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Rethinking Information Literacy Assessment: Relevance, Reliability, and Validity of Constructs and Measures

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All learning must be assessed. Assessment must be aligned with learning objectives. Learning objectives must be specific, observable, and measurable. Everyone reading this chapter has almost certainly heard these statements many times. They have been repeated time and again until they have become part of the mantra of higher education, and even some librarians have ceased to cite their authors. In fact, the very haziness of their origins and the assumptions upon which they are based have become a major stumbling block for the modern instruction librarian. Measures employed in the assessment of learning cannot be relevant, reliable, or valid if they are based on outdated or invalidated theories of learning, and librarians cannot design appropriate assessments for information literacy learning without an understanding of both current and outdated learning theories as well as their implications. Learning is more than the classical and operant conditioning espoused by the behaviorists of the 20th century, and so assessment must be multifaceted and flexible enough to allow for the natural ambiguities of the human mind. Learning also occurs on more than just the cognitive domain: social and emotional growth does not halt at the entrance to adulthood, and the cultivation of these critical skills demands attention.

Knowledge and Learning

One of the most influential persons on the current educational system is B. F. Skinner, whose work on behaviorism in the second half of the 20th century came to dominate learning-theory thought in the 1970s and 1980s (Hill, 1997). Whereas earlier theorists, such as Dewey (1930), acknowledged a cognitive or “psychical” type of knowledge and learning (p. 389–390), Skinner (1953) defined knowledge solely in terms of action (or reaction):

We need not regard such repertoires as “signs” of knowledge but rather as knowledge itself. Knowledge enables the individual to react successfully to the world about him just because it is the very behavior with which he does so (p. 409).

Learning, therefore, is the process by which individuals are conditioned to respond with the desired behavior when presented with a given stimulus (Skinner, 1953, p. 65). If one believes that knowledge does not exist without physical demonstration and learning has not happened without increased operant behavior, then it is logical to expect assessment to be observable and measurable. Furthermore, in this theoretical framework, knowledge does not exist without learning, learning does not exist without knowledge, and neither exists without instruction (i.e., conditioning). Because knowledge, learning, and teaching are defined by one another, the measures designed to assess them are essentially the same: a measure of learning necessarily indicates knowledge and teaching, and a measure of knowledge necessarily indicates learning and teaching. It is straightforward, simple, and appears to be perfectly reliable and valid, and in this context, the performance or behavioral objectives advocated by Mager (1962), Esbensen (1966, 1967, 1970), Deno and Jenkins (1967), and many others seem quite reasonable.

Experienced instructors, however, know that their observations of teaching and learning do not always match this theoretical framework. Knowledge exists independent of action; for example, one can know that the earth is spherical without indicating it in word or deed. Likewise, knowledge may not be taught, as is the case when students synthesize existing knowledge into new, complex ideas. A new philosophy of learning-theory addressed these gaps by focusing on the cognitive aspects of learning and knowledge. Heavily influenced and shaped by the work of Jean Piaget, it came to be called constructivism because knowledge was regarded as something constructed by each person within his/her mind, rather than an outward behavior, response, or object. Piaget (1985) described learning in terms of cognitive equilibrium, internal and external elements, and change in schemes through assimilation and accommodation (p. 5–6). Although many scholars have expounded, expanded, and criticized his work, the cognitive aspect is still a critical part of current learning theories; however, the resultant methodological problems of assessment have not been satisfactorily addressed. Cognitive processes cannot be measured directly, and so researchers must define indirect measures of learning and knowledge. Indirect measures result in less construct validity than direct measures (6 & Bellamy, 2011), with the actual level of construct validity varying greatly

by the quality of the measure(s) chosen. Measures of knowledge, which are now distinct from those of learning, indicate achievement or performance and may comprise any snapshot-style assessment. Measures of learning, however, indicate growth. Demonstrating growth requires assessment at two or more points in time.

TYPES OF KNOWLEDGE AND SKILL TRANSFERABILITY

A further complication was introduced by a Piagetian scholar whose discussion of metacognition introduced a third category of knowledge—conditional (or strategic)—to the commonly acknowledged declarative and procedural categories (Flavell, 1985, pp. 105–106). Declarative knowledge, also called factual knowledge, can be expressed as discrete statements, such as “the earth is spherical” or “Paris is a city in France.” Procedural knowledge, as the name implies, relates to processes, which may vary in complexity from simple to complex; for example, knowing how to tie your shoe or knowing how to perform cerebrovascular surgery. Conditional knowledge, however, involves the when’s and why’s of applying, adapting, and synthesizing declarative and procedural knowledge: it is the framework of problem-solving and critical thinking. Although Flavell identified this type of knowledge specifically within the context of metacognition, he noted that metacognitive knowledge is not inherently different from other knowledge, aside from the object of attention (Flavell, 1985, p. 106–107). Similarly, Bandura (1986) distinguished between knowledge (declarative and procedural) and skill, which could be gained only from enactive experience and analysis of the resultant sensory feedback (p. 107–108). The term “skill” implies some automation of cognitive processes, but in many ways it is analogous with conditional knowledge.

Classifying knowledge in this way, however, both clarifies and complicates problems with assessment. A perennial question in information literacy instruction is why students cannot transfer skills learned for one assignment to another in a different class or discipline. Cognitive skill transfer depends upon analysis, synthesis, and evaluation, which form the upper levels of Bloom’s (1956) taxonomy of the cognitive domain and require relevant conditional knowledge. Therefore, if students are unable to transfer information literacy skills from one situation to another, they probably do not have the conditional knowledge to do so, and if that is a goal of instruction, then sessions should focus on developing this category of knowledge. However, assessing conditional knowledge is more complicated than declarative or procedural. Most standardized instruments focus on declarative knowledge because the questions are easily phrased as multiple-choice, true/false, or matching, which are easy to score and demonstrate high test/retest and internal consistency reliability (6 & Bellamy, 2011). This reliability is deceptive, though, because these instruments have low validity in measuring the higher-level cognitive skills students need.

KNOWLEDGE AND LEARNING BEYOND THE COGNITIVE DOMAIN

Rethinking assessment, though, requires more than just a review of knowledge and knowledge acquisition, which may be thought to reside in the cognitive domain; the other domains of learning, which impact cognitive learning, must also be considered. Although addressed in the literature as primarily a K-12 issue, social and emotional learning continue into and throughout adulthood. Continued social development,

the importance of which is emphasized in Bandura's social learning and social cognitive theories and Vygotsky's social development theory, is critical for student success. Bandura (Bandura, 1986; Bandura & Walters, 1963) theorized that human behavior is largely shaped by interaction with the environment, especially with other people, who influence those around them through modeled behavior and reactions to the behavior of others. Human behavior and the environment in turn affect cognition (and other internal factors, such as personality, attitude, and emotion) through "triadic reciprocal determinism" (Bandura, 1986, p. 18). Social interaction also features prominently in Vygotsky's social development theory, which emphasizes the importance of mediators, such as people and structured activities (i.e., scaffolding), in developing the higher-level cognitive skills (Kozulin, 2003, p. 17). The interpersonal skills students need in order to learn effectively will also be important for success in their professional and personal lives, as are the emotional skills (e.g., self-efficacy, self-confidence, emotional regulation, resilience), that should be included in a balanced approach to education (Olatunji, 2014). Krathwohl, Bloom, and Masi's (1964) taxonomy on the affective domain, a follow-up to Bloom's (1956) taxonomy on the cognitive domain, notwithstanding, social and emotional development has largely been omitted from curricula, instruction, and assessment in higher education.

Implications for Co-Curricular Learning

Taking these issues and complications into account, it is clear that assessment of information literacy needs to change. If a complete assessment of the cognitive domain is not possible, then at least the higher-level cognitive skills and conditional knowledge should be its focus. A complete assessment of the social and emotional domains would be ideal, but some attention is better than none. Because this represents a change for students and librarians alike, a gradual transition is natural, and co-curricular learning is an especially good place to start. Classrooms may be familiar and comfortable, but they come with expectations for behavior, curriculum content, and assessment. Co-curricular activities, however, are different: their structure, setting, and content are new and exciting. It would make sense for assessment to be different as well. Furthermore, opportunities for development in the social and emotional domains are particularly rich in co-curricular settings. Capturing evidence of that learning and presenting it alongside evidence of cognitive development would give administrators a more complete picture of student outcomes in co-curricular learning and enhance their understanding of its importance and impact.

Reliability, Validity, and Measures

Selecting relevant measures for assessing co-curricular learning requires close attention to the goals and objectives, just as with traditional, classroom-centered learning. Is the aim to assess knowledge or learning? Do measures assess conditional knowledge and higher-level cognitive processes? Which social and emotional dimensions are of interest

for the program and relevant to the co-curricular activity? The exact instrument needed may not exist yet, but many of the existing instruments can be adapted to different audiences and contexts, general scales can be modified to be domain-specific, and pieces can be combined with others to build one that fits the goals and objectives.

ASSESSING PROCEDURAL AND CONDITIONAL KNOWLEDGE

Although most multiple-choice questions are written to assess declarative knowledge, it is possible to phrase them in a way that addresses procedural knowledge. Abu-Zaid & Khan (2013) provided some basic guidance on the process. In addition to the wording and focus of questions, multiple-answer multiple-choice questions, sometimes called pick-N multiple choice questions, can be employed to encourage critical thinking and problem-solving, while preserving the ease of marking that makes multiple-choice questions popular with instructors. When using this type of multiple-choice questions, though, the grading algorithm has a significant impact on results, and an algorithm that produces partial-credit for partially correct answers should be preferred to a dichotomous, correct/incorrect grading scheme (Bauer, Holzer, Kopp, & Fischer, 2011).

A second method of assessing procedural knowledge is to examine objects (e.g., bibliographies, reports or essays, portfolios) for evidence that students understand how to accomplish certain goals; called authentic assessment, it has been used in information literacy assessment (Carter, 2013; Holliday et al., 2015; McCulley, 2009; Whitlock & Nanavati, 2013). One caveat for this method, though, is to take care with the inferences drawn from the data; students who know how to do something may not necessarily understand the reasons why or be able to transfer that skill to another situation. However, combining authentic assessment with reflective writing that requires students to explain the steps they followed to complete the assignment, the decisions they made during the process, and the thinking behind their problem-solving can demonstrate conditional as well as procedural knowledge.

Assessing conditional knowledge can be as easy as asking students to explain their reasoning, though those responses may be time-consuming to score. Budd (2008) described an approach used in a credit-bearing information literacy course designed to develop metacognitive skills through coached and repeated questioning, but the method could be adapted to assess conditional knowledge by changing the content and object of the questions. Rubrics and other grading frameworks can streamline the evaluation process, and librarians can draw on the many examples employed by instructors in other domains, such as English, history, and philosophy.

ASSESSING NON-COGNITIVE LEARNING

Non-cognitive learning refers to learning on any domain other than the cognitive. In the K-12 literature, it is called social and emotional learning (SEL):

[SEL] is the process through which children and adults acquire and effectively apply the knowledge, attitudes, and skills necessary to understand and manage emotions, set and achieve positive goals, feel and show empathy for others, establish and maintain positive relationships, and make responsible decisions (Collaborative for Academic, Social, and Emotional Learning, n.d.).

In higher education, non-cognitive goals and objectives are more frequently referred to as affective instead, at least in part because that is the terminology used by Krathwohl, et al. (1964). Although this term is sometimes used in a broader sense that includes SEL (Schroeder & Cahoy, 2010, p. 129), more often it refers to beliefs, attitudes, and values, rather than skills and abilities. As a result, affective learning objectives bear some similarity with indoctrination (e.g., students will value or believe what the instructor or program decides), instead of the content-neutral SEL objectives (e.g., students will advance their interpersonal skills or improve their ability to recognize and respond appropriately to their emotions). For this reason, the chapter uses the terminology of SEL, but reviewing the literature on affective learning can be equally helpful in inspiring and developing a non-cognitive component of information literacy assessment.

Instruments designed to measure the social and emotional learning of children are plentiful, and though they are not directly relevant to college students, literature reviews on the subject (Frydenberg, Liang, & Muller, 2017; Humphrey et al., 2011; Stewart-Brown & Edmunds, 2003; Wigelsworth, Humphrey, Kalambouka, & Lendrum, 2010) may yield one that fits a stated learning objective and can be altered to suit young adults. Furthermore, domain-specific reviews, such as Buissink-Smith, Mann, and Shephard's (2011) summary of quantitative and qualitative measures of affective learning in a particular domain, sustainability studies, may also serve as inspiration for adapting or developing one's own instrument.

Several reliable and validated instruments relevant to the SEL of college students, or that are related closely enough to be easily adapted, have been published:

- An emotional literacy scale with 34 items on five dimensions to measure emotional literacy with a large sample ($N = 345$) of undergraduate students in Turkey (Akbağ, Küçüktepe, & Özmercan, 2016). Testing of the final version showed both reliability and validity, with Cronbach's $\alpha = 0.80$ and test-retest validity of 0.89.
- Achievement Emotions Questionnaire (AEQ) was designed to quantify students' emotions in three education-specific contexts: the classroom, studying outside class, and testing situations (Pekrun, Goetz, Frenzel, Barchfeld, & Perry, 2011). This scale was developed and tested with undergraduate students, making it ideal for use in information literacy assessment, although the contexts addressed in the scale would need to be adjusted.
- Widener Emotional Learning Scale (WELS) is a 33-item, 5-subscale instrument designed for use in higher education (Wang, Young, Wilhite, & Marczyk, 2011).
- Personal-Interpersonal Competence Assessment (PICA) was developed as a 32-item scale to measure social skills in graduate and undergraduate college students (Seal et al., 2011).
- Student Orientation to School Questionnaire (SOS-Q), one version of which intended for students in grades 9 through 12, addresses a range of affective domains, including attitudes, beliefs, and emotional and social competence (Burger, Nadirova, & Keefer, 2012).

Many indicators of social and emotional learning rely on self-reported data, which, though critical for assessing unseen effects, can be of questionable quality. Aside from controlling for socioeconomic and personality factors, one way to improve the reliability

and validity of this data is to correct for participants' attitude and approach to self-description (Primi, Zanon, Santos, De Fruyt, & John, 2016). A second way is to validate self-reported data with a measure of observed behavior or performance (Cahoy & Schroeder, 2012, p. 78–80). For example, a self-reported measure of social competence, such as PICA, might be complemented by peer assessments of a student's social and emotional competence (Issa, 2012) or performance on a standardized exam of social and/or emotional problem-solving (Durlak, Domitrovich, Weissberg, & Gullotta, 2015, p. 323), which results in a more complete and reliable representation of these constructs.

Conclusion

This is an exciting time in information literacy instruction and assessment. Growing interest in higher-level cognitive skills, which require attention to conditional knowledge in instruction and assessment, and understanding of the importance of social and emotional factors in learning, as evidenced by the introduction of the ACRL's new *Framework for Information Literacy for Higher Education* and its attention to the affective domain of information literacy, have set the scene for rapid, responsive change. Broadening the focus of assessment, both in and out of the classroom, to include social and emotional learning, as well as incorporating different types of knowledge, will result in the use of more relevant and valid measures, a better understanding of information literacy acquisition, and librarians creating more engaging and effective instruction.

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