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Initial Development of the Perception of Information Literacy Scale (PILS)

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Abstract

The ACRL *Framework for Information Literacy for Higher Education* has provided academic librarians a guiding document to facilitate the development of information literacy skills in students. Despite widespread adoption of the *Framework* in academic libraries, a lack of valid and reliable *Framework*-based scales for assessing students' knowledge practices and dispositions hinders further understanding of student information literacy. The current article describes the development and testing of the Perception of Information Literacy Scale (PILS). The participants in this study were 443 graduate students. The resulting scale is made up of 36 items that measure seven distinct constructs of information literacy. The subscales of the PILS had good estimates of internal consistency and showed evidence of convergent and discriminant validity. PILS allows academic librarians to measure how students perceive their own information literacy knowledge practices and dispositions and could be useful for outreach, instructional design, and assessment activities.

Keywords: information literacy, graduate students, scale development, *Framework for Information Literacy for Higher Education*, perception, assessment

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Introduction

As the Association of College and Research Libraries (ACRL, 2015) *Framework for Information Literacy for Higher Education* becomes integrated into the information literacy (IL) work of librarians, professionals need a valid, reliable *Framework*-based tools to assess varying aspects of student IL. Creating such tools has been a difficult task for a few reasons: Due to the relatively recent adoption of the *Framework,* librarians have had a limited amount of time in which to develop tools based on it. In addition, the *Framework* provides unique challenges for assessment of IL because it is grounded in Meyer and Land's (2006) idea of *threshold concepts.*

Oakleaf (2014) outlined the considerations of assessing IL through the lens of the *Framework* and how Meyer and Land (2006) addressed assessment of threshold concepts. Included is the need for instructors to identify the "stuck places" or troublesome areas of learning for their students. In addition, documenting where learners are in their journey "across the threshold" (and perhaps even at multiple points in their learning process) is key to helping students identify and understand these concepts and assimilate them into their practice (Oakleaf, 2014). An element of this aspect of IL assessment is identifying the ways in which students perceive their IL skills, particularly where they see themselves on the continuum of understanding. This self-evaluation is one way to measure student progress through key thresholds concepts.

Guiding students to reflect on their own IL understandings may also support the important metacognitive process of self-assessment and adjustment/growth in their practice (Fulkerson, Ariew, & Jacobson, 2017; McKinney & Sen, 2012; Sen & McKinney, 2014). The results of self-assessment tools may be particularly powerful for learning when paired with skills-based IL assessment results; students can compare and reflect on their perceived skill level and demonstrated skills.

In addition to building agency, enabling self-reflection in their learners is important to librarians for a range of IL instructional considerations. Students who are overconfident in their research skills are less likely to seek research help or believe they can gain anything

from IL instruction (Freeman, 2004; Molteni & Chan, 2015), may believe they don't have anything new to learn about how to use and create information (M. Gross & Latham, 2009), and may generally struggle to demonstrate expected IL competencies at their academic level (Ganley, Gilbert, & Rosario, 2013).

This paper outlines the development of a *Framework*-based assessment tool, the Perception of Information Literacy Scale (PILS), designed out of the need to understand where students perceive themselves to be in crossing key IL thresholds and to address institutional needs for IL instruction with graduate students. In addition to presenting a potential process for developing an assessment instrument based on the *Framework*, the researchers hope that this instrument may be useful to other libraries and institutions that need to assess perceptions of IL development.

Literature Review

Perception and Development of Information Literacy

PILS measures self-perceptions of IL competency on a developmental scale from novice to expert. Within the *Framework*, the knowledge practices and dispositions of novice and expert researchers are examined in relationship to each other, not necessarily as indicators of proficient/not proficient performance but in acknowledgement of the ways information literacy develops through increased understanding and prior experience (ACRL, 2015). For example, the frame "Authority is Constructed and Contextual" states,

> Experts know how to seek authoritative voices but also recognize that unlikely voices can be authoritative, depending on need. Novice learners may need to rely on basic indicators of authority, such as type of publication or author credentials, where experts recognize schools of thought or discipline-specific paradigms (ACRL, 2015, p. 12).

Beginning researchers are often taught to only consult scholarly sources from library journal subscriptions; another common rule is to use web information from authoritative, top-level domains, such as .gov or .edu. These guidelines are useful for novice learners becoming familiar with the protocols for evaluating information but are insufficient for the more advanced researcher who must practice information use and evaluation in situational and context/discipline specific ways (Farrell, 2012).

[RESEARCH ARTICLE]

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Literacy Scale

Asking students to rate their IL on a scale of novice to expert allows them to situate themselves within a continuum of IL skills and understandings. This continuum, rather than a proficient/not proficient scale, makes space for the "training-wheels" phase of information literacy development (Farrell, 2012, p. 11) while also allowing for the assessment of metacognitive, social, and dispositional aspects of developing information experts (Tucker, 2014).

Many studies examine perceptions of IL as a concept, particularly perceptions of instructional faculty and how they value IL as a literacy for their students (Bury, 2011; Bury, 2016; DaCosta, 2010; Dubicki, 2013; Kim & Shumaker, 2015; McAdoo, 2008; Pinto, 2016; Sandercock, 2016; Saunders, 2012). Additional studies have also examined faculty perceptions of student IL competency as well as student self-perceptions of IL skill (Freeman, 2004; Ganley et al., 2013; Jackson, MacMillan, & Sinotte, 2014; Kousar & Mahmood, 2015; Singh, 2005). These are valuable studies for the academic librarian profession: Using a similar approach can inform an understanding of faculty and student IL perceptions within the new theoretical context of the *Framework.* Used in conjunction with other measurements such as faculty perceptions of student IL skills or tests of IL competencies, librarians are also able to identify potential gaps in self-perceived versus actual IL skills or differences between faculty and student perceptions. This information can inform instruction outreach, lesson and course planning, and campus assessment efforts.

Information Literacy Assessment Tools

Although many studies have evaluated student perceptions of IL (Arnone et al., 2010; Catts, 2005; M. Gross & Latham, 2007, 2009, 2012; Latham & Gross, 2011; Kurbanoğlu et al., 2006; Michalak, Rysavy, & Wessel, 2017; Oliver, 2008; Pinto, 2010), currently no instruments use the *Framework's* approach to IL to investigate perceptions of students' skills, understandings, and values. While several librarians have shared their local assessment activities for teaching and learning grounded in the *Framework*, a discussion of the development of a valid and reliable testing instruments is still forthcoming for this new IL model. At the writing of this article, the only *Framework*-based testing instrument known to the authors is the Threshold Achievement Test of Information Literacy (TATIL) from Carrick Enterprises (2018). TATIL is a valid and reliable test that has undergone extensive development.

TATIL test-takers receive a report of their performance on the test and recommendations for further developing their research skills. Similar to PILS, this report encourages reflection on information practices and aligns with the *Framework*'s core concern with "critical self-reflection" (ACRL, 2015, p. 8). In contrast to TATIL, PILS is specifically focused on self-assessment of skills and understandings rather than situational demonstration of IL skill. This evaluation of self-efficacy has a range of benefits for learners, including direction and engagement with future learning, as well as positive or negative reactions to learning (Bandura, 2006; Mahmood, 2017; Rosman, Mayer, & Krampen, 2015). As Mahmood (2017) pointed out, however, self-efficacy scales for IL also have perceived weaknesses concerning the accuracy of student self-evaluation.

Previous IL self-perceptions instruments that have been tested for validity and reliability focus on constructions of IL grounded in multiple definitions, but they do not include the *Framework*. Kurbanoğlu, Akkoyunlu, and Umay's (2006) *Information Literacy Self-Efficacy Scale* (ILSES) is a 17-item scale with three components identified: basic, intermediate, and advanced. The ILSES was designed based on seven categories extracted from multiple IL definitions and standards, which limits librarians' ability to assess students based on the *Framework*. Similarly, Pinto's (2010) IL-HUMASS, a 25-item scale, measures four IL categories tri-dimensionally: students' motivation, self-efficacy, and source of learning. Both the ILSES and the IL-HUMASS use multiple international definitions and standards documents in their scale development.

Other existing instruments, such as the *Information Skills Survey for Assessment of Information Literacy in Higher Education* (ISS) (Catts, 2005) and the *Perceived Competence in Information Skills Scale* (PCIS) (Arnone, Small, & Reynolds, 2010) were created before the adoption of the *Framework* and are based on other IL standards (respectively, the Council of Australian University Librarians *Information Literacy Standards* and the American Association of School Librarians *Standards for the 21st Century Learner*). This situation presents considerable challenges to librarians measuring *Framework*-based perceptions. Thus, PILS was developed to assist librarians conducting *Framework*-based assessment and research.

Method

The purpose of this study was to develop an instrument—the Perception of Information Literacy Scale (PILS)—that measures *Framework*-based perceptions of IL skills and to

examine its validity and reliability for use with graduate students. The method recommended by DeVellis (2016) in *Scale Development: Theories and Applications* was followed in developing this scale.

Generating Initial Item Pool

The initial item pool was developed by adapting the knowledge practices and dispositions that make up the *Framework*. Each of the six frames were treated as subscales and broken down into 44 individual statements intending to measure subjects' perceptions of IL, such as "I can define and know how to use intellectual property laws and copyright." These items were submitted for content validation.

Conducting Content Validation

Content validity ensures that the items in the scale actually measure the construct under investigation (Netemeyer, Bearden, & Sharma, 2003). In this study, content validation of the items was performed by seven experts recruited through the American Library Association (ALA) Framework Advisory Group; subject matter expertise is a common and widely used method for establishing content validity. Each expert was asked if the 44 items aligned to the subscale with which they were associated. Experts rated each item on a three-point Likert scale (1 = *does not align*, 2 = *somewhat aligns*, and 3 = *closely aligns*) and provided additional feedback on item clarity and item overlap. Items with a content validity index (CVI) of less than .80 were removed following recommendations of Rubio, Berg-Weger, Tebb, Lee, and Rauch (2003). Based on CVI results, two items were removed: "I understand that information has economic value, but how this value is determined varies by culture and community," and "I am willing to browse and be flexible when searching for information." This resulted in a 42-item scale. After initial content validity was established, the 42-item scale was pilot tested with a convenience sample of graduate students to examine psychometric properties of the scale, as described below.

Procedure and Participants

Once ethics approval was obtained in accordance with California State University, Fresno's policies and procedures on research with human participants, an invitation to an online confidential survey administered through Qualtrics was sent to current, first-year Fresno State graduate students through email. Before completing the survey, students who consented to participating in the study were given a detailed response scale with explanations of each performance level (available in the online supplementary materials).

Initial response rate was lower than desired, and subsequent rounds of the survey were sent to currently enrolled graduate students who had not previously participated until the desired response rate was achieved.

Of the 2,318 graduate students who were invited to participate, 443 students completed the online survey (19% response rate). Participants' ages ranged from 21 to 63 years old (*Mdn* = 27 years), and 72% of participants identified as female. The participants were 38.9% Hispanic, 29.6% White, 8.8% Asian, 8.3% Other, 7.5% non-resident alien, and 3.4% African American. Participants in the study had an average GPA of 3.77, with 49.5% indicating themselves as first-generation students and 6.3% indicating themselves as international students. Participant representation from each college was similar to the overall composition of the Frenso State graduate student body (see Table 1). Majors were diverse, including the fields of chemistry, biology, education, social work, nursing, physical therapy, and psychology.

Table 1: Frenso State Graduate Student Enrollment Fall 2017 and Survey Responses by College

College	Graduate Enrollment		Survey Responses	
	N	%	N	%
College of Arts and Humanities	215	7.2%	26	5.8%
College of Health and Human Services	564	18.9%	112	25.2%
College of Science and Mathematics	323	10.8%	65	14.6%
College of Social Sciences	114	3.8%	19	4.2%
Craig School of Business	119	4.0%	13	2.9%
College of Agricultural Sciences and Technology	93	3.1%	10	2.2%
School of Education & Human Development	1,421	47.7%	175	39.5%
College of Engineering	124	4.2%	23	5.1%
Undeclared / Other	6	0.2%	0	0.0%
Total	2,979		443	

Measure

The 42-item PILS was designed to measure the following six constructs: authority is constructed and contextual (six items), information creation as a process (five items), information has value (six items), research as inquiry (seven items), scholarship as conversation (seven items), and searching as strategic exploration (11 items), based on the

Framework. The initial 42 items are listed in the online supplemental materials. The response scale was adapted from Dreyfus's five-stage model of adult skill acquisition (Dreyfus, 2004; Dreyfus & Dreyfus, 1980). Specifically, students had the opportunity to rate their own skill level on a 7-point Likert scale: 1 = novice, 2 =advanced novice, 3 = emerging, 4 = advanced emerging, 5 = developing, 6 = advanced developing, and 7 = expert.

Data Analysis

A confirmatory factor analysis (CFA) was used to examine factorial validity of PILS as well as to identify and trim highly correlated items to further refine the scale and optimize its length, following recommendations of Hair, Black, Babin, and Anderson (2010). CFA is a primary technique in measurement-related studies that allows for testing whether specific variance is shared between indicators of hypothesized factors. Because a chi-square test is oversensitive for sample size, multivariate normality, and minor model misspecifications, the fit of the CFA model was examined based on several indices, such as root mean square error of approximation (RMSEA), comparative fit index (CFI), Tucker Lewis index (TLI), and standardized root mean square residual (SRMR), following recommendation of Hair et al. (2010, p. 654). Specifically, based on a sample size of over 250 and at least 30 observed items, evidence of good fit would include a CFI and TLI of above .90, RMSEA of less than .070 with CFI of .90 or higher, and SRMR of .80 or less with CFI above .92. In terms of the length optimization of the scale, Hair et al. (2010) recommended that deleting less than 20% of the measured items constitutes minor modifications, in which case reevaluating the CFA with a new data set is not necessary. For model diagnostics and model improvements, standardized residuals and modification indices served as guidelines. Modification indices were estimated for all non-estimated parameters and, thus, could point out the high correlations among items resulting from correlated measurement errors or indicating redundancy in items. However, changes suggested by modification indices were made when they were conceptually justified.

When the final items were selected, construct validity, which is defined as "the extent to which a set of measured items actually reflects the theoretical latent construct those items are designed to measure" (Hair et al., 2010, p. 686), was examined based on its two subtypes: convergent and discriminant validity. Convergent validity, which assesses the "extent to which indicators of a specific construct converge or share a high proportion of variance in common" (Hair et al., 2010, p. 669), was examined based on standardized factor loading estimates, average variance extracted (AVE), and reliability. The standardized factor

loadings should be of at least .50 or higher and ideally of .70 or higher. In a case of a single-factor solution, standardized factor loadings are interpreted as standardized regression coefficients; a squared standardized factor loading reflects proportions of explained variance in the scale by the item. For example, if standardized factor loading for an item is .50, then the factor explains 25% of the observed variance in that item. In CFA, the model should explain the majority of variance (i.e., > .50), which would imply that ideally a standardized factor loading should be at least .70 for each item. In a case of two or more factors, standardized factor loadings are interpreted as standardized regression coefficients that control for correlated factors. As a note, in these models, the researcher cannot generally square standardized factor loadings to obtain proportion of the variance explained in the factor by the item.

The AVE, which is "computed as the total of all squared standardized factor loadings (squared multiple correlations) divided by the number of items" (Hair et al., 2010, p. 687), should be of .50 or higher. Reliability was examined based on coefficient alpha, which should be of .70 or higher. Discriminant validity, which is the "extent to which a construct is truly distinct from other constructs" (Hair et al., 2010, p. 687), was examined based on values of correlations among the subscales and on testing alternative models.

Finally, descriptive statistics were examined to make inferences about average students' perceptions related to ILs in this sample. All analyses were performed in Mplus 8, version 8.2 (Muthén & Muthén, 1998-2017) and in IBM SPSS Statistics, version 25 statistical software.

Results

Missing data on individual items ranged from 0 to 8.4%. The CFA was performed on the 42 items to test factorial validity of PILS using the Maximum Likelihood estimation with robust standard errors, which allows for more accurate test results when the data include missing values and are not normally distributed (Muthén & Muthén, 1998-2010; Yuan & Bentler, 2000). The 42 items were specified as indicators of their intended factors: *authority is constructed and contextual* (six items), *information creation as a process* (five items), *information has value* (six items), r*esearch as inquiry* (seven items), *scholarship as conversation* (seven items), and *searching as strategic exploration* (11 items). The 6-factor model with 42 items showed inadequate fit: $\chi^2(804, N = 443) = 3248.79$, $p < .001$, RMSEA = .083, 90% *CI*

[.080, .086], CFI = .877, TLI =.868, SRMR = .038 (see Model A in Table 2). Therefore, each subscale was examined with regards to the items that could threaten the dimensionality of the scale or were redundant based on examination of standardized residuals and modification indices. As a result, no changes were made to the *authority is constructed and contextual* and *information creation as a process* subscales. Due to redundancy in items, one item was removed from the *information has value* subscale (item 6), two items were removed from the *research as inquiry* subscale (items 6 and 7), and three items were removed from the *scholarship as conversation* subscale (items 2, 3, and 7). The *searching as strategic exploration* subscale was split into two separate subscales, which were relabeled as *searching as strategic exploration – tools & tasks* (items 1 through 6) and *searching as strategic exploration – mindset* (items 7 through 11).

Overall, a total of six items were deleted (14.3% of observed items); thus, this constituted minor modifications. The remaining 36 items were specified to represent the following seven factors: *authority is constructed and contextual* (six items), *information creation as a process* (five items), *information has value* (five items), *research as inquiry* (five items), *scholarship as conversation* (four items), *searching as strategic exploration – tools & tasks* (6 items) and *searching as strategic exploration – mindset* (5 items). The 7-factor model with 36 items showed a good fit to the data, which was accepted as the final model: χ^2(573, $N = 443$) = 1618.33, $p< .001$, RMSEA = .064, 90% *CI* [.060, .068], CFI = .935, TLI = .929, SRMR = .035 (see Model B in Table 2). The final 36 items of the revised PILS are listed in the online supplemental materials.

Table 2: Summary of the Model Fit Statistics for the Estimated Models, N = 443

Model	χ^2	*df*	RMSEA	90% CI RMSEA	CFI	TLI	SRMR
Model A: 6 correlated factors (42 items)	3248.79	804	.083	[.080, .086]	.877	.868	.038
Model B: 7 correlated factors (36 items)	1618.33	573	.064	[.060, .068]	.935	.929	.035
Model C: 1 factor (36 items)	3915.02	594	.112	[.109, .116]	.794	.781	.050
Model D: Second-order model (36 items)	1771.45	587	.067	[.064, .071]	.926	.921	.042
Model E: Bi-factor model (36 items)	1505.16	558	.062	[.058, .066]	.941	.934	.034

Note. df = degrees of freedom; CI = confidence interval; RMSEA = root mean square error of approximation; CFI = comparative fit index; TLI = Tucker Lewis index; SRMR = standardized root mean square residual.

Convergent Validity

Table 3 summarizes the evidence of convergent validity. All standardized factor loadings in this model were statistically significant and ranged from .81 to .95 (see online supplemental materials for factor loadings by item), thus meeting the requirement of .70 or higher. The values of AVE were all above the criterion of .50 or higher. Cronbach's alphas ranged from .94 to .97, which were all above .70 and indicated excellent reliability of the subscales. Thus, the scale showed evidence of convergent validity.

Table 3: Factor Loadings, Average Variance Extracted (AVE), and Reliability Estimates, N = 443

Subscale	# of items	Factor Loadings: Range	AVE	Cronbach's alpha
1. Authority is constructed and contextual	6	.83-.92	.78	.95
2. Information creation as a process	5	.86-.95	.83	.96
3. Information has value	5	.84-.89	.75	.94
4. Research as inquiry	5	.90-.93	.85	.97
5. Scholarship as conversation	4	.81-.95	.82	.94
6. Searching as strategic exploration – tools & tasks	6	.87-.95	.85	.97
7. Searching as strategic exploration – mindset	5	.91-.95	.87	.97

Discriminant Validity and Alternative Models

As shown in Table 4, all subscales were positively correlated with each other, with correlation coefficients ranging from .73 to .89, $p < .001$. Examining the 95% confidence intervals for correlations showed that none of them included a value of 1.0 in the upper levels of the intervals, suggesting that the subscales were distinct from each other.

Because the correlation values among the subscales were positive and strong, alternative CFA models were examined, including (a) a single-factor model, in which the 36 items were specified to load on one information literacy factor; (b) a second-order model, in which the 36 items were specified as indicators of the seven first-order factors and the seven first-order factors were specified as indicators of the second-order factor, information literacy; and (c) a bifactor model, in which the 36 items were specified to load on the seven specific factors as well as on one general factor. The results showed that the single-factor model did not have an adequate fit: $\chi^2(594, N = 443) = 3915.02$, $p < .001$, RMSEA = .112, 90% CI [.109,

.116], CFI = .794, TLI = .781, SRMR = .050 (see Model C in Table 2). These results indicated that it was important to consider the seven separate factors.

Table 4: Pearson's Correlations and Descriptive Statistics for Subscales, N = 443

Subscale	1	2	3	4	5	6	7
1. Authority is constructed and contextual	-						
2. Information creation as a process	.84	-					
3. Information has value	.83	.83	-				
4. Research as inquiry	.86	.86	.87	-			
5. Scholarship as conversation	.79	.82	.84	.87	-		
6. Searching as strategic exploration – tools & tasks	.81	.84	.83	.88	.88	-	
7. Searching as strategic exploration – mindset	.74	.79	.73	.81	.88	.89	-
M	4.34	4.61	4.30	4.54	5.05	4.74	5.26
SD	1.48	1.50	1.52	1.49	1.45	1.50	1.51

Note. All correlations are significant, $p < .001$.

The results for the second-order model, $\chi^2(587, N = 443) = 1771.45$, $p < .001$, RMSEA = .067, 90%CI [.064, .071], CFI = .926, TLI = .921, SRMR = .042 (see Model D in Table 2), and for the bifactor model, $\chi^2(558, N = 443) = 1505.16$, $p < .001$, RMSEA = .062, 90%CI [.058, .066], CFI = .941, TLI = .934, SRMR = .034 (see Model E in Table 2), showed good fit to the data (see online supplemental materials for factor loadings). Taken together, these results suggest not only that the 36 items represent seven separate constructs but also that the second-factor—the general factor of *information literacy*—can be used after controlling for the seven separate factors.

Descriptive Statistics

Mean scores were computed for the seven subscales by averaging their corresponding items (see Table 4). Mean values ranged from 4.30 to 5.26, showing that, on average, students rated themselves as advanced emerging, developing, and advanced developing users of information. The highest mean scores were on the *searching as strategic exploration - mindset* and on the *scholarship as conversation* subscales; whereas the lowest mean scores were on the *information has value* and on the *authority is constructed and contextual* subscales.

Discussion

Initially, a total of 44 items were developed and submitted for the content validation. During the content validation phase, two items were deleted. The resulting 42 items were pilot tested with the sample of graduate students. Results from the pilot test showed that 36 items

can be used to measure seven dimensions of IL: *authority is constructed and contextual, information creation as a process, information has value, research as inquiry, scholarship as conversation, searching as strategic exploration – tools & tasks,* and *searching as strategic exploration – mindset.*

The first subscale, *authority is constructed and contextual*, consisting of six items, refers to one's knowledge of the nature of information resources, how their authority is constructed through communities, and the context in which the information will be used. The items in this subscale were designed for students to self-assess their knowledge practices and dispositions around the authority of information sources. Understanding the role of authority, and the complexity of authoritativeness in information production and evaluation, has been identified as a key threshold concept in IL even in early research (Hofer, Townsend, & Brunetti, 2012; Townsend, Brunetti, & Hofer, 2011). The ability to independently query authoritativeness and to consider the power structures behind authority in information demonstrates an advanced approach to information.

The second subscale, *information creation as a process*, consisting of five items, refers to one's understanding that information is presented in particular formats to convey a particular message. The items in this subscale were designed to give students the opportunity to self-assess their knowledge practices and dispositions surrounding the iterative process of information creation and its impact on final product. The importance of information creation is a significant addition to the *Framework* emphasizing the "greater role and responsibility in creating new knowledge" (ACRL, 2015, p. 7). Metaliteracy, or the ability to access, use, and create information in a networked and collaborative information environment, is an underlying concept in defining IL in the *Framework* (ACRL 2015; Jacobson & Mackey, 2013). In addition, this scale captures many aspects of information synthesis, the ability of an information creator to integrate existing information into a new information product (Lundstrom, Diekema, Leary, Haderlie, & Holliday, 2015). A student's ability to thoughtfully engage with information as an active creator and to acknowledge and identify themselves as information creators who possess agency within the information environment is an important aspect of IL (Jacobson & O'Keefe, 2014).

The third subscale *information has value*, consisting of five items, examines the value one places on information and the influence it has over one's life, both societal and personal. These items measure one's perceived understanding and practices surrounding the legal,

socioeconomic, educational, and cultural value of information as well as its production and dissemination. This section engages the complexity of ethical and legal information use beyond citations and plagiarism, particularly by including an understanding of the socioeconomic and cultural effects on the value of information in the language of the *Framework.* As explored in the literature of critical IL pedagogy, this aspect of IL, amongst others, engages the political systems and power structures within information production and use (Bauder & Rod, 2016; Tewell, 2015). Understanding the commodification and value of information is necessary for IL in the information age.

The fourth subscale, *research as inquiry,* consisting of five items, looks at student understanding of the iterative nature of research and inquiry cycles. The items in this subscale were written to assess students' ability to examine their own research and inquiry process. This section particularly engages the reflective aspect of information access, use, and creation. In Kuhlthau's (2004, 2010) work, the Information Search Process model and the Guided Inquiry Design framework both posited reflection and self-assessment as a component of information use and synthesis and process evaluation as an essential component of the research experience. The *Framework* also points to "critical self-reflection" (ACRL, 2015, p. 8) or metacognition as key processes for the 21st century information literate student.

The fifth subscale, *scholarship as conversation,* consisting of four items, looks at scholarship as a sustained discourse in which evolving perspectives and interpretations lead to new insights and discoveries. The items in this subscale measure students' ability to understand the conversational nature of scholarship and their responsibility to contribute to this discourse. This subscale again refers to the importance of information creation for the information literate individual as well as the recognition of the multiple voices and perspectives that create the conversation of scholarship. Kuglitsch's (2017) disciplinary take on scholarship as conversation described how voices in the sciences have been historically narrow in terms of race, gender, and class, and pointed out the importance of students recognizing the ways in which this exclusion has defined authorship, impact, and collaboration for information creation, access, and dissemination.

Searching as strategic exploration is the first section of PILS to part from the structure of the *Framework.* As a result of validity testing, this frame was split into two subscales. The sixth subscale, *searching as strategic exploration – tools & tasks,* consists of six items, which refer to

the basic understanding of search tools, search tasks, and search strategy. This subscale assesses students' ability to develop a search strategy for an information need, to identify the tools for finding information, and to create strategies for locating needed information. This subscale focuses on foundational skills, such as defining a topic, selecting a search tool, and using search terms to refine results.

The seventh subscale measured in PILS is *searching as strategic exploration – mindset*, consisting of five items. This subscale refers to advanced search dispositions, including open-mindedness and persistence. In contrast to the *tools & tasks* subscale, the *mindset* subscale engages the higher-level understanding and affective aspects of the search process and investigates students' ability to refine search strategies when challenges arise or information needs are not met from a search. Included in this skill is the willingness to seek assistance from experts. As Tucker (2014) outlined in a study of expert searchers, defining expert information behaviors requires not only an understanding of expertise but also an understanding of novice behavior and how it differs in practice from expert behavior. This distinction informs the use of the novice-to-expert scale within PILS and the two separate *searching as strategic exploration* sections.

Practical Implications

PILS was developed to investigate the gaps in perceptions of IL skills between graduate students, graduate faculty, and librarians. In outreach at Frenso State, graduate faculty often reported to librarians that students possessed the necessary skills for graduate-level research work. However, the experience of librarians in facilitating graduate student research did not align with this perception. In addition, the majority of graduate students at Frenso State rarely sought the assistance of librarians for their research work.

The PILS test can be used to measure graduate student perceptions of IL, and the results can be used as an outreach tool to create a dialogue between graduate students, faculty, and librarians. When considered in light of students' tendency to overrate their own IL abilities (Gross and Latham, 2007), PILS could be particularly useful as a self-reflection tool.

Used in conjunction with other IL assessment tools, librarians may also consider PILS for measuring IL competency. By comparing changes in self-perceptions of skills over time, or how these changes align with objects that demonstrate IL practices, such as student research journals, librarians and graduate faculty may use PILS to gain additional insight into their

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learners' IL development. In future studies, the authors intend to address the results from administering PILS on their campus and additional implications for IL outreach and practice.

Limitations and Future Directions

Because scale development and validation is a cumulative and a continuous process, discussing limitations is important in order to serve as guidelines for future studies. One limitation of this study is its focus on the graduate student population. This study emanated from a desire to understand a particular phenomenon with providing IL instruction to graduate students at one institution. Future studies examining the validity of PILS with additional populations, including undergraduate students, would extend the use of this instrument. In this study, the authors did not consult with the users of PILS, the graduate students, to learn about their interpretations of the language used in the PILS items. Future studies could include asking the intended participants about their interpretation of the PILS items as a step in validating the instrument with other populations.

Another limitation of this study is the self-reported nature of the perceptions of IL among students. Because of social desirability, some students might have overestimated their perceived information abilities. Self over- or underrating has also been observed in students' self-perceptions of IL in several studies (D. E. Gross, 2009; M. Gross, 2005; M. Gross & Latham, 2009; Mahmood, 2017). PILS is not intended to be administered as a standardized test; instead, it should be viewed as a teaching and self-reflection tool. While this study is focused on the development of PILS, future studies of the application of PILS will further explore these implications. Despite these limitations, PILS constitutes the first instrument assessing *Framework*-based self-perceptions of IL development.

Conclusion

PILS can be used to measure seven distinct constructs of IL: or, the general factor of *information literacy* can also be tested after controlling for the seven separate factors. Findings of this study showed that the subscales of PILS demonstrate evidence of convergent and discriminant validity. Additionally, all subscales had good estimates of internal consistency. Thus, PILS showed good psychometric properties and can be used with graduate students to assess their perceptions of themselves as users of information related to the following dimensions of IL: *authority is constructed and contextual, information creation as a process, information has value, research as inquiry, scholarship as conversation,*

searching as strategic exploration – tools & tasks, and *searching as strategic exploration – mindset*. Future studies should continue examining and establishing the validity of PILS, particularly with additional populations of students.

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