Cognitive Growth, Instruction, and Student Success

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As Diane Zabel points out, the literature on information literacy is voluminous.[1] Amidst the challenges of volume and multiple points of view, there are some astute observations, innovative approaches, and critical assessment. Of necessity, the works referred to here do not represent the expanse or the diversity of thought on information literacy, but they will offer a substantive grounding for the present study. A seemingly logical place to begin is the standards on information literacy propounded by the Association of College and Research Libraries (ACRL).[2] These standards address the importance of identifying an information need, the skill required to use structured resources, and the critical acumen necessary to the evaluation of retrieved information. We can probably stipulate for the time being that the content of the standards is necessary, but is it sufficient? That is, are the standards and the accompanying performance indicators exhaustive with regard to the goals of an instruction program? The answer suggested here is no; there are some essential factors that are not included in the standards and that may even be at odds with some specific points articulated by ACRL. What will be presented here is an alternative conceptual framework that can be called "phenomenological cognitive action." The framework and its name are original to this work, although some particular ideas are borrowed from a variety of philosophers and cognitive scientists. The framework is examined within the context of a newly created course, offered in the fall semester 2006 at the University of Missouri-Columbia. Since much of the course includes aspects that follow from the intent of the ACRL Standards (the necessary elements), the focus here will be on those elements that illustrate the framework.

Background

Within a substantial amount of the thought and writing devoted to information literacy there is a strong, but tacit, reliance on an information-processing model of cognition. The information-processing character of instruction is not explicitly recognized in the professional literature, but the conclusion is drawn from examination of the content of some information literacy courses. There is a general tendency for the content to focus on hierarchical procedures of identifying needs, searching, evaluating sources, etc. Karen Macpherson defined the model: "An information-processing model represents

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information that is either controlled or automated, sequential, and iterative. The information-processing model caters for the production sequence of a procedure, characterized by IF… THEN decision points."[3] This model tends to obviate a semantic concept of information and accept a syntactic one. In 1949 Warren Weaver summarized and simplified Claude Shannon's complicated mathematical theory of communication—usually referred to as information theory—emphasizing that the objective of the theory is to help analyze the fidelity of message transmission across channels. As Weaver said, "One has the vague feeling that information and meaning may prove to be something like a pair of canonically conjugate variables in quantum theory, that is, that information and meaning may be subject to some joint restriction that compels the sacrifice of one if you insist on having much of the other."[4] In other words, the concern at the heart of the theory is process rather than meaning. In some important ways, Shannon's theory and some conceptions of information literacy are related to work done by George Zipf. He studied people's efforts expended on communication, hypothesizing that both message senders and message receivers attempt to expend as little effort as they can. The result is a heightened potential for misunderstanding or lack of understanding.[5] Support for Zipf's hypothesis may be readily apparent in everyday life, but it is observable in formal communication as well. The challenge for students (and others) may well be to manage effort so as to optimize results. Greater effort spent on some learning activities may lead to efficient expenditure of effort at later times. The explicit implication for information literacy is that students could be convinced that the cognitive effort spent in such a course can result in sufficient cognitive difference that their performance in other courses will be enhanced.

The task facing information literacy is also complicated by a related model of cognition. This powerful and popular model is the computational theory of mind. Also, according to this model, the brain operates as an information (or data) processor. The model is an alternative in part because of the ready analogy with computers, which can be constructed, employed, and programmed. A substantial number of those working in the fields of cognition and philosophy of mind—including Owen Flanagan, Jerry Fodor, and John Searle—have rejected the computational theory as being behavioristic and incapable of pointing to causes for beliefs, knowledge, and action. Fred Dretske got to the heart of the matter in his analysis of the difficulties of straightforward and uniform computation:

> It makes little sense, therefore, to speak of *the* informational content of a signal as though this was unique. Generally speaking, a signal carries a great variety of different informational contents, a great variety of different pieces of information, and although these pieces of information may be related to each other (e.g., logically) they are nonetheless *different* pieces of information [emphasis in original].[6]

Searle took the disagreement with the computational model even further: "*Computation is defined syntactically*. It is defined in terms of the manipulation of symbols. But the syntax by itself can never be sufficient for the sort of contents that characteristically go with conscious thoughts…. *Syntax by itself is not sufficient for semantic content*" [emphasis in original].[7]

It is apparent that at least some thought on information literacy accepts the computational model. William Orme has reported on an application of the Texas Information Literacy Tutorial (TILT) at one university. TILT is a skills-based, task-oriented program intended to improve students' effectiveness at completing certain kinds of assignments. He found that TILT demonstrates some efficacy when the measures of success are based

on the kinds of tasks (such as accurately transcribing citation elements from an index) that the Tutorial includes.[8] Orme drew upon some work done by John Bransford and his colleagues, who said that "different types of teaching environments have strong effects on transfer.… By placing more emphasis on the systematic development of well-organized knowledge in addition to executive processes, it may be possible to increase considerably the speed with which people can become able to think effectively in a variety of knowledge-rich domains."[9] In a somewhat similar vein, Burke, Germain, and Xu examined instruction as a kind of intervention in the actions of undergraduate students. The students tended to consult with librarians more frequently after the instruction than prior to it.[10] Perhaps less explicitly, Bonnie Gratch Lindauer has advocated assessment of information literacy programs that is based on learning outcomes that are grounded in competencies such as those included in the ACRL Standards.[11] These competencies follow, to a considerable extent, a computational or information-processing model. Lindauer does, however, attempt to temper the computational with assessment of understanding (albeit understanding of retrieval processes more than argument, reasoning, and evidence).

The ACRL Standards, which form the foundation of many instructional programs, have related frameworks. One, for example, is Benjamin Bloom's taxonomy of educational objectives. More than thirty years ago, Bloom posited a hierarchical taxonomy that included knowledge, comprehension, application, analysis, synthesis, and evaluation.[12] As is common to taxonomies, there is an artificial aspect that cannot be avoided. The artifice is shared by other process schemata, such as Carol Kuhlthau's work on seeking meaning. Her criteria for learning (formulated for application in school libraries, but sometimes borrowed in academic libraries) included six stages: initiation, selection, exploration, formulation, collection, and presentation.[13] There is apparent similarity among these conceptions of learning; a consistent aspect is the linear progression from beginning with a question to some kind of evaluation. The foundational guidelines, taken together, appear to suggest formulae for processes that can result in the advancement of sets of competencies. The modeling that Bloom, Kuhlthau, and others posit can be useful as tools used by educators, but the extension of the models to pedagogical methods can carry some difficulties. The formulaic approach is bound to fall prey to the kind of objectivism that George Lakoff warned against (fixed properties of things, leading to fixed relations among things).[14]

There is work in librarianship that transcends the limitations of formulae for competencies. John Doherty and Kevin Ketchner, for example, presented a case for intentional learning that engages students in ways that allow students to frame questions and seek meaningful answers.[15] James Elmborg has said that information literacy researchers have separated students from the rest of their education; as a remedy, he suggested, "The real task for libraries in treating information literacy seriously lies not in defining it or describing it, but in developing a critical practice of librarianship—a theoretically informed praxis."[16] Kyung-Sun Kim and Bryce Allen studied students' searching and integrated the individual and social elements that affect cognition. They found considerable variability among students' procedures and styles, and concluded that the technical design of any database or interface must include flexibility so that different cognitive actions are accommodated.[17] All of these works, though not necessarily deliberately, affirm the need for the incorporation of metacognition into instruction. Once a fundamental understanding of reading and assessing the thought of others is introduced, students can begin to reflect on their knowledge of their own cognitive actions. As students more fully appreciate the nature of

knowledge and the intentional action it requires, they can apply metacognition to justification for knowledge.[18]

The aforementioned writings are based on a particular idea of phenomenology that many cognitive scientists speak of. This phenomenology is a simple one; it is subjective in that introspection is personal (the perception of phenomena). That is, each of us thinks *about* the world around us and inside us in individual ways, filtered through individual experiences. Better than anyone else, Colin McGinn captured the challenge and the reality of the simple phenomenology:

> Our concepts of consciousness are fixed by our own introspective abilities, which is why we cannot form the concept of a bat's consciousness; in addition, we cannot grasp a theory that requires us to transcend our own introspectively based concepts. Suppose you had never seen the color red, but to understand a certain theory you would need to possess the concept *red*: then you simply could not grasp that theory, period.[19]

If we assume (and educators are on safe ground with the assumption) that students enter college lacking awareness of some facts, theories, hypotheses, and concepts because they have no cognitive experiences though which to filter them, no instructional design that does not admit to this phenomenological state can succeed. Learning, according to this phenomenology, is not merely an information-processing exercise wherein a set of inputs and a logical mechanism are all that is needed for full cognitive action. As McGinn pointed out, a genuine understanding of consciousness at this level is elusive; the first step is comprehension of the limitations of our understanding. It is likely that our teaching will be altered by the realization that instructors and students face limitations. The alteration can be profound: "To change the very concept of a category is to change not only our concept of the mind, but also our understanding of the world."[20]

A richer and more complex phenomenology is also possible. A challenge to its integration into information literacy (and into cognition in general) is the fact that there are a number of articulations and theses of phenomenology, along with expected discontinuities and even contradictions. It is possible, though, to build a coherent phenomenology that is essential to all education, and to information literacy in particular. The framework proposed here embodies such a coherent form of phenomenology. A starting point in the construction is a realization not unique to phenomenology but definitely not shared throughout cognitive science, philosophy, and education. Sensory experience is a potential source of knowledge, but it is not the only component. Evaluation and employment of ideas and thoughts are also integral. To these two components the phenomenological requirement of intentionality should be added. Dan Zahavi defined intentionality thus:

> One does not merely love, fear, see, or judge, one loves beloved, fears something fearful, sees an object, and judges a state of affairs. Regardless of whether we are talking of a perception, thought, judgment, fantasy, doubt, expectation, or recollection, all of these diverse forms of consciousness are characterized by intending objects and cannot be analyzed properly without a look at their objective correlate, that is, the perceived, doubted, expected object.[21]

Another addition is the fact that we live in the midst of other consciousnesses and wills. The combination of these components (which may be reconfigured in a number of ways by phenomenological thinkers) offers an account of knowledge in a world where we may have some, although limited, experiences, where we

may have differing cognitive apparatus, and where what we are experiencing may be the ideas of someone else. A student who has not come across a particular concept will have a difficult time understanding both the concept and some other ideas that relate directly to it. Each individual exists within a lifeworld; that lifeworld is expandable, though, as each of us accumulates experiences, becomes conscious of a wider and deeper array of concepts, becomes accustomed to logic as an evaluative mechanism, and reflects on what others say. Education is a formal way to expand one's lifeworld. Education has an additional objective—to instill in students a desire to understand not just what exists, but also how it exists (that is, its being).

Combining the above features, phenomenological cognitive action is the intentional effort to learn and to know, grounded in the mind's ability to employ logic and reason, within the context of recognizing that one's own perceptions are engaged in a dialogue with those of others. The phenomenological element is explicit recognition that the individual does not, cannot, begin to know about something purely through the individual's own effort. What others say and teach contribute to knowledge creation and growth. The decisions that learners make are shaped by reasoning through arguments, along with acceptance of the intentional communication that writers and speakers are responsible for. The action of learning is both personal and social; what other people say, write, and show is evaluated according to logic *and* the assessment of commentators.

Challenges in Information Literacy Courses

Teaching and learning include some inherent difficulties that stem from cognition, language, symbols, and intentions. The difficulties militate against any simplistic information-processing model of education. If we take a popular and frequently used metaphor, we can see the difficulties in rather stark relief. It is said that the human genome is an information-bearing system. The mapping of an individual's genetic fingerprint is a precise arrangement of symbols that communicate unambiguously. To an extent the metaphor works, but the genome is not an intentional system; it does not include a subjective mental state that is directed at the natural world (Searle, 12).[22] The genome, in short, does not carry "how it exists" information; that is, the sequencing of genes does not relay the being of the person. We can extrapolate from the foregoing example to something that is directly related to information literacy. The Standards and much of the writing on information literacy urge making students competent information seekers and retrievers. Let us assume that a student frames a question that driven by a class assignment. The student may then retrieve a set of documents by searching in a database. The student must next read the documents and make judgments about them. The documents themselves hold no inherent relevance to the student's intellectual and conscious needs. They are subject to the reading, understanding, and incorporation into existing knowledge of the student. A document that illustrates a particular point well, but by negative example (by being incorrect) may be more relevant to the student than a document that illustrates a point poorly by positive example (by being correct).

We can also back up to the assumption that began the example—the student framing the question. If the ideas of cognition articulated by McGinn, Searle, and others are correct, entering college students may not be cognitively ready to ask questions that are based in complex concepts and multifarious experiences. This realization is in no way a criticism of the students; they are at stages in life where they are still accumulating and reflecting on experiences and ideas. No one has captured the challenge of cognitive and phenomenological framing of questions, perceptions, knowledge, and

so on more completely or more deeply than does Erving Goffman. People who interact frequently still assess situations from their own vantage points, their own perspectives. There is a natural aspect to perspective; if one views the Grand Canyon from the South Rim, one has a specific view. If one were to view it from the North Rim, one would see certain physical features, but not the ones discernible from the South Rim. Of only one vantage point is available to a person, that person *cannot* know about the view from another vantage point. To illustrate a phenomenological sense of perspective, Goffman used an example: the fans of opposing football teams can watch their teams play each other, but not see the "same" game.[23] If a class assignment for a student is to write a short paper on the familial ties among Amish people, the student will learn more about the topic if she attempts to understand as much as possible about the cultural framework of Amish society. That response, too, is phenomenological.

The phenomenological cognitive approach illustrates the pedagogical necessity of locating the intersection between materialism and constructivism. The intersection, as metaphor, admits that both materialism and constructivism exist and describe how we think and act (at least to some degree). Humans do construct what they believe, but must do so in some formal fashion. That is, there is a need for information, but knowledge construction is enhanced by presentations, amounts, and kinds of information that make the most sense cognitively for the learner. Another way to look at the construction of learning is that the student is the builder. As builder, the student may benefit most by having a particular challenge or problem to solve, using the materials that best suit the task at hand. The phenomenological responsibility of the teacher is to comprehend and present the challenge or problem that best fits the builder's capabilities. Further, the teacher can introduce the student to the materials that can be useful to construction. One important element must be emphasized—the challenge or problem must make sense to the student/builder; it must be something that is connected to other things the student believes are important. That element is key to the phenomenological relationship between teacher and student.

This constructivist aspect is necessarily accompanied by a materialist one. A clear example of materialist considerations is offered by Fred Paas and colleagues in their discussion of cognitive load theory. According to the materialist theory, working memory is limited in capacity when individuals are presented with new information. The cognitive apparatus can only accept, comprehend, assimilate, and retrieve a limited amount of information. Further, learners can be overwhelmed in situations where complex cognitive tasks are presented, where a considerable amount of information is presented, and where there are numerous interactions among the information elements.[24]

The effective combination of materialist and constructivist elements of learning and knowledge may be the most profound challenge facing information literacy (and all teaching and learning). It is customary for schooling from early years to have entailed students reacting to what teachers do. Teachers may frame questions and expect responses that fit that framework. Melissa Gross has shown that "imposed queries" are problematic for students, since they do not originate the question and may not be fully aware of the framing in which the teacher engaged.[25] The move to active learning, stressed in some of the work on information literacy, is an answer to student-reactive schooling. The materialist-constructionist connection is a particular conceptual grounding wherein learning can thrive. The philosopher Alvin Goldman has urged a transformation of traditional epistemology so as to accept the impact of human psychology on knowledge. His epistemological-psychological connection is very closely

related to the materialist-constructionist one. He has written:

> The solution of intellectual problems often involves (a) speech, (b) writing things down, either in words, diagrams, or formulas, (c) physical manipulation of experimental apparatus, and (d) physical interaction with machines and devices, such as computers, calculators, and abaci.… First, the *purpose* of employing physical aids, such as diagrams and other inscriptions, is ultimately to guide one's psychological states, i.e., to produce *belief* or *understanding* (in any of their specific psychological manifestations. Second, one needs appropriate mental operations to *guide* these physical activities. Which activities should be executed? When? And in what order? These pose problems for the *mind*, problems of the structure and retrieval of plans and subroutines, to which psychology is clearly relevant [emphasis in original].[26]

As Goldman argues, his idea is a rather radical one within the realm of philosophy.

Content of the Course

The design of the course began with the collaboration of individuals affiliated with the Columbia, Kansas City, and St. Louis campuses of the University of Missouri. The course was offered at the University of Missouri-Columbia for one credit hour and met for one one-hour class period each week during the fall 2006 semester. The phenomenological cognitive action approach, described above, is the unifying design imperative. All presentations, discussions, exercises, and assignments begin with understanding of the cognitive state of undergraduate students, including awareness that the students may not have experienced some of the concepts that define the subject matter they are working on within their academic programs or the metacognitive perception that underlies their own learning. A particularly problematic aspect of some species of phenomenology is the insistence on the absence of presuppositions. In the extreme, the presuppositionless requirement is akin to a black slate; the requirement is unrealistic and unsustainable. Students enter college with numerous presuppositions—some of which are very helpful to learning, but some of which are erroneous and inhibitory. Teachers cannot assume a presuppositionless state for students, but teachers *can* attempt to subordinate their own presuppositions regarding what the students come in knowing and what their capacities are. Such a starting point is advocated by Carolyn Willis and Wm. Joseph Thomas.[27] It is that kind of absence of presuppositions that guides instructors in this course. In pedagogical terms, the challenge is to introduce students to new concepts and a new awareness of metacognition that is seamless with their complete learning experience.

The first goal of the course is to enhance students' abilities to frame meaningful questions. A strategy that is employed to achieve the goal is to urge a critical reading of documents (or viewing of images) as dialogic. The author and the reader/viewer can be in a conversation; the students can imagine asking the author questions that are prompted by the document. Instructors present the following to students:

> As we read we may question the author: What made you come up with this idea? Why did you ask the question this way? How are you coming up with the conclusions you reach? Why did you use the particular evidence you did, and not some other sources of evidence? Are you genuinely seeking an answer, or are you trying to convince me of something in particular? What may be the most pertinent question for

> the students is, "What is the author saying to *me*?" In other words, we don't necessarily take everything we read or view at face value; we take a skeptical attitude.

The questioning and the skepticism are themes that recur in every class meeting. The dialogic form is employed within that course as students discuss the assignments they are working in their other courses. The objective is to enable students to examine the assignments so as to foster a deeper and more complete understanding of the assignments. The understanding is intended to help students complete their assignments successfully. As a preface to working with actual assignments, the course instructors bring in some items from newspaper and/or popular magazines and the students can ask:

- Were you aware of this (the topic of the item) in general?
- Are you familiar with the particulars of this piece?
- What questions does it raise for you?
- How would you transform that question into a search?
- Where would you go to find out answers to your question?

Another element of the course is the inclusion of reasoning based on some elementary linguistic analysis. Building upon the practice of questions, of engaging in dialogue with others, students are presented two statements: (a) Poverty is the cause of violence in urban areas, and (b) Poverty is a cause of violence in urban areas. The students are asked about the difference between the two statements and the task of searching for support or refutation of each statement. This exercise is one of practical reasoning; the structure of a search is based on the logic of the statement. The exercise also serves as a prelude to discussion about categorization in general and structured classification in particular. Examples that build on common experiences (such as the arrangement of a grocery, music, or video store) introduce presentation of the ways documents are actually described in indexes and library catalogs so that the nonstandard state of indexing (in the sense that indexes and aggregators adhere to their own structures but do not necessarily share them among each other) is covered. One item that is included in two databases illustrates the kinds of categorical differences that can occur: the following article:

> Andrew Calabrese, "The Promise of a Civil Society: A Global Movement for Communication Rights." *Continuum: Journal of Media & Cultural Studies* 18 (Sept. 2004): 317–29

is assigned different subject headings in different databases. In Academic Search Premier the subjects are: Civil society, Communication, Communication policy, Consensus (Social sciences), Social contract, and Sociology. In Sociological Abstracts the subjects are: Civil society, Rights, Communication policy, Participation, and Social Movements. Categorization is explored more expansively with an in-class exercise. While the exercise does not cover subject differences as such, the features of a database are illustrated clearly as students complete the exercise (collaboratively):

> The following can be done in real time in class:
>
> For example, the students can search for items on "communication policy."
>
> First: they can enter this as a basic search.
>
> Second: they can enter it in advanced search mode (no difference).
>
> Third: they can enter it as a subject (far fewer).
>
> Fourth: they can narrow by date (say, January 2001 to date).

> Fifth: they can limit to scholarly journals (becoming more manageable).
>
> Sixth: they can limit to full text.
>
> Ask them to tell you what the differences are. The progressive reduction in hits can become readily apparent.

Since undergraduate students may be tempted to turn to Internet resources first, locating useful and meaningful information on the Web is a component of the course. The structure of tools, such as Google, is explained; the technique of harvesting, Google's page ranking, and the commercial element are included. Refinements, like Google Scholar, are introduced as a different kind of information container. This container is no longer everything; it is a subset of the entirety of accessible sites. For example, a search of Google (advanced, all the words) of the words "music download copyright" results more than 146 million hits (search executed October 22, 2006). The same search structure in Google Scholar results in 12,500 hits (search executed October 22, 2006). The matter of questioning and skepticism is vital to the discussion of Internet resources, particularly within the context of learning and success (the latter determined by the instructors of their courses). Among other things, the questioning turns on the matter of authority:

> One criterion related to this topic is authority. If information is going to be trusted, you may want to know on what basis someone speaks. Has the author done work in this area before? Does the author appear to know how to investigate the topic? Authority may also have institutional connection. For example, an item retrieved may be a report by a panel of experts. It is still important to examine the institutional source. Is this a political institution? Is it a partisan group? Source also affects authority. Is a blog as authoritative as a peer-reviewed journal?

To augment students' understanding of authority, the practice of peer reviewing in academic publishing is explained.

Translating "relevance" into something undergraduate students can readily grasp is a challenge. In our profession we tend to think of relevance, but that thinking may not translate to a group of students. Students, however, do want to find meaningful information that is connected to what they want to know and do. Finding something meaningful requires thinking about what might be some criteria of information. This is only a starting point, but it is an essential one; a search cannot be designed without some criteria. The criteria for students are cognitively grounded. So the starting point of any query is not possible search terms but what the searcher wants to find out. This means it is very important for the students to give some thought before searching to the nature of an assignment, the requirements for a paper, and other factors. Most important, this is a chance to demonstrate to the students that, if they spend some time and effort conceiving what they want and/or need to know at the outset, they can save time and effort further down the road. The context that is created by an assignment is one criterion; others include terminology understandable to the student, concepts that have been perceived and experienced, inclusion of evidence, argument that follows practical reason, effective use of background literature, and authority. A decision about the relevance of a document is one that follows the application of the criteria as evaluative mechanisms. Further, the relevance decision includes the phenomenological assessment of an author's intention; this entails the students' assessment of the criteria alongside the author's persuasive rhetoric. The questioning and skepticism attune students to the intention of persuasion and enable them to inure themselves,

to some extent, to the rhetorical force of persuasion.

Course Evaluation

Assessment of the course took place at the end of the fall 2006 semester. Fifty students were in the three sections of the course; students completed the university's standard form. Additionally, the students were interviewed during finals week. As could be expected, students expressed some dissatisfaction with a few specific elements of the course. The element mentioned most frequently was the set of tutorials that librarians at other institutions have created. The students needed a clearer context so that understanding of database structure, search strategies and protocols, and information production would be enhanced. It is very likely that the tutorials are used by their creators within a context that makes their application clear; the use in the course described here did not have that particular application. This feedback from students enforces the premise, though, that they are engaged in connected cognitive activity, so context is vital to understanding. Some of the students also expressed the desire for a few more operational and functional elements, including the workings of interlibrary loan services and other specific services offered by the MU Libraries. These comments will be incorporated into ongoing refinements of the course.

The positive comments were greater in number and were shared by the majority of students. Students were not prompted to respond according to the goals of the course, but the most consistent remarks related to their ability to read assignments in other courses more closely and to understand the relation of the content of information sources to those assignments. Some students added that they were already seeing enhanced ability to write successful papers. The exercises in the course repeatedly asked students to examine discursive practices (the content of the materials they read) from multiple perspectives. Granted, the self-assessment of the students may inflate perceptions of competency; some evaluation of their performance in other courses—including courses taken in semesters following the instruction—would be needed to provide authentic evidence of impact. As Rui Wang explains, existing assessment methods demonstrate inconsistent outcomes.[28] Respondents stated that they saw clear benefits from adopting that kind of critical response to what they read. Some, for example, said they began to think differently about news reports and Web sites. This response signals a shift in students' lifeworld (in the phenomenological sense). That is, there is a change in the intentional ways in which students assess their cognitive apprehension of information. One of the goals for the courses appears to have been at least partially achieved. The evaluation that the students engaged in is an indication of the mix of material (the physical reality of the sources they perceive) and subjective (their informed interpretation of those sources).

A few respondents noted that the assignments and exercises they found most helpful were those that involved formulating a question, refining their searches, and employing what they learned about peer review. Again, the students were not prompted for responses; the assessments were made independently of questions asked of them. This, too, is related to the phenomenological cognitive framework. The questioning, especially the critical assessment of their own questions, reflects students' growing abilities to suspend the final approval of their searches. Peer review also reflects this kind of suspension. In general, the sentiment was that they gained a greater understanding of the processes that researchers employ and that they could use that understanding in their own work. There is an implication to students' confidence that should be mentioned and must be addressed in future offerings of the course. The teachers in other courses the students take can

be envisioned as authorities, not just regarding course content and topic but also regarding the processes of the courses and the students' outputs (assignments, papers, exams, and so on). The course described here tacitly urges acceptance of content and topic authority but also tacitly fosters some challenge to the process authority. That is, as students more fully comprehend the framing of questions and the critical apprehension of the thought of others, they exercise a kind of intellectual and cognitive autonomy as well as altering the phenomenological relationship with the teacher. This is a factor that must be explored more deeply. Another consistent comment was that the students appreciated the interactive nature of the course (in each session there were class discussions, hands-on exercises, and conversations about what was effective and what was not). These elements of the course will be featured more prominently in future offerings of the course.

Esther Grassian and Joan Kaplowitz write, "It is the librarian's job to help the critical thinking process become a routine and natural part of each step of the information-seeking process."[29] Their observation could be taken a bit further; it is the librarian's job to ensure that students in their instructional programs gain a greater and more precise understanding of the necessary metacognitive processes that make learning possible. A basis for this claim is suggested by Derek Bok: "The ability to think critically… is the indispensable means of making effective use of information and knowledge, whether for practical or purely speculative purposes. What is remarkable, then, is not the professors place so high a value on critical thinking; the wonder… is that they do not do more to act on their belief."[30] The course described here represents one attempt to make the step toward integrating cognitive growth into students' experiences. One way to appraise the course is that it is an attempt to enable students to understand, not only *what* is but also *how* it is. The idea is based on Fodor's claim that "as far as anyone knows, relevance, strength, simplicity, centrality, and the like are properties, not of single sentences, but of whole belief systems."[31] Knowledge rests on a particular kind of belief system, one that is shaped by what we can call testimony (what others, especially authorities, have said), individual and collective (social) evaluation of what is heard, empirical evidence, and other things that can help justify beliefs. The development of such a belief system cannot be taken for granted or presumed; it is an integral part of human growth. Instructional programs in libraries are not separate from the development of belief systems. Assessment of what is written and said, as a component of instructional programs, can become more intentionally rooted in the development of the justification for beliefs. The present course tries to accomplish that goal; further improvements to the course will have the goal in sight.

Notes

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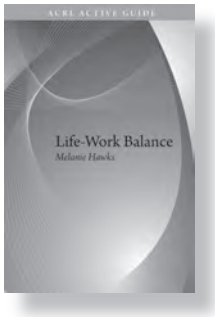

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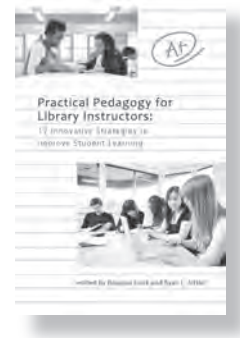

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