



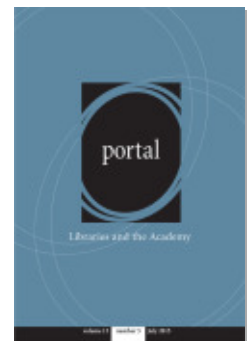
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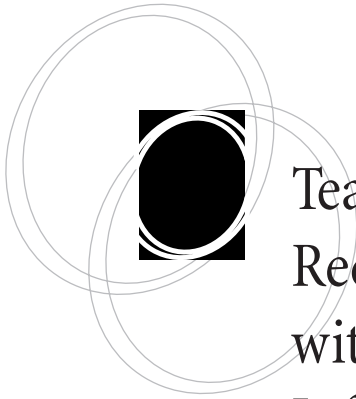
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Teaching for Transfer: Reconciling the Framework with Disciplinary Information Literacy

Rebecca Z. Kuglitsch

abstract: This article explores the tension between information literacy as a generalizable skill and as a skill within the disciplines. The new ACRL Framework for Information Literacy for Higher Education addresses many challenges facing the previous ACRL Information Literacy Competency Standards for Higher Education, but the tension between disciplinary expertise and generalizable skills remains. Viewing the documents through the lens of teaching for transfer—that is, instruction that enables students to utilize knowledge and skills gained in one context in other situations—offers a useful approach. Exploring the Framework from the point of view of teaching for transfer addresses both practical and theoretical challenges. This viewpoint respects both the generalizable nature of information literacy and the highly contextual nature of its application in an academic setting.

Introduction

The literature of library instruction has discussed at length the question of how to balance information literacy (IL) as a generalizable skill versus IL as a discipline-based competence. The release of the Association of College and Research Libraries (ACRL) Framework for Information Literacy for Higher Education (the Framework), which proposes threshold concepts for information literacy grounded in the discipline of information science, raises the question again. This positioning of information literacy within a separate discipline has some advantages—for example, it gives IL a disciplinary home, which may increase credibility in discipline-focused academic institutions. But when most faculty and students identify themselves with a discipline outside of information science, how can librarians position information literacy as relevant if it is

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embedded in information science? How can they teach the threshold concepts as general skills rooted in information science while valuing specialized disciplinary IL? Approaching the Framework's threshold concepts as a type of teaching for transfer, which helps students apply knowledge and skills learned in one setting to other situations, offers a way to resolve the tension.

A practical method has been simply to develop focused documents that rework a larger set of standards to highlight a particular discipline's needs. Like the ACRL Information Literacy Competency Standards for Higher Education (the Standards), the Framework is intended as a broad, generalizable statement on information literacy. Since the Standards were published, educators have developed various disciplinary versions, modifying and applying the Standards to particular instances. These adaptations range in formality from contextualizations, such as the Information Literacy Standards for Science and Engineering/Technology,¹ to standards from completely different bodies, such as the Information Competencies for Chemistry Undergraduates: The Elements of Information Literacy, developed by the Special Libraries Association in consultation with the American Chemical Society.²

Just like the initial Standards, the Framework is explicitly rooted in the discipline of librarianship. The Framework is divided into six core concepts called "frames" that are central to information literacy, each of which involves a set of knowledge practices and dispositions. The ACRL Information Literacy Competency Standards for Higher Education Task Force explicitly encourages situating the frames within disciplines.³ But positioning the frames within fields of study does not resolve the underlying tension between the generalizable skills of information literacy and IL situated within the disciplines. By examining the literature of effective teaching and teaching for transfer, however, we may find that this seeming conflict actually offers librarians a way to encourage effective teaching and transferable learning. This article will explore that proposition in relation to information literacy in the sciences.

Clearly, there are pragmatic reasons to contextualize the generic Framework within the disciplines. Situating these concepts in the disciplines enhances learning by providing students with a clear, meaningful need for information literacy. Doing so will also help students avoid developing oversimplified understandings of the generic concepts. But these pragmatic reasons still do not fill the theoretical gap between a Framework rooted in generalizable IL concepts and the focus on information literacy within the disciplines that librarians often recognize as important for learning.

Threshold Concepts and Disciplinary

To begin examining how the draft Framework relates to disciplinary information literacy and to IL as a discipline, it is first important to review how scholars have conceived of threshold concepts in relation to disciplinaryity. The learning researchers Jan Meyer and Ray Land developed the idea of threshold concepts in 2003 as a way of identifying core learning outcomes that open up new ways of thinking for students.⁴ Many educators describe threshold concepts as a portal or a doorway through which students must pass to continue successfully learning a discipline.⁵ Meyer and Land identified five typical characteristics of a threshold concept. A threshold concept, they said, is one that is:



1. transformative, in that it changes the way a learner approaches a field;
2. irreversible, in that it cannot be unlearned once learned;
3. integrative, in that it exposes connections between ideas that previously seemed unrelated;
4. bounded, in that it is *particular to a specific field*;
5. and troublesome, in that it is somehow challenging to students.⁶

The five characteristics are descriptive of threshold concepts rather than definitional. In other words, they are not required qualities that must be checked off to qualify an idea as a threshold concept. Instead, they are characteristics commonly associated with threshold concepts. Thus a threshold concept need not be a full, identical match for the five characteristics but rather should have a general fit with most of them.

Though all five characteristics are variable and bear more investigation, boundedness within a field is of most interest to the question at hand. Many threshold concepts fit neatly within a single field. Every physicist, for example, might agree that Isaac Newton's laws of motion are threshold concepts for physics, and most non-physicists would classify these laws within that discipline without a second thought.⁷ Even within easily agreed-upon disciplines, however, there is the question of multiple

Scholars have raised the question, for example, of whether information literacy applies only to traditional textual research or also to data research. The question remains not fully settled.

threshold concepts within a single discipline. For example, a molecular biologist and an ecologist might have different threshold concepts for their subdisciplines, while still being broadly considered members of the same discipline. We might also ask whether this variation applies in information literacy. Scholars have raised the question, for example, of whether information literacy applies only to traditional textual research or also to data research. The question remains not fully settled. Megan Bresnahan and Andrew Johnson, for example, argue that data literacy fits well within the draft Framework.⁸ Other scholars have made similar arguments for viewing data literacy as encompassed by the Standards.⁹ Still other experts, however, regard data literacy as related to but distinct from information literacy.¹⁰

Moreover, many *concepts* that fit the criteria of threshold concepts fit uneasily within a discipline, or raise the question of whether their field is, indeed, a field. Some threshold concepts, for example, do not fit within a single field, such as the threshold concepts of becoming a research scholar¹¹ or threshold concepts in writing, rhetoric, and composition.¹² Information literacy, like composition, is a field that extends across other fields; like becoming a research scholar, gaining information literacy might not fit within a field at all. Thus, the disciplinary nature of threshold concepts offers great scope for exploration and discussion.



Threshold Concepts and IL as a Discipline

In the field of IL, several case studies explore threshold concepts for information literacy as a focal point within particular fields of study, such as engineering¹³ or nursing.¹⁴ The prevailing trend in research, however, accords with the Framework in situating IL within information science or as a discipline itself. In this vein, Lori Townsend, Korey Brunetti, and Amy Hofer initially identified a suite of four threshold concepts for information literacy: (1) format as process, (2) authority is constructed and contextual, (3) information as a commodity, and (4) primary sources and disciplinarity.¹⁵ In their germinal article, the authors position these concepts as bounded in and derived from the discipline of information science, making them generalizable to students researching across the disciplines.¹⁶

Hofer, Brunetti, and Townsend formalized this picture of threshold concepts in a follow-up study, which identified threshold concepts using a qualitative survey to explore and code librarians' perceptions of student bottlenecks.¹⁷ Checking the original concepts against a wider swath of experience resulted in an expanded set of seven proposed threshold concepts, again bounded in the discipline of information science:

- Metadata = findability
- Good searches use database structure
- Format is a process
- Authority is constructed and contextual
- "Primary source" is an exact and conditional category
- Information as a commodity
- Research solves problems.¹⁸

While these concepts were more deeply grounded, they remained descriptive and analytical, a part of the academic literature rather than active praxis.

This situation changed when ACRL turned to threshold concepts in 2013 as a solution to several of the problems vexing the then-current Standards.¹⁹ The Standards were due

for revision because they had been written thirteen years previously—thirteen years of rapidly increasing access to and production of information, as well as significant technological change. But they were also due for revision because of changes in pedagogy. Threshold concepts shift the focus of information literacy from procedural instruction to a more conceptual model.²⁰ This more conceptual model enables more active learning and accommodates other changes in pedagogy. Rather than applying a set of standards that focus on specific tasks and can easily slip into skills training,

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Moreover, a threshold-concepts approach could alleviate several other challenges the Standards presented to librarians. The focus on key concepts could prevent the overload



instructors might feel faced with tens of pages of skills. It could address the difficulty of finding a level of specificity that was “just right” rather than too broad or too narrow. Finally, such a focus could clarify priorities to avoid the burden of nebulous concepts that overrun the boundaries of information literacy into impractically large outcomes such as “lifelong learning.”²¹ After the proposal, ACRL combined the concepts from Hofer, Brunetti, and Townsend’s 2012 qualitative survey with an unpublished Delphi study collecting the ideas of a group of prominent educators to develop the Framework.²² The Framework, having undergone several cycles of revisions before its final version, lists six major threshold concepts, or frames:

1. Authority is constructed and contextual,
2. Information creation as a process,
3. Information has value,
4. Research as inquiry,
5. Scholarship as conversation,
6. Searching as strategic exploration.²³

These concepts are broadly applicable, but for effective instruction, they must be contextualized within specific knowledge communities for many reasons, both pragmatic and theoretical.

Assigning the threshold concepts to the bounded community of information literacy remains a challenge. Do we *really* want to train students to be information scientists? It is practically a truism that we are not preparing students to be librarians. Moreover, the community of practice students will eventually join is not, typically, that of information scientists. In higher education, students simultaneously apprentice to several communities of practice, as conceived by Jean Lave and Etienne Wenger.²⁴ Broadly, they are becoming participants in the community of college graduates. More narrowly, they are apprenticing to the community of scholars in a particular discipline or to the community of a particular profession. Only a few will join a profession in information. Thus, if for no other reason than addressing motivation, it is vital that we contextualize the Framework in disciplinary instruction.

IL in the Disciplines

Librarians often try to teach information literacy within the disciplines. In the sciences, disciplinary standards of information literacy appeal for a variety of reasons. One simple pragmatic reason is the relative abundance of accrediting bodies in the United States (for example, the American Chemical Society, American Occupational Therapy Association, and many others). Each body may wish to specify its own set of information literacy skills. This situation, of course, is not limited to the sciences; other bodies such as the Council of Writing Program Administrators or the College Art Association produce disciplinary standards that encompass information literacy. From a librarian’s

From a librarian’s point of view, this disciplinary fragmentation of IL is both helpful and problematic.



point of view, this disciplinary fragmentation of IL is both helpful and problematic. It is obviously useful to quickly see relevant skills in a specific circumstance, particularly for librarians new to teaching information literacy in a particular field.

Another contributor to the push for disciplinary standards is the rhetorical positioning of much of information literacy within the liberal arts.²⁵ By using language most familiar to librarians and the liberal arts, the Standards may read as irrelevant to or distant from the sciences.

Since many of our students are interested in disciplines other than information science, it is essential to explore IL threshold concepts within the disciplines to deploy the concepts in meaningful, effective, and motivating ways. Research shows that contextualized instruction promotes learning when, as Char Booth says, it “connects learning targets to practical needs.”²⁶ Engineering students, for example, would find considering

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the contextual authority of the American Society of Civil Engineers to produce standards for construction more engaging when the ideas are connected to an authentic scenario, such as constructing a bridge or developing a bioremediation plan for a contaminated site.

Cognitive science suggests that learners look for connections between new and old information, and they will more likely engage with information that connects to their past knowledge.²⁷ Link-

ing information literacy to a setting in which students have personal investment and connections increases the chances that new IL concepts will hook into their previous knowledge and be retained.

It is also important to contextualize IL concepts because students are particularly engaged in becoming part of a disciplinary community of practice. Kate Manuel points out that some of the rhetoric and vocabulary of information literacy may alienate science, technology, engineering, and mathematics (STEM) faculty.²⁸ If students are studying to become part of that community, they will likely be equally alienated by terminology that is meaningless to them. Thus it is essential to meet members of that community on their own terms to engage them. For example, one might think of the concept of research. A recent interaction in the library is a perfect illustration of the multiple meanings of research—a student showing her parents a campus science library was asked if this was “where they did research.” The student looked at her parents with affectionate condescension and explained that of course this was not the place where research happened: it was the place where books and references were found. The student did *research* upstairs in the lab. Librarians using terminology naively will likely encounter the same condescension and thus may fail to motivate students to engage with information literacy.

Moreover, a common challenge in information literacy instruction is the repetition students may face during sessions. Librarians often need to teach groups that include students who have had several sessions as well as those who have never entered a library. A disciplinary focus allows students who have attended other sessions to have a new



and still valuable experience.²⁹ This practice also aligns with educational strategies that support transfer. Teaching general principles in specific but varied contexts promotes independent transfer skills.³⁰ Thus a disciplinary focus on general information literacy skills facilitates transfer of IL concepts, while also minimizing the repetition that can provoke student disengagement.

It is also important to conceptualize threshold concepts within the disciplines so students can understand their nuances. Many of the threshold concepts seem deceptively simple in scientific settings. For example, the concept of how authority is constructed initially appears clear in science: experimental research is conducted and then peer-reviewed

to ensure it is accurate and meaningful. But as more and more research has been called into question and found to be unreproducible, the question of authority becomes complicated. The simple idea that a researcher gains authority by getting a PhD, writing a research article, and submitting it for peer review, which will determine whether the article is meaningful and valid, is a vast oversimplification. Without deeply situating the concept of authority in the scientific context, it is easy to develop a naive understanding and blindly overestimate the value of peer review. Evaluating articles solely on the basis of credentials is problematic based on the steady flow of hoaxes and unreliable papers³¹ and the continuing debate about the existence and definitions of predatory journals. Scholars in the sciences also confront questions of unreplicable research,³² managing retractions,³³ and an increasingly complex international research landscape, where it can be difficult to understand

credentials. Students may give too much credence to unfamiliar credentials because they sound impressive. On the other hand, students who still struggle with a local academic landscape, let alone an international one, may fail to recognize noteworthy qualifications. An additional consideration is that many students leave the university and work in the nonacademic world, where gray literature, unpublished data sets, and government reports may contain the information they need. If they rely too blindly on signifiers of authority, then key resources will be invisible to them. Even within the purely academic environment, students will still encounter fuzzy cases such as preprints, tools such as arXiv, conference papers, and conference abstracts. The ability to understand authority beyond the binary of peer-reviewed or non-peer-reviewed is essential within and without the academy. Without a careful contextualization in the STEM milieu, students will apply excessively simple understandings of what constitutes authority. By focusing on

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a particular discipline, students can more fully understand the nuances underlying the frame “Authority is constructed and contextual,” rather than rely on simple answers. Similar considerations apply to the other frames.

Clearly, then, there are pragmatic reasons for contextualization and discipline-specific information literacy. Librarians also use terms and rhetoric that can marginalize if not alienate science faculty. For example, we often speak of information literacy as critical thinking or connect it to the liberal arts, without exploring how it ties in to scientific literacy or numeracy.³⁴ Fairly or unfairly, this language can give the impression that IL is less important for the sciences than it is for the humanities or social sciences. Although specialization and focus can get us around that difficulty, they can also lead to a hardening of disciplinary identities and an increase in siloing or isolation between librarians. A shared foundational document, such as the Standards or the Framework, can be a strong base for a customized disciplinary approach. Contextualizing information literacy to suit the discipline will result in better learning.

The Framework harks back to the original intent of the Standards to provide a generalizable touchstone of information literacy across the disciplines. To achieve this generalizability, threshold concepts in information literacy position the concepts as fitting into the discipline of information science, and thus, as inherently generalizable across disciplines in the academic library. In other words, Townsend, Brunetti, and Hofer argue, when teaching IL concepts to biology students, librarians are not training them to perform literature research as a biologist would; instead, librarians are teaching students to perform research as if they were information scientists.³⁵ Using threshold concepts to construct the Framework simply implies that our instruction comes from a discipline of information literacy. We can examine the literature of teaching for transfer to bridge the gap between a need to recognize disciplinary variations and a duty to teach generalizable skills.

Transfer and Information Literacy

Perhaps reflective of the concept of information literacy as a generalizable skill, library literature on transfer of IL skills has focused on the transfer between school, daily life, and work³⁶ or from high school to college.³⁷ Researchers have documented basic transfer of information-related competencies between work, daily life, and academic settings in

adult online learners.³⁸ Library scholars have paid little attention to transfer *between* disciplines, though transfer between disciplines is one of the most important features of IL transfer in the university. For example, can a student who has learned to search in the field of physics transfer that understanding to chemical or anthropological materials?

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anthropological materials? Given the rarity of full, programmatic IL instruction, teaching information literacy in a way that facilitates transfer of IL skills between disciplines will



broaden the reach of library instruction. Moreover, the capacity to transfer skills and knowledge provides a foundation for academic success. As libraries strive to remain integral to the university, contributing to the development of foundational academic skills is key.

While the library literature has relatively little on disciplinary transfer, there is an extensive literature in educational research on the problem of transfer, which we can apply to the library. David Perkins and Gavriel Salomon's classic article on teaching for transfer develops models for near and far transfer, and suggests several techniques for supporting transfer.³⁹ Perkins and Salomon differentiate between two main types of transfer: low road transfer, or transfer from the original learning situation to a perceptibly similar context; and high road transfer, which involves mindfully and intentionally transferring abstract concepts from one setting to another. Educators can teach these two using two different techniques. Low road transfer is taught as "hugging" concepts—in other words, highlighting explicit similarities between ideas. High road transfer is taught by "bridging," which entails abstracting and connecting ideas between dissimilar settings. Teachers facilitate this bridging by asking students to take ideas out of their immediate context.⁴⁰ Combining the two methods is particularly effective. Starting with a concept, librarians might begin instruction with a hugging strategy, drawing analogies between similar areas, or showing a technique in similar settings. Next, they might move into a bridging strategy that places the concept in a wholly new context.⁴¹ This idea offers a tool to resolve the tension between information literacy as a general skill and as a disciplinary skill. We can teach information literacy more effectively by taking the abstracted threshold concepts of the Framework and connecting them to local IL knowledge. Thus we might consider bridging between information literacy as a discipline and other subject areas to most effectively transmit reusable IL ideas. Just as there is a tension between subject-specific and generic information literacy, Perkins and Salomon identify a tension between local knowledge (for example, domain-specific knowledge) and general knowledge.⁴² They conclude that "a synergy of local and more general knowledge" is ideal for supporting transfer.⁴³ These are just the conditions we can provide by teaching generalizable information literacy skills within domain-specific knowledge.

More recently, David Billing reviewed the literature on transfer, mainly in higher education, establishing that transfer can be taught and synthesizing the methods that support it.⁴⁴ The strategies he identified include metacognition, integrating general cognitive skills into domain contexts, and emphasizing prior learning.⁴⁵ These methods can be applied in library instruction and facilitated by attempting to bridge information literacy as a discipline and subject-specific knowledge. Indeed, overall evidence suggests that students acquire general skills

By placing the larger principles in a particular setting and explicitly drawing them out, we can encourage students to think about the principles metacognitively, with awareness of their own thinking and learning processes, and to learn to see the principles as transferable to new, particular circumstances.



most effectively when the skills are contextualized in domains.⁴⁶ If our aim is to teach students the generalized skills of information literacy, educational research suggests that the best way to do so is to explicitly situate those generalized skills of the Framework in a domain familiar to students. Students can then use their local knowledge of the domain to support and abstract the general principles of information literacy. By placing the larger principles in a particular setting and explicitly drawing them out, we can encourage students to think about the principles metacognitively, with awareness of their own thinking and learning processes, and to learn to see the principles as transferable to new, particular circumstances.

Interdisciplinary Studies of Transfer

Many case studies of interdisciplinary transfer bear out these theoretical suggestions. Work from composition studies can provide a model for transfer between disciplines for information literacy. Both composition and information literacy are skills frequently considered generalizable—students who have taken a first-year writing course ought, in theory, to be prepared for writing across and within many disciplines, just as students who have taken an IL course (or session) should be able to transfer their skills to another discipline. Yet there is growing acceptance of the idea that writing is a highly contextual activity within and without composition studies. A science student will not learn to write in scientific format in a general writing course, but the general course can prepare the student for thinking about writing in the disciplines.

A similar approach could suit information literacy. Linda Adler-Kassner, John Majewski, and Damian Koshnick provide a useful case study. They explore how threshold concepts in writing can be usefully applied to general education requirements in higher education and suggest that concepts which span disciplines can be successfully taught when the teaching clearly articulates shared concepts.⁴⁷ Their case study focused on teaching transfer between composition and history courses, but the basic threshold concepts for literature research would also be good candidates. Moreover, they say, presenting concepts that span disciplines can facilitate “more effective transfer across both [disciplines].”⁴⁸ The Framework threshold concepts extend across disciplines and could be effectively taught this way.

Of the models we can explore from composition studies, I argue that Rebecca Nowacek’s agent of integration model can be particularly helpful in helping librarians to reconcile information science with disciplinary knowledge. Nowacek calls for students to become what she calls “agents of integration,” actively working to find connections as well as explaining to others the connections they make. Using Nowacek’s model, developed in composition studies, we can highlight our own disciplinary expertise in information science while maintaining our connection to the disciplines and encouraging students to develop transfer skills.⁴⁹ This is useful for both students and librarians.

Nowacek’s model explicitly encourages the student to transfer concepts between disciplines—in other words, to actively take on agency in integrating concepts.⁵⁰ A student who is an agent of integration brings a concept from one setting to another. For example, during a discussion of how authority is constructed in scientific publishing, a student acting as an agent of integration would connect an idea from writing classes



or lab exercises—that scientific writing has an objective tone—with an information literacy concept—that the appeal to empiricism and observation is part of the construction of scientific authority. Jessie Moore suggests an approach similar to the agent of integration model. To reinforce transfer, students are explicitly asked to bring their own interdisciplinary knowledge to a scenario and apply it; thus, the act of transfer is made visible and approachable.⁵¹

Simply identifying threshold concepts in context and making them more visible can be a first step in facilitating transfer.⁵² Further steps for facilitating transfer include developing assignments that provoke conscious reflection on the transformative ideas, for example, by asking students how understanding research as a conversation affects their perception of scholarly articles. We might also inquire of students how their new knowledge might affect their future work, asking them to explain not only how they will apply the idea of research as a conversation in their current assignment but also how it might influence their work in a future science class.⁵³ These activities will be most meaningful when information literacy instruction occurs within the disciplines. Thus, an explicit discussion of threshold concepts applied to the discipline most familiar to students sets the stage for metacognition, better transferability, and consequently more student success.

James Herring and Stephanie Bush suggest that enhancing transfer at a secondary level requires several measures. These include explicit training for staff, imbuing the entire curriculum with opportunities to practice transfer skills, having a consistent approach across the school,

and frequently reminding students of the importance of information literacy.⁵⁴ The Framework offers an opportunity for this effort. By teaching the same overarching ideas contextualized within disciplinary communities of practice, we can consistently expose students to IL concepts and enable them to transfer the concepts better, both between disciplines and after graduation.

These models explicitly encourage transfer from one context to another, and thus give us the space to clearly value the disciplinary expertise and goals of most of our students, who would rather become an expert in their own discipline or profession, instead of ours. At the same time, this approach integrates information science, which is the foundation of the information literacy students will need to pursue their own research eventually.

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Conclusion

Threshold concepts for teaching information literacy present an initial challenge in that they require librarians to teach information science to non-information scientists. But, if we think of threshold concepts in the transfer of knowledge, Nowacek's description of students as "agents of integration" is a solution to this theoretical tension. It positions us as experts in a discipline and allows us to recognize the importance of a scientific discipline in drawing connections and developing transferable skills. In a course-integrated



session, this approach would let us bring students into the library as experts in their field, while the session might invite them to temporarily participate in a community of practice as experts in finding information. The students, then, can actively bridge those

By asking students to transfer the lessons of information science into their own discipline, we give them the opportunity to explicitly and reflectively transfer skills between disparate contexts.

two spheres of expertise and resolve the tension between becoming, for example, an expert biologist and an expert information scientist. We can invite them to integrate the threshold concepts they learn into their chosen sphere of expertise. This integration not only will provide a meaningful context for students, allowing them more authority in their learning, but also will strengthen their capacity for transfer. By asking students to transfer the lessons of information science

into their own discipline, we give them the opportunity to explicitly and reflectively transfer skills between disparate contexts. Paradoxically, by using a Framework that exhorts us *not* to focus on lifelong learning and other impossibly large goals, we might find ourselves doing a better job supporting these larger outcomes.

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Notes

1. The ALA/ACRL/STS (American Library Association/Association of College and Research Libraries/Science & Technology Section) Task Force on Information Literacy for Science and Technology, "Information Literacy Standards for Science and Engineering/Technology," accessed March 30, 2014, <http://www.ala.org/acrl/standards/infolitscitech>.
2. Special Libraries Association, Chemistry Division and American Chemical Society, Division of Chemical Information, "Information Competencies for Chemistry Undergraduates: The Elements of Information Literacy," accessed June 29, 2014, http://en.wikibooks.org/wiki/Information_Competencies_for_Chemistry_Undergraduates.
3. Association of College and Research Libraries, Framework for Information Literacy for Higher Education, accessed March 31, 2015, <http://www.ala.org/acrl/standards/ilframework>; ACRL Information Literacy Competency Standards for Higher Education Task Force, Framework for Information Literacy for Higher Education, Draft 3, accessed November 12, 2014, 26, <http://acrl.ala.org/ilstandards/wp-content/uploads/2014/11/Framework-for-IL-for-HE-draft-3.pdf>.
4. Jan Meyer and Ray Land, *Threshold Concepts and Troublesome Knowledge: Linkages to Ways of Thinking and Practising within the Disciplines* (Edinburgh, UK: University of Edinburgh, 2003), accessed August 15, 2014, https://www.dkit.ie/ga/system/files/Threshold_Concepts_and_Troublesome_Knowledge_by_Professor_Ray_Land.pdf.
5. *Ibid.*, 10.
6. *Ibid.*, 4–5.
7. *Ibid.*, 7.
8. Megan Bresnahan and Andrew Johnson, "Building a Unified Data and Information Literacy Program: A Collaborative Approach to Instruction" (presented at Library Instruction West, Portland, OR, July 25, 2014), http://scholar.colorado.edu/libr_facpapers/8.



9. Jacob Carlson, Michael Fosmire, C. C. Miller, and Megan Sapp Nelson, "Determining Data Information Literacy Needs: A Study of Students and Research Faculty," *portal: Libraries and the Academy* 11, 2 (2011): 629–57.
10. Jian Qin and John D'Ignazio, "Lessons Learned from a Two-Year Experience in Science Data Literacy Education" (presented at the International Association of Scientific and Technological University Libraries, 31st Annual Conference, Purdue University, West Lafayette, IN, June 22, 2010), accessed December 31, 2014, <http://docs.lib.purdue.edu/iatul2010/conf/day2/5>.
11. Margaret Kiley, "Identifying Threshold Concepts and Proposing Strategies to Support Doctoral Candidates," *Innovations in Education and Teaching International* 46, 3 (2009): 293–304.
12. Linda Adler-Kassner, John Majewski, and Damian Koshnick, "The Value of Troublesome Knowledge: Transfer and Threshold Concepts in Writing and History," *Composition Forum* 26 (Fall 2012).
13. Phil Yorke-Barber, Loretta Atkinson, Gisela Possin, and Leith Woodall, "Light Bulb Moments: Identifying Information Research Threshold Concepts for Fourth Year Engineering Students" (presented at the Nineteenth Annual Conference for the Australasian Association for Engineering Education, Australasian Association for Engineering Education, Institution of Engineers, Australia, 2008), accessed March 27, 2014, <http://espace.library.uq.edu.au/view/UQ:159735>.
14. Natalie Clairoux, Sylvie Desbiens, Monique Clar, Patrice Dupont, and Monique St-Jean, "Integrating Information Literacy in Health Sciences Curricula: A Case Study from Québec," *Health Information & Libraries Journal* 30, 3 (September 1, 2013): 201–11.
15. Lori Townsend, Corey Brunetti, and Amy R. Hofer, "Threshold Concepts and Information Literacy," *portal: Libraries and the Academy* 11, 3 (2011): 853–69.
16. Ibid.
17. Amy R. Hofer, Corey Brunetti, and Lori Townsend, "A Threshold Concepts Approach to the Standards Revision," *Communications in Information Literacy* 7, 2 (February 12, 2013): 108–13.
18. Amy R. Hofer, Lori Townsend, and Corey Brunetti, "Troublesome Concepts and Information Literacy: Investigating Threshold Concepts for IL Instruction," *portal: Libraries and the Academy* 12, 4 (2012): 402.
19. Hofer, Brunetti, and Townsend, "A Threshold Concepts Approach to the Standards Revision."
20. Ibid.
21. Ibid.
22. ACRL, Framework for Information Literacy for Higher Education, <http://www.ala.org/acrl/standards/ilframework>.
23. Ibid.
24. Jean Lave and Etienne Wenger, *Situated Learning: Legitimate Peripheral Participation*, Learning in Doing: Social, Cognitive and Computational Perspectives (New York: Cambridge University Press, 1991).
25. Kate Manuel, "Generic and Discipline-Specific Information Literacy Competencies," *Science & Technology Libraries* 24, 3–4 (2004): 279–308.
26. Char Booth, *Reflective Teaching, Effective Learning: Instructional Literacy for Library Educators* (Chicago: ALA, 2011), 55.
27. Marilyn M. Lombardi, "Authentic Learning for the 21st Century: An Overview," *EDUCAUSE Learning Initiative* 1, 2007 (2007): 8.
28. Manuel, "Generic and Discipline-Specific Information Literacy Competencies."
29. Ibid., 302.
30. David Billing, "Teaching for Transfer of Core/Key Skills in Higher Education: Cognitive Skills," *Higher Education* 53, 4 (April 1, 2007): 512.
31. Manuel, "Generic and Discipline-Specific Information Literacy Competencies."



32. Richard A. Klein, Kate A. Ratliff, Michelangelo Vianello, Reginald B. Adams Jr, Štěpán Bahník, Michael J. Bernstein, Konrad Bocian, et al., "Investigating Variation in Replicability: A 'Many Labs' Replication Project," *Social Psychology* 45, 3 (2014): 142–52.
33. Richard Van Noorden, "Science Publishing: The Trouble with Retractions," *Nature* 478, 7367 (October 5, 2011): 26–28.
34. Manuel, "Generic and Discipline-Specific Information Literacy Competencies," 293.
35. Townsend, Brunetti, and Hofer, "Threshold Concepts and Information Literacy," 858.
36. Jason Eyre, "Context and Learning: The Value and Limits of Library-Based Information Literacy Teaching," *Health Information & Libraries Journal* 29, 4 (December 2012): 344–48; Annemaree Lloyd, "Information Literacy the Meta-Competency of the Knowledge Economy? An Exploratory Paper," *Journal of Librarianship and Information Science* 35, 2 (June 1, 2003): 87–92; Sharon Weiner, "Information Literacy and the Workforce: A Review," *Education Libraries* 34, 2 (January 2011): 7–14.
37. James E. Herring and Stephanie J. Bush, "Information Literacy and Transfer in Schools: Implications for Teacher Librarians," *Australian Library Journal* 60, 2 (May 2011): 123–32; Diane D. Kester, "Secondary School Library and Information Skills: Are They Transferred from High School to College?" *Reference Librarian* 20, 44 (1994): 9–17.
38. Núria Ferran-Ferrer, Julià Minguillón, and Mario Pérez-Montoro, "Key Factors in the Transfer of Information-Related Competencies between Academic, Workplace, and Daily Life Contexts," *Journal of the American Society for Information Science and Technology* 64, 6 (June 2013): 1112–21.
39. David N. Perkins and Gavriel Salomon, "Teaching for Transfer," *Educational Leadership* 46, 1 (September 1988): 22.
40. *Ibid.*, 29.
41. *Ibid.*, 30.
42. *Ibid.*, 30–31.
43. *Ibid.*, 31.
44. Billing, "Teaching for Transfer of Core/Key Skills in Higher Education."
45. *Ibid.*, 508–9.
46. *Ibid.*, 512.
47. Adler-Kassner, Majewski, and Koshnick, "The Value of Troublesome Knowledge."
48. *Ibid.*, 26.
49. Rebecca S. Nowacek, *Agents of Integration: Understanding Transfer as a Rhetorical Act*, CCCC (Conference on College Composition and Communication) Studies in Writing & Rhetoric (Carbondale: Southern Illinois University Press, 2011).
50. *Ibid.*
51. Jessie Moore, "Designing for Transfer: A Threshold Concept," *Journal of Faculty Development* 26, 3 (September 1, 2012): 23.
52. *Ibid.*
53. *Ibid.*
54. Herring and Bush, "Information Literacy and Transfer in Schools."