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Scholarship of Teaching and Learning and Transfer of Information Literacy Skills

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Introduction

One of O'Brien's four points of reference that form a compass for navigating SoTL is "What will my students learn, and why is it worth learning?" If information literacy (IL) instructors apply the second part of this question, most would say that it is so that students can critically participate in scholarship, their careers, and their personal lives.[1] Another point on O'Brien's compass asks, "How do I know if my teaching and students' learning has been effective?" If librarians are successful in their teaching, students will transfer skills from the library classroom to work and personal contexts. Thus, an understanding of transfer theory enhances IL scholarship of teaching and learning.

Classic transfer theory describes the application of knowledge from one context to another after a new skill is learned.[2] This kind of transfer is often thought of as aligning with two sets of concepts:

- Low road and high road transfer
  - low road—engaging automatic behaviors and adjustments to routine knowledge or activities
  - high road—which requires "mindful abstraction of skill or knowledge from one context for application in another"[3]
- Near and far transfer
  - near transfer—transfer when contexts share visible similarities
  - far transfer—in which transfer occurs between different contexts

Typically, but not invariably, near transfer and low road transfer are aligned, while far transfer and high road transfer are aligned. For successful transfer of IL, instructors would want to encourage high road and far transfer in particular. But even as many IL instructors

appreciate the importance of this, implementing teaching strategies that promote transfer can be a challenge.

By broadening IL focus from procedural skills to foundational concepts, the Association of College and Research Libraries' (ACRL) *Framework for Information Literacy for Higher Education* primed the authors to address some of these challenges, build teaching practices by integrating active learning, and consider how to promote transfer of learning.[4] Specifically for the authors, the ACRL *Framework* sparked discussion of IL issues that both supersede and contain disciplinary concerns, as transfer theory recommends. The ACRL *Framework* also addresses the affective side of IL, suggesting a way to talk about IL as an opportunity to engage in curiosity, persistence, and joyful inquiry, qualities that are often assumed to be tacitly understood by experts but not always discussed with students. Moreover, it explicitly calls for a special emphasis on metacognition, aligning with the emphasis on metacognition in transfer theory.[5] Thus, the authors find similarities between priorities in the *Framework* and transfer theory that can promote transfer of IL skills.

As illustrated in table 3.1, this case study draws from literature related to transfer theory, workplace learning, and the authors' challenges and opportunities of teaching IL for transferring learning to answer the following questions: How can IL instructors situate transfer theory, metacognition, and workplace learning within the specialized context of pedagogical content knowledge (PCK) for IL? How can they encourage the transfer of IL skills across disciplinary boundaries and into applied contexts? What specific classroom practices that can extend classroom interactions help learners use IL skills within their applied contexts and cultivate a mindset and affect for transferring IL strategies to contexts beyond a specific course assignment or one-shot session?

Table 3.1. Themes that Enhance Transfer

Preparation for Learning	**Active Learning**	**Metacognition & Reflection**	**Social Learning**
Transfer requires a solid understanding of initial material (National Research Council, 1999)	Solving problems over memorizing facts; learning with understanding vs. procedural knowledge (Bransford and Schwartz, 1999, p. 64)	Mindful abstraction, identifying general principles from specific situations (high road). (Salomon and Perkins 1989, p. 124-5; National Research Council, 1999; Barber, 2012; Billing, 2007)	Invite conversations with students which can foster reflection (Barber, 2012)
Actively bridge contexts for and with students (Barber, 2012)	Extensive and varied practice (low road). (Salomon and Perkins, 1989, p 124) Knowledge taught in multiple contexts is more transferable (National Research Council, 1999)	Strategy training with metacognitive reflection (Billing, 2007, p. 508; Perkins and Salomon, 1988)	Teach within a social context. Students can practice explaining their learning to other students (Billing, 2007, p. 509-511)

Preparation for Learning	Active Learning	Metacognition & Reflection	Social Learning
Concrete examples boost relevance (Bransford and Schwartz, 1999, p. 64)	Problem-based or project-based learning strategies (Bransford and Schwartz, 1999, p. 64)	Use modeling and coaching to encourage meta-cognitive skills (Billing,2007, p. 509)	Teacher appreciation of prior knowledge facilitates transfer (Bransford and Schwartz, 1999, p.83; National Research Council, 1999)
Transfer occurs based on prior knowledge; (National Research Council, 1999)	Show specific skills, activities, and dispositions in context (without overemphasizing context) (Billing, 2007, p. 509)	Promote perspective taking (ask students to consciously imagine the perspectives and viewpoints of others) (Barber, 2012)	Collaboration among librarians and teachers, including discussing transfer across the institution (Herring and Bush, 2009)
Show underlying rules or principles (Billing, 2007p. 509); worked or partly worked examples reduce cognitive load, expose underlying principles (Billing, 2007p. 510)	Help students create their own systems/ models, helpful tools, and shortcuts (such as their own aids for math charts) (Bransford and Schwartz, 1999, p. 82)	Encourage students to set their own learning goals, encourage mastery goal orientation; sub-goals help students chunk and be less overwhelmed (Billing, 2007, p. 508)	Suggest students seek out others' opinions and feedback to challenge/improve models (Billing, 2007, p. 82-83)
Emphasize similar structures using bridging analogies (Billing, 2007, p. 510)	Use "schema-oriented questions to foster abstraction of a principle or problem schema from examples" (Billing, 2007, p. 509)	Feedback (different from advice) can allow students to "infer a general strategy themselves" (Billing, 2007, p. 511)	"Teaching knowledge transformation, rather than knowledge telling" (Billing, 2007, p. 511)

Teaching Recommendations

Over decades of teaching and learning scholarship on transfer (see table 3.1), scholars consistently identify several themes as promoting transfer. These include abstraction of ideas and concepts, metacognition, activation of prior knowledge, and active learning. Drawing on this literature and the authors' own teaching experiences, the following proposes three opportunities for IL instructors to experiment and encourage transfer of learning within the particular PCK of information literacy: cultivating dispositions that foster exploration and iteration, active learning, and stimulating metacognitive abilities. Table 3.2 lists specific examples linking transfer practices to pedagogical content knowledge for information literacy.

Table 3.2. Examples of Pedagogical Content Knowledge

Preparation for Learning	**Active Learning**	**Metacognition & Reflection**	**Social Learning**
Ask students to list ways information literacy skills can be or have been used in daily life or beyond their assignment: How do they find information for a significant purpose? How does someone become an authority on something they're passionate about, like trance music or snowboarding?	Problem-based or real-world scenarios, e.g., background research on community partner organization for leadership project; how to find information from stakeholders in an assessment of community environmental needs and concerns	Encourage students to consider voices missing from the conversation, such as perspectives and needs of African teachers during a discussion of solutions for education quality in African schools, or how a lack of attention to user experience could result in engineering failure.	Ask students to discuss strategies they used and places they got stuck the last time they had an assignment using outside sources. How might these strategies be useful to their peers in the current context?
Use case studies and real-world examples of IL problems (such as attribution of song samples in pop music, writing informational pamphlets for a protest event, or building something based on a design inspiration).	Encourage students to map or diagram their research process and current understandings of topics.	Incorporate metacognitive questions such as "What will your next step need to be for this project?" to encourage reflection and self-awareness.	Ask students to work in small groups to compare pros/cons of different search tools for a bilingual education project, then report to the larger group.
Boost student activation of prior knowledge of IL concepts and tools such as comparing database filters to online shopping sites.	Ask students to explore one or two tools and identify underlying principles.	Suggest that students choose a particular goal for the session or project, such as "Learn 3 strategies for narrowing search results effectively."	Ask students to trade their keyword or mind-mapping exercises with another student or group for additional ideas and troubleshooting.
Highlight similarities between structures, e.g., controlled vocabulary on many websites as well as library tools.		Attend final presentations or incorporate a reflection component into assignments asking students what went well, what could go better, and what they learned.	

Cultivating Dispositions that Foster Exploration and Iteration

Encouraging students to cultivate a sense of play, persistence, and curiosity can help engage and reinforce positive information searching schemas and strategies. For example, when Roberts discusses evaluating search results with students, she encourages students to look for patterns in highlighted or bolded search results as a way of understanding the underlying organization of information. This type of troubleshooting helps students learn to look more carefully at their search terms and learn to iterate based on what results show, encouraging shared problem-solving and a playful seeking mentality. Learning strategies to improve searches and receive more desirable results helps build a positive feedback loop for solving puzzles. Librarians can apply their PCK by developing the scaffolding and modeling that helps students recognize patterns and organizing structures they will later independently develop.[6]

A strategic approach to problem-solving and search strategies requires adaptability. For instance, both the authors encourage students to recognize discipline-specific vocabulary or source types prioritized in their discipline and to tailor their strategies to those specific norms. Over time, problem-solving abilities are more beneficial to students than procedural or fact-based knowledge.[7] As Project Information Literacy identified among recent college graduates, there was often a disconnect between students' perceptions of their search abilities and sources used in the field, compared to the strategies and sources employers wanted students to use.[8]

In early transfer research, teaching strategies to encourage transfer such as "hugging" and "bridging" were proposed, where hugging emphasizes similar situations to encourage low road transfer and bridging aims to teach for high road transfer by explicitly encouraging students to abstract the skills to other problems or situations.[9] These bridging examples can be especially productive and engaging when they activate prior knowledge. A library instructor might ask students to consider when, in their personal lives, they have searched strategically, knowing what they want and identifying key resources to get it, or when they have searched serendipitously, discovering an information source by chance and then building on it. This can be deployed in more academic contexts, as well. For example, Kuglitsch has explicitly discussed the difference between a workplace engineering environment and an academic engineering environment, asking students to identify similarities and differences in contextual pressures or expectations and consequently information seeking. Bridging the work world of engineering, which many students are familiar with from internships, with the academic world can help students understand not just the requirements in each but the reasons underlying them, increasing the ability to transfer assessment of information priorities in multiple contexts. As a point of motivation, research suggests that engineers who engage with the literature of their field most intensively tend to be recognized as experts and gatekeepers in their organizations.[10]

Additionally, helping students build schemas or deeper understandings of their fields' information practices and sources may assist students in critically synthesizing sources

and viewpoints.[11] With graduate students, Roberts often teaches literature review matrices as a visual way of organizing information and building mental maps of viewpoints and methodologies within students' fields, effectively creating their own schemas. These visual organizers help students with the Scholarship as a Conversation frame as they summarize, contrast, identify gaps, and begin to participate through their own contribution to the conversation. Kuglitsch often uses mind mapping to help students contextualize their research questions, explore smaller branches of a topic, and bring questions together to form new research questions, visualizing the concepts of Research as Inquiry. This visualization can help students who may struggle to see how they can contribute new knowledge on the relatively small scale of a term paper.

Finally, a focus on play and process helps normalize challenges for students and balances the affective struggles of information-seeking. Lowering the stakes may reduce library anxiety and allow students to more effectively process large amounts of information.[12] When working with graduate students, Roberts uses PCK to talk openly about the highs and lows of Kuhlthau's Information Search Process and includes affective questions to help students reflect on their search processes and expectations.[13]

Within applied contexts, such as engineering, business, healthcare, and other fields, library research can be integrated with design to cultivate playful, flexible, and inquiry-based team environments. Through a group of researchers on campus, Roberts has seen an innovative way of creating this type of environment: high school students learn to construct infographics that communicate science concepts and consider credibility, reliability, and ethics in working with data sources. Their infographics may ultimately be shared publicly so that students get to participate in science journalism as they learn science concepts.[14] Fosmire and Radcliffe propose an Information Rich Design Model for engineering that interweaves the information-seeking process throughout the design experience quite explicitly, tying the model to concerns of engineering quality, creativity, and ethics.[15] Table 3.1 strategies for "Preparation for Learning" and "Social Learning" can help support the suggestions in this case study and give further IL-specific examples of PCK for these ideas.

Active Learning

Active learning opportunities, including problem-based learning, design thinking, and hands-on scenarios, are thought to help students connect abstract concepts with real-world application and context.[16] In terms of PCK for IL instructors, this might take the form of librarians embedding in practicum or capstone experiences or acting as consultants to project teams.[17] Roberts has developed a partnership with a capstone leadership class where students serve as consultants to community-based non-profits. Roberts works with classes to identify what they already know about their organizations and stimulate question posing that help identify gaps in their knowledge. Roberts then facilitates group work where students consider the context of their community organization and related groups with shared missions or similar practices at the local and national levels from whom they can learn. Next, teams spend time searching for information using advanced Google search

techniques to find strategic planning documents or trends in their industry as well as trade publications and scholarly best practices through library databases. Because these sessions are grounded in real-world information needs, students see the relevance of searching for information and have specific contexts with which to apply search strategies and techniques.

Another active learning strategy that works well in the information literacy classroom is to demonstrate an example of concepts in one specific context, and then ask students to work through the problem in another. For example, the instructor might discuss assessing the trustworthiness of a news story and developing criteria for credibility, then ask students to develop and apply criteria for an analogous, yet different situation for far transfer. This might be evaluating children's nonfiction books for a second-grade reading buddy or assessing the evidence for an unsettled scientific question, like nutrition guidelines.

Learning by teaching is an approach that can be incorporated into both longer and shorter instruction sessions and can mirror the kind of on-the-job learning students will experience in internships or as entry-level employees.[18] Kuglitsch has asked students to form small teams, explore an information source, and then return to the larger group, with each team then teaching the rest of the class about the kinds of questions the source can help answer, how to use the source, and what aspects of the source are similar to or different from more familiar sources like Google or Wikipedia. This team learning and teaching approach has also worked well when asking students to analyze the way authors use citations in academic papers: a group might analyze who is cited and why in a methods section, an introduction, and a discussion section and then teach that out to the rest of the class. Students have been engaged and eager to compare their area of authority with others'. When these scenarios are performed fully in class, they typically take most of the session, but when a class is even shorter than the typical one-shot, the team learning could be assigned as preparatory work, perhaps taking place in an online learning environment.

In a one-shot, short problem-based learning "warm-up" scenarios that take advantage of librarian PCK can help students remember the real-world value of IL skills, even when their academic assignment may be more limited. For instance, Roberts has used problem-based scenarios around stakeholders in public education (teachers, parents, principals, policymakers) to help students consider authority and access to information in the education field, as well as to begin to differentiate between types of education sources and information needs. Kuglitsch has found the same approach to be effective in environmental science and engineering design contexts.

Librarian office hours held near a lab or work location can also help promote point-of-need assistance, as Roberts has seen with her liaison department by holding office hours inside the education building. Students, staff, and faculty often stop to say hello, then casually discuss specific projects or information needs. Proximity and low-stakes conversations both seem to facilitate these interactions. Kuglitsch has presented research consultations for students in engineering as consultations with a subject-matter expert, an approach familiar to the discipline, where the subject, in this case, is finding information. Table 3.1 suggestions for "Active Learning" can support the recommendations in this section.

Providing Opportunities for Metacognition and Reflection

Metacognitive reflection fosters transfer of IL skills, as seen in table 3.1. Metacognition, an umbrella term, describes the practice of reflection, self-monitoring, and awareness of opportunities for transfer, among other features.[19] Salomon and Perkins indicate that without metacognitive awareness and thoughtful abstraction, far or high road transfer may be impossible.[20]

Reframing earlier views of transfer, Bransford and Schwartz advocate for a "preparation for learning" view to adapt students' knowledge to new situations and build or discard mental schemas.[21] This view of transfer supports students' use of metacognitive strategies to monitor and reflect on their progress, with support from experts who can provide feedback and additional perspective on gaps in knowledge and growth.[22]

In terms of PCK within library instruction, this can be promoted in several ways. A library instructor might suggest that students choose a particular goal for the session or project, such as "Learn three strategies for narrowing search results effectively." Incorporating explicit reflection time, asking students to explain to others, or promoting "think aloud" during searching provide an opportunity to open the conversation. Kuglitsch models her search thought process, for example, taking particular care to highlight connections with other information seeking situations: e.g., noting that she is not finding as many results as hoped for, but that in other situations, modifying search terms and experimenting helped her find a productive search strategy. Or she might choose to highlight the idea that primary sources are those produced by a person experiencing a situation by comparing historical primary sources with scientific primary sources.

Though modeling metacognition is useful, it is also important to provide opportunities for students to draw genuine connections using their own frame of reference. Kuglitsch also uses think-pair-share activities in which students are asked to connect current experiences to past experiences, or explicitly to connect the session experience with their desired future experiences, as a way to derive general principles, and increase motivation. If faculty are amenable, embedding a reflection component into assignments can be a venue as well, as both Roberts and Kuglitsch have done.

In all of these situations, providing feedback is more useful than advice or criticism. Billing notes that feedback rather than criticism, in particular, can encourage students to construct guidelines and mental models for themselves rather than relying on the frameworks provided by instructors and leading to more authentic transfer.[23] Feedback also offers an opportunity to support positive transfer and realign unhelpful transfers.

Encouraging engagement over time, before, during, and after library instruction is a powerful strategy for promoting reflection, keeping libraries in the minds of students and faculty, and promoting transfer.[24] This extended engagement poses some unique challenges for librarians teaching primarily one-shot sessions, but several tactics can be used to overcome these challenges. Roberts and Kuglitsch frequently conduct pre-session surveys to elicit students' past information needs, behaviors, and experiences. This not

only helps librarians prepare more relevant lessons, it also activates prior knowledge. Faculty commitment allows more intensive but still manageable approaches: embedding librarians into the course LMS, so they can continue to engage students around the research experience; returning to visit classes for short discussions around research experiences at different stages in the research process, as Roberts has done; engaging faculty to integrate IL reflections and prompts into their regular instructional practices after a one-shot, as both Roberts and Kuglitsch do regularly. All of these approaches encourage reflection before and after the session, consolidating and promoting transfer.

Another option for engagement over time is by attending final presentations, poster sessions, or simulations of professional presentations. Engaging with students as they present final projects provides an opportunity to ask students to reflect on their process, closing the loop from finding to using information. For students in applied fields, this can be an opportunity to connect the tools, processes, and concepts they have learned in class to potential future work situations.

Discussion and Conclusion

By encouraging reflection in the classroom, IL instructors are engaging in PCK, bringing IL full circle in students' experiences, and tying IL to past experience and future plans. An attention to future IL needs and potential experiences, such as workplace IL practices in students' chosen fields, can help students understand IL instruction as a meaningful experience and encourage habits of mind that will promote future growth, especially when taught using active learning methods that encourage reflection and iteration. As discussed in the teaching recommendations for cultivating dispositions that foster exploration and iteration, librarians engage in PCK by framing IL instruction in the language of the discipline, presenting abstract structures and patterns that simultaneously both catch and promote student interest. To position students to succeed at exploring their own interests in the workplace—and academically—it is necessary for students to develop an ability and willingness to recognize patterns and the structures that underlie information. Such abilities form a strategic approach as well as the disposition to flexibly explore and adapt to new information landscapes. Teaching to these underlying structures is more effective in promoting transfer—and more engaging for students as well as librarians.

Grounding these structures in lived experience and hoped-for futures can bring the affective side of IL into play as well. Intellectual transfer of IL is important to ground students' future lifelong learning, but addressing the affective side of IL is key to fostering the habits and choices that encourage students to not only be capable of learning but to actively seek it out, an aspect of PCK that can be addressed by providing opportunities for metacognition and reflection. What use is an extensive intellectual understanding of the idea that research is inquiry to create new knowledge—whether in an academic context a or a personal quest—if a student is deterred by the discomfort of seeking out, synthesizing, and creating that knowledge? When librarians teach their unique knowledge of the affective information search process, they help students understand that discomfort is part of the

process rather than a personal flaw, fostering student persistence. Using active learning to explore affective and cognitive aspects of IL is a prime example of PCK within the scope of library instructors. By teaching to normalize the affective aspects of IL, research and learning, librarians can give students the tools they need to build their own futures creatively and wholeheartedly.

ENDNOTES

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