me naturally. I don’t think about it, right? I was like, “Yeah, do this, this, this.” But when I was explaining to them, I was like how do I know this? It was very specific.

This student reflects on how much he had learned without being aware of the knowledge he had acquired. The student expresses surprise at realizing that he had, almost unwittingly, developed expertise. The research process itself, in this case empirical lab work, seemed to produce an unexpected degree of knowing and understanding.

These moments of transformed understanding, which may seem to happen only after the hard work of conducting research, also appeared in other students’ accounts. For example, consider one student’s story about a research project conducted during a study abroad program:

It blew my mind . . . I mean, a state library, or a state-funded library, books everywhere. They had a section just dedicated to him [political figure] and a lot of these books were
positive books. I think there were only three that were [negative]. And it really blew my mind, especially considering the government [there] right now.

This example resembles the biology major’s experience in that a moment of realization occurs when the student’s perspective shifts in relation to what she thought she knew. This student clearly brings prior knowledge to the research experience within this new cultural context. And yet, the student researcher discovered unanticipated knowledge, such that the unexpected sources in the library were, in and of themselves, a form of deep learning. This account is a reminder of the potential value of not knowing and sifting that seems so central to undergraduates’ process of doing research.

In other accounts, students’ references to potentially transformative learning are perhaps more obtuse. For example, a psychology major said, “For me personally, it takes a while for everything to click.” This student, like others, spoke of the need for repetition, saying that not until she had “read through it all again” did she understand. Interestingly, for some students, time pressure could also motivate learning. The history major who spoke of an article annotation method described a challenging semester with multiple research assignments: “That is really the semester where, through fire I guess, this approach that I’ve become very committed to has come out.”

Some undergraduates may continue to struggle with research papers. One spoke of the challenge of trying to write in an academic voice, stating, “That was difficult because I kept trying to do the regular essays where it’s my voice. Literally, conversational is like poking out, and it’s not supposed to be conversational.” This student continued, “I’m like, ‘I’m trying, I really am. I just don’t get it,’ and that’s something I still struggle with today.” One notable theme across these examples is that, while each research paper may lead to new discoveries, important learning also seems to happen across assignments and semesters. As one student explained, “That one [paper] came at like the height of after doing so many research papers. It was one of my last [research assignments]” for the major.

While each research paper may lead to new discoveries, important learning also seems to happen across assignments and semesters.

Conclusion

The goal of this project has been to use a qualitative, retrospective interview approach to become better attuned to undergraduates’ research experiences. More specifically, the study uses student interviews to investigate Meyer and Land’s foundational work on threshold concepts in relation to research assignments. This student-centered perspective on Meyer and Land is important because much of the existing literature on threshold concepts has relied on the expert viewpoint of faculty and librarians. This student perspective is invaluable, and such insights can help librarians become more receptive to student needs within a classroom setting and during reference consultations. In addition, the study has aimed to offer contributions to two overlapping areas of inquiry—librarians’ consideration of threshold concepts within the field of information literacy and the wider cross-disciplinary literature inspired by Meyer and Land. While the authors have found the Framework thought-provoking for library instruction, we also suggest
the value of revisiting the foundational work on which the Framework is based. This study reminds us of how deeply challenging research assignments may be for students. From the perspective of Meyer and Land’s cross-disciplinary work, such research assignments may also be an important opportunity for students to grapple with troublesome content, perhaps even disciplinary-identified threshold concepts. Therefore, librarians may usefully design information literacy instruction with such challenges in mind and remind students that such difficulties are often a normal part of the research process.

The interviews also draw attention to the “how” of student research practice. Research assignments may serve as a type of threshold concept practice where students become more adept at working with difficult or perplexing ideas. In students’ own words, doing research seems troublesome because it involves “not knowing” and “sifting” through an extensive amount of content. Yet, the authors were struck by the interviewees’ stories of their own creative ways of doing things. Some of the students’ research practices were highly individualized and seemed to offer them a way through the difficulties of doing research. While some students try to resist the challenge of research assignments, the interviews also suggest a trajectory of growth across assignments. In fact, some students seemed surprised by how much they had learned from their research experiences. That said, the research process may continue to be difficult even after assignments have been completed or as students work on research projects across the curriculum. While the interviews revealed much about research that, in the words of Meyer and Land, is troublesome, the students also offered important insights about the practice of research as transformational and as a potential vehicle for deep learning.

Ann Marshall is an instruction librarian at the Walter E. Helmke Library of Purdue University Fort Wayne in Indiana; she may be reached by e-mail at: marshala@pfw.edu.

Sarah Wagner is an instruction librarian at the Walter E. Helmke Library of Purdue University Fort Wayne in Indiana; she may be reached by e-mail at: wagners@pfw.edu.

Notes
2. Ibid.
5. For an introduction to deep learning in the sense this article uses the term—that is, understanding the big ideas in the material rather than just remembering facts and
Ann Marshall and Sarah Wagner


12. ACRL, “Framework for Information Literacy for Higher Education.”


34. For example, Meyer and Land, “Threshold Concepts and Troublesome Knowledge,” 5–6, offers a flexible definition of threshold concepts, in that they are “probably irreversible” and “potentially (and possibly inherently) troublesome” (emphasis original). Barradell, “The Identification of Threshold Concepts,” 266, added to this definition.


36. Ibid., 4.
