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# Investigation of the Validity Evidence of the Information Literacy Self-Efficacy Scale (ILSES) Among Undergraduate Students

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## Abstract

The purpose of this research was to provide validity evidence for the Information Literacy Self-Efficacy Scale (ILSES), a widely used instrument that was constructed in 2006. The researchers were interested in investigating the validity of this instrument due to the evolution of the information environment that has taken place since the scale's original development, mostly as a result of the prominence of the internet. Data were collected from undergraduate students participating in a broader information literacy research study ( $n = 253$ ). Data were subjected to descriptive analyses, internal consistency reliability, and a confirmatory factor analysis (CFA). After evaluating three different CFA models based on the ILSES' construction, the researchers determined that a four-factor model fit the data with the following latent constructs: 1) Initiating the search strategy, 2) Assessing and comprehending the information, 3) Interpreting, synthesizing, and using the information, and 4) Evaluating the product and process. A discussion of these findings is provided in light of the evolving information environments in which undergraduate students are expected to use information for their academic, personal, and professional lives.

**Keywords:** information literacy, internal validity evidence, self-efficacy, confirmatory factor analysis

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## Investigation of the Validity Evidence of the Information Literacy Self-Efficacy Scale (ILSES) Among Undergraduate Students

Over thirty years ago, the American Library Association (ALA) appointed a committee to define information literacy (IL) and make instructional recommendations for librarians and educators (ALA, 1989). Since then, the importance of IL has only grown. IL sets the foundation for lifelong learning, a key mission of higher education (Association of College and Research Libraries [ACRL], 2000). It gives power to individuals to gain control over their learning, become more self-directed and informed in their exploration of information, and master topics that they are investigating (ACRL, 2000). IL is especially important today, as individuals must navigate “the dynamic and often uncertain information ecosystem in which all of us work and live” (ACRL, 2015, p. 7).

Despite the importance of IL, developing an effective IL curriculum remains a challenge in higher education, partially due to competing definitions of IL and in part because no standard assessment measure exists to gauge this complex and multi-dimensional construct (Sparks et al., 2016). Without adequate assessment tools, curriculum development is haphazard at best. Although learners’ beliefs in their own abilities may not be accurate (Clark, 2017), in general, higher levels of learner self-efficacy have been shown to be associated with higher levels of achievement (and vice versa) (Aharony & Gazit, 2019). Therefore, a valid measure of IL self-efficacy is an important tool for educators and librarians who seek to cultivate IL knowledge and skills in their learners. Due to difficulties regarding assessing IL knowledge and skills directly, along with the previously found connection between IL self-efficacy and IL skills (Tang & Tseng, 2013; Tella, 2009), investigating the validity of an IL self-efficacy assessment is important to the IL field as a whole.

The goal of this study was to use confirmatory factor analysis (CFA) to test the dimensionality and validity evidence of the Information Literacy Scale Self-Efficacy Scale (ILSES) that was developed by Kurbanoglu et al. (2006) with undergraduate students. In the years since the ILSES was constructed, the internet has become increasingly important to IL, even as the structures of the internet have grown both more complex and less visible to the average user (Leu et al., 2017; Lynch, 2016; Marsh & Yang, 2017). The researchers decided to evaluate the internal structure validity of ILSES in particular for the present study

because they had planned to use it in a larger study and were curious about the scale's relevance in the current information environment. The researchers also felt it was a worthy IL self-efficacy assessment to investigate because of its high use in IL research (Aharony & Gazit, 2019; Aharony & Gazit, 2020; Kiliç-Çakmak, 2010; Robertson & Felicilda-Reynaldo, 2015; Ross et al., 2013; Ross et al., 2016; Usluel, 2007). The purpose of this study, therefore, was to determine if the ILSES remains useful in the contemporary information environment.

## Literature Review

### Challenges to Assessing IL in Higher Education

In 2000, the Association of College and Research Libraries (ACRL) cited its parent organization, the American Library Association (1989), to define IL as the set of skills required for an individual to “recognize when information is needed and have the ability to locate, evaluate, and use effectively the needed information” (p. 2). Fifteen years later, ACRL (2015) expanded this definition in its *Framework for Information Literacy in Higher Education*:

Information literacy is the set of integrated abilities encompassing the reflective discovery of information, the understanding of how information is produced and valued, and the use of information in creating new knowledge and participating ethically in communities of learning. (p. 8)

This expanded definition emphasizes the “dynamism, flexibility, individual growth, and community learning” that are all considered to be essential components of IL (p. 8). This change was a recognition of the complexity of the contemporary information ecosystem. The rapid pace of change in the way information is distributed and accessed means that many previously established skills will become quickly outdated. Although IL encompasses more than the internet, scholars from a range of disciplines recognize the centrality of the internet to academic, civic, personal, and work lives (Leu et al., 2017).

Developing and measuring IL knowledge and skills, however, has been shown to be difficult. While the internet makes more information than ever accessible to users, it also presents unprecedented challenges to evaluating that information. Both the sheer volume and the nature of the electronic media through which such information is delivered make evaluation difficult (Carr, 2011; Wolf, 2018). As the technological and financial barriers to creating quality digital content have decreased, markers of credibility that were once useful

in evaluating online content have lost their meaning (Marsh & Yang, 2017; Wineburg & McGrew, 2019). This creates a digital environment in which information users are responsible for finding, evaluating, and using the information they come across on their own (Metzger & Flanagin, 2015). Furthermore, the online environment is frequently designed to appeal to and reward one's emotions and instincts over one's logical reasoning, making cognitive appraisals of online content even more difficult (Carr, 2011; Wu, 2016). All of this leads to an outcome that has been confirmed by multiple studies: many college students have a general lack of IL skills (e.g., Hanbridge et al., 2018; Wiley et al., 2009; Wineburg & McGrew, 2019).

Despite the documented need for improved IL instruction, no standard curriculum has been established for the teaching of IL, particularly in higher education. One challenge is simply defining IL. In a review of assessments of digital IL, the Educational Testing Service (ETS) listed 12 unique definitions developed by 11 leading national and international organizations (Sparks et al., 2016). As a result, while many organizations and institutions call for improved IL instruction, educators still do not know exactly what to teach (Wineburg & McGrew, 2019).

Further complicating matters are challenges with IL assessment. As curriculum is developed and implemented, instructors benefit from having access to reliable, validated instruments to assess student growth. However, of the 10 existing validated IL assessments for adults identified by ETS, only three were designed to measure learning (Sparks et al., 2016); the others were created for program evaluation, professional certification, or international benchmarking. Many of these assessments are time consuming and costly, and thus inappropriate for regular, formative use by instructors. Furthermore, because the internet is changing so rapidly, assessments may quickly become outdated.

#### Self-Efficacy and IL

One solution to these challenges is to use measures of self-efficacy. Since Bandura's work on self-efficacy in the late 1970s (e.g., Bandura, 1977), self-efficacy has been shown to be a significant predictor of individuals' motivation and learning (Zimmerman, 2000). Along with having necessary skills, individuals' level of self-efficacy is "a major determinant of people's choice of activities, how much effort they will expend, and of how long they will sustain effort in dealing with stressful situations" (Bandura, 1977, p. 194). As stated earlier, levels of learner self-efficacy have been shown to have a direct relationship with levels of achievement (Aharony & Gazit, 2019). Further, discipline-specific self-efficacy (i.e., IL self-

efficacy) has been found to be a stronger predictor of learning and performance than self-efficacy in general (i.e., school self-efficacy) (Kim & Park, 2000); this supports the notion that self-efficacy should be studied in relation to a particular subject or context (Klassen & Chiu, 2010).

Kurbanoglu (2003) made the case that self-efficacy is closely linked to IL and stated that IL self-efficacy should be measured in order to improve instruction in higher education. Considering and measuring self-efficacy can help educators better understand learners' behaviors and decision-making during tasks that apply IL skills (Folk, 2016). Current empirical studies that link self-efficacy with IL in higher education have documented limitations, including exploring subgroups of IL or populations (versus a more general approach) and inconsistencies in terms of approaches, measures, and operationalized conceptions of self-efficacy and its connection to IL (Folk, 2016). Despite these limitations, findings in general suggest that higher levels of IL self-efficacy are associated with a better understanding of IL knowledge (Folk, 2016). This suggests the value in focusing on developing methods to improve IL self-efficacy and instruments to measure it (Kurbanoglu, 2003).

Some research has suggested that IL should be considered a unidimensional construct. For example, Catts (2005) and Katz et al. (2018) both found that a single-factor model best represented the data collected in their respective studies. Others have even suggested that IL is so complex that it cannot be properly measured (Catts, 2005). However, with such a wide range of knowledge and skills that IL encompasses, exploring how these very different components of IL relate to one another is vital. A construct with this wide range of complexities needs continued investigation.

## Method

A confirmatory factor analysis (CFA) was employed to test the dimensionality and provide validity evidence of the ILSES (Kurbanoglu et al., 2006). The researchers wanted to test if the data collected in this study fit to the model that Kurbanoglu et al. proposed in their development of the scale. The original instrument and corresponding proposed model are described below.

### Information Literacy Self-Efficacy Scale

Kurbanoglu et al. (2006) designed the ILSES to “measure self-efficacy for information literacy” (p. 732). They reviewed literature related to IL and self-efficacy and extracted seven categories:

- A. Defining the need for information,
- B. Initiating the search strategy,
- C. Locating and accessing the resources,
- D. Assessing and comprehending the information,
- E. Interpreting, synthesizing, and using the information,
- F. Communicating the information,
- G. Evaluating the product and process (Kurbanoglu et al., 2006, p. 733).

These seven categories were used as the factors for the proposed model tested with the CFA in the current study.

Kurbanoglu et al. (2006) conducted five phases of development in which they administered the assessment and analyzed data to determine the validity of the instrument. They employed item analyses, discrimination indices, a principal components analysis, a varimax rotation, and used discriminant validity throughout the phases of ILSES development.

As a result, a 28-item Likert-scale type of survey was developed, with each item contributing to one of the seven categories. For example, the item “Decide where and how to find the information I need” is part of category C. Locating and accessing the resources. The scale begins with the overall stem “I feel confident and competent to,” followed by the items, and participants select one of the following responses: “7 = almost always true, 6 = usually true, 5 = often true, 4 = occasionally true, 3 = sometimes but infrequently true, 2 = usually not true, 1 = almost never true” (Kurbanoglu et al., 2006, p. 742).

### Procedure

The ILSES was organized into a Qualtrics survey and administered to undergraduate learners in four different courses offered by the College of Education at a large southeastern, public research university in the Fall 2019 and Spring 2020 semesters. These courses were selected because of the relatively diverse population of undergraduate students that enroll in



these courses in terms of age, major, and year classification. Institutional Review Board (IRB) approval was granted prior to data collection.

A script was developed so that individual differences amongst members of the research team would not be a factor during data collection. The script simply expressed the details and purpose of the study, noted that participating is optional, and gave the participants the web address to access the informed consent form, which was the opening page of the Qualtrics survey. Participants then navigated to the web address and completed the ILSES individually. Course instructors had the option of providing extra credit in their course to their students for participating in the study.

### Participants

Only data from undergraduate learners who completed the entire ILSES were retained. Data from  $n = 253$  participants were included. The participants' mean age was 20.28 years old, represented 36 different majors offered at the university, and consisted of 14.2% first-year students, 30.8% sophomores, 22.1% juniors, and 32.8% seniors. Also, 74.3% of the participants were female and 25.7% were male. For demographic data regarding the ethnicities of the participants, refer to Table 1.

**Table 1: Ethnicity Frequencies of Participants**

Ethnicity	$n$	%
American Indian/Alaskan Native	1	0.4
Asian	16	6.3
Black/African American	24	9.5
Hawaiian/Other Pacific Islander	2	0.8
White/Caucasian	189	74.7
Other	21	8.3

### Data Analysis

A confirmatory factor analysis (CFA) was used to test the dimensionality of the 28-item ILSES using the data collected in this study. The researchers were interested in testing the fit of the seven-factor model that Kurbanoglu et al. (2006) proposed based on the IL literature. The estimation approach used in the analyses for this study was robust maximum likelihood estimation (MLR). MLR was employed because maximum likelihood estimation has been found robust to non-normality when the data is comprised of ordinal indicators with greater than five levels (e.g., the Likert-type scale used in the ILSES), and MLR has



been shown to perform well with potential skewness (Kline, 2016). All analyses were performed on the raw data from the ILSES. The statistical software MPlus Version 8.4 was used for CFA data analysis.

In order to evaluate the different models tested in this study, several model-fit indices were used: Chi-Square test, root mean square error of approximation (RMSEA), comparative fit index (CFI), Tucker-Lewis index (TLI), and standardized root mean square residual (SRMR). The Chi-Square test assesses the discrepancy between the observed covariance matrix and the covariance estimated by the model (Smith & McMillan, 2001); therefore, a smaller value suggests the observed covariance has better fit with the model's estimation. RMSEA has been considered to have more descriptive value than the Chi-Square test, and values closer to zero suggest better fit (0.05 or less is considered good fit) (Smith & McMillan, 2001). CFI and TLI are incremental fit indices that depend on the average size of correlations within the data, and values greater than 0.9 are considered acceptable fit (Kenny, 2020; Smith & McMillan, 2001). SRMR evaluates the standardized difference between observed and estimated correlations, where values closest to zero suggest better fit (.08 or less is considered good fit) (Kenny, 2020).

## Results

### Descriptive Statistics

Descriptive statistics regarding the participants' responses on the ILSES can be found in Appendix A. Interestingly, all mean responses on items were between 4.64 and 5.75. Item 10 ("Locate resources in the library using the library catalogue") returned the lowest mean score of 4.64, while Item 11 ("Use internet search tools [such as search engines, directories, etc.]") returned the largest mean score of 5.75.

### Seven-Factor Model

Typically, the first step in choosing a model to fit to the ILSES would be to test the fit of the data using the seven-factor model proposed by Kurbanoglu et al. (2006) in the development of the scale. However, one factor (A. Defining the need for information) only had one item loading onto it in the final version of the scale. Based on CFA literature, "two indicators per factor is the required minimum for CFA models with multiple factors" (Kline, 2016).

Therefore, the authors removed the first item and factor from the model because a CFA model could not be identified if it were included (Kline, 2016).

### Six-Factor Model

The six-factor model, fit to the 27-item assessment (Factor A and its corresponding single item were removed), was associated with fit indices displayed in Table 2. These values indicate poor fit (Hooper et al., 2008). Model fit refers to the extent to which the observed data (responses from participants in the sample) aligns with the proposed model (the proposed dimensionality of the scale and corresponding expected pattern of responses). When the researchers state that the six-factor model displayed poor fit, this means the participant responses on the 27-item ILSES did not statistically represent response-patterns proposed by the six-factor model.

**Table 2: Model Fit Indices for the Six-Factor Model**

Fit index	Six-Factor Model
Chi-Square	1098.095
RMSEA	0.100
CFI	0.809
TLI	0.784
SRMR	0.159

An item breakdown for each factor, along with corresponding standardized factor loadings, for the six-factor model can be found in Appendix B. Appendix C displays the factor diagram for the six-factor model.

Because this underlying six-factor model was grounded in the literature, the researchers did not want to disregard it due to the poor fit. So, the researchers took a systematic approach by running separate CFAs for each factor and their corresponding items in order to determine if certain factors were not being measured as expected in the data. The result of this approach suggested that all of the underlying factors specified from the literature displayed adequate fit with their corresponding factors except two: Factor C (Locating and accessing the resources) and Factor F (Communicating the information). These factors, when isolated to a one-factor model, displayed poor fit (Hooper et al., 2008). Table 3 shows the fit indices for these two factors.

**Table 3: Model Fit Indices for Factor C and Factor F**

Fit index	Factor C	Factor F
Chi-Square	280.320	129.620
RMSEA	0.227	0.181
CFI	0.690	0.818
TLI	0.566	0.727
SRMR	0.154	0.070

*Note.* Factor C = Locating and accessing the resources; Factor F = Communicating the information.

#### Four-Factor Model

An alternative model that removed the factors and items that displayed poor fit with the data was assessed. This resulted in a CFA being employed to assess the fit of a four-factor model with 12 items to the data (Factors C and F were removed from the six-factor model, along with the 16 items that were designed to load onto those factors). Table 4 displays the four-factor model's fit indices presented against the fit indices for the six-factor model. An item breakdown for each factor, along with standardized factor loadings, for the four-factor model can be found in Appendix D. Appendix E displays the factor diagram for the four-factor model. Participant responses on all of these factors displayed evidence of internal consistency reliability, with Cronbach alpha coefficients of 0.86, 0.93, 0.85, and 0.90, respectively.

**Table 4: Model Fit Indices for the Six-Factor and Four-Factor Models**

Fit index	Six-Factor Model	Four-Factor Model
Chi-Square	1098.095	89.619
RMSEA	0.100	0.059
CFI	0.809	0.969
TLI	0.784	0.958
SRMR	0.159	0.033

## Discussion

The confirmatory factor analysis (CFA) run in this study suggests that once the single-item factor was removed (Kline, 2016), the six-factor model specified by the authors who developed the scale did not display adequate fit with the observed data collected in this study. This finding suggests that the 27-item ILSES may not assess the six-factors it intends to measure, as responses on the ILSES from this study do not demonstrate evidence of appropriate construct validity, specifically internal structure validity (Messick, 1987). This

result is significant because the original ILSES could be used inappropriately to make assumptions about individuals' IL self-efficacy. Researchers considering construct validity in terms of how results from assessments are interpreted and used is critical (Messick, 1987). If evidence of adequate construct validity is not established, test interpretations and uses can also be compromised, leading to potentially harmful unintended consequences.

A four-factor model is proposed, with 12 corresponding items from the original ILSES, which displayed adequate fit to the data. This does not prove that the model represents reality (contemplating theoretical considerations regarding the underlying constructs is integral as well), but it shows the model is consistent with the observed data, demonstrating evidence of internal structure validity. While this model is not completely comprehensive of IL self-efficacy, the researchers believe this model is more representative in measuring what it is meant to assess. The four factors retained in the model include 1) *Initiating the search strategy*, 2) *Assessing and comprehending the information*, 3) *Interpreting, synthesizing, and using the information*, and 4) *Evaluating the product and process* (Kurbanoglu et al., 2006).

These four retained factors are consistent with many of the essential aspects of IL, which is a testament to the diligent work Kurbanoglu et al. (2006) put into their development of the original ILSES. In 1989, the ALA stated that “to be information literate, a person must be able to recognize when information is needed and have the ability to locate, evaluate, and use effectively the needed information.” The retained factors in the alternative ILSES model proposed in this paper aligns with the original IL definitely in multiple ways. *Initiating the search strategy* from the retained ILSES is consistent with recognizing information needs and having the ability to locate information. *Assessing and comprehending the information* and *Evaluating the product and process* both relate to evaluating information. *Interpreting, synthesizing, and using the information* directly associates with effectively using needed information.

As stated earlier, the ACRL, an authority on IL in higher education (Johnston & Webber, 2003), updated their definition of IL in 2015. While the retained factors in this study may not account for all of these adjustments, the four factors still represent some essential pillars of this updated perspective of IL. *Interpreting, synthesizing, and using the information* aligns with the end of the updated definition regarding using information to create new knowledge. *Assessing and comprehending the information* and *Evaluating the product and process* are related to “the understanding of how information is produced and valued” (ACRL, 2015,

p. 8), as considering the processes of information creation and how it is valued play an important role in assessing and evaluating that information.

Along with this updated definition, the ACRL *Framework* also presented six key concepts of IL that include: “Authority Is Constructed and Contextual,” “Information Creation as a Process,” “Information Has Value,” “Research as Inquiry, Scholarship as Conversation,” and “Searching as Strategic Exploration.” *Initiating the search strategy* directly relates to the concept of strategically searching for information, while *Assessing and comprehending the information* and *Evaluating the product and process* connect to the frames regarding authority, information creation, and information value. Similarly, the Society of College, National and University Libraries (SCONUL, 2011), another authority on IL based in Europe, updated their seven pillars of IL that include Identify, Scope, Plan, Gather, Evaluate, Manage, and Present. One can see consistencies between these pillars and the four factors retained from the ILSES in this study, including the focus on having an information searching strategy and evaluating or assessing information. All of this demonstrates that while the 12-item, four-factor ILSES retained in this study may not encompass a measurement of self-efficacy regarding a complete and comprehensive view of IL knowledge and skills, the factors and items retained are relevant to multiple essential aspects of IL.

The authors who constructed the original ILSES included item analyses, discrimination indices, principal components analysis, a varimax rotation, and discriminant validity throughout multiple phases of development and administrations of the scale. With careful test development and an emphasis on validity from the start, why does the original ILSES model not show adequate fit with data from a sample of higher education learners today?

A possible explanation is that the information environment has changed so considerably since the development of the ILSES in 2006 that the underlying knowledge, skills, and considerations that individuals need to be information literate within that environment have significantly evolved as well. This drastic change is a result of the explosion of the internet, as more human-made information is available to users on the internet than ever before (Levitin, 2017) with fewer traditional gatekeepers of credible information being available to users (Metzger & Flanigan, 2015). This all leads to the idea that the underlying dimensions that were carefully pulled from the IL literature prior to 2006 may not be completely relevant to users of today who need knowledge and skills to navigate the information ecosystem.

Similarly, the ILSES's underlying IL self-efficacy dimensions may need an update of their own to keep up with the evolving information environment. When the environment in which IL skills are typically applied has changed as much as it has, the knowledge and skills necessary to navigate that environment will naturally change as well. Therefore, aspects of IL instruction, including assessment, must be re-investigated and reconsidered to be relevant to information users of today.

#### Limitations and Delimitations

Some limitations and delimitations related to this study should be considered. First, the researchers only sampled undergraduate learners from a single institution. Findings are not generalizable across a population, as it should always be established that findings are truly a reflection of the sample at hand. This is especially true with a research topic such as IL, where differences are prominent among individuals, and factors such as available resources, socio-economic status, beliefs, and worldviews can play a significant role. To counter this limitation, the researchers sampled from courses in which a diverse population of learners typically sign up. Second, self-reporting on survey instruments can be associated with certain issues like societal pressures or biases that impact responses. To counter this challenge, when administering the survey, the researchers encouraged the learners to answer the prompts as honestly as possible, since the responses were completely anonymous.

#### Implications for Future Research

The alternative four-factor model proposed in this study does not fully encompass IL self-efficacy, as the original ILSES attempted to do. The rapidly changing information landscape presents a situation in which the seven categories from Kurbanoglu et al.'s (2006) instrument may need to be reconsidered. A change in information environment, along with necessary skills needed to navigate it, leads to a need to update assessment of self-efficacy of those skills. Thus, we believe future research should focus on developing a complete measure of self-efficacy of essential IL categories by investigating what types of knowledge and skills are most relevant to learners today.

This may not mean a complete overhaul of the ILSES but some revision to components of IL. For example, *Initiating the search strategy*, one of the original ILSES factors that displayed appropriate fit, may not need to be changed drastically, because the underlying motivations to initiate the search for information may not be as affected by the dynamic online

environment as other IL concepts. However, the factors that did not display adequate fit, *Locating and accessing the resources* and *Communicating the information*, may need to have a more serious update. Locating, accessing, and communicating information have all changed since the growth of social media and blogging, for example.

Another possibility for future researchers could be starting with new IL categories to assess; the ACRL *Framework* could be a good place to start. The six threshold concepts, which were chosen to represent the core ideas of IL, were established with the evolving and dynamic online information ecosystem in mind. Similarly, SCONUL updated their seven pillars of IL in order to be more relevant in current times.

Despite the difficulties involved in creating an updated measure of self-efficacy in IL, revising and developing updated scales is essential to IL instruction and, in turn, improving IL skills in individuals. Assessing these scales in terms of construct validity will continue to be a relevant and integral part of moving the field forward as the information environment continues to evolve. Developing updated IL self-efficacy assessments that can be interpreted and used in appropriate ways can improve instruction to better fit the needs of its learners (Bandura, 2006). Improved IL measurement and instruction that fits the needs of learners in the current, complex information environment will help individuals develop the knowledge and skills necessary to be responsible and critical information consumers and users.

## References

- Aharony, N., & Gazit, T. (2019). Factors affecting students' information literacy self-efficacy. *Library Hi Tech*, 37(2), 183–196. <https://doi.org/10.1108/LHT-10-2018-0154>
- Aharony, N., & Gazit, T. (2020). Students' information literacy self-efficacy: An exploratory study. *Journal of Librarianship and Information Science*, 52(1), 224–236. <https://doi.org/10.1177/0961000618790312>
- American Library Association. (1989). *Presidential committee on information literacy: Final report*. <http://www.ala.org/acrl/publications/whitepapers/presidential>
- Association of College and Research Libraries (2000). Information literacy competency standards for higher education. <https://alair.ala.org/handle/11213/7668>
- Association of College and Research Libraries. (2015). *Framework for information literacy for higher education*. <http://www.ala.org/acrl/standards/ilframework>



- Bandura, A. (1977). Self-efficacy: Toward a unifying theory of behavioral change. *Psychological Review*, 84(2), 191–215. <https://doi.org/10.1037/0033-295X.84.2.191>
- Bandura, A. (2006). Guide for creating self-efficacy scales. In F. Pajares and T. Urdan (Eds.), *Self-efficacy beliefs of adolescents* (pp. 307–337). Information Age Publishing.
- Carr, N. (2011). *The shallows: What the internet is doing to our brains*. W. W. Norton.
- Catts, R. (2005). Confirming the relational model of information literacy. *International Information and Library Review*, 37(1), 19–24. <https://doi.org/10.1080/10572317.2005.10762661>
- Clark, M. (2017). Imposed-inquiry information-seeking self-efficacy and performance of college students: A review of the literature. *The Journal of Academic Librarianship*, 43(5), 417–422. <https://doi.org/10.1016/j.acalib.2017.05.001>
- Folk, A. (2016). Academic self-efficacy, information literacy, and undergraduate course-related research: Expanding Gross's imposed query model. *Journal of Library Administration*, 56(5), 540–558. <https://doi.org/10.1080/01930826.2015.1105545>
- Hanbridge, A. S., Sanderson, N., & Tin, T. (2018). Using mobile technology to enhance undergraduate student digital information literacy skills: A Canadian case study. *IAFOR Journal of Education*, 3(SE), 108–121. <https://doi.org/10.22492/ije.3.se.07>
- Hooper, D., Coughlan, J., & Mullen, M. (2008, June). Evaluating model fit: A synthesis of the structural equation modelling literature. In A. Brown (Ed.), *Proceedings of the 7th European conference on research methodology for business and management studies* (pp. 195–200). Academic Publishing.
- Johnston, B., & Webber, S. (2003). Information literacy in higher education: A review and case study. *Studies in Higher Education*, 28(3), 335–352. <https://doi.org/10.1080/03075070309295>
- Katz, I. R., Rijmen, F., & Attali, Y. (2018). *Investigating the factor structure of the iSkills™ assessment* (Research Report No. RR-18-25). Educational Testing Service. <https://doi.org/10.1002/ets2.12211>
- Kenny, D. A. (2020, June 5). *Measuring model fit*. <http://davidakenny.net/cm/fit.htm>

- Kiliç-Çakmak, E. (2010). Learning strategies and motivational factors predicting information literacy self-efficacy of e-learners. *Australasian Journal of Educational Technology*, 26(2), 192-208. <https://doi.org/10.14742/ajet.1090>
- Kim, A., & Park, I.-Y. (2000, April 24–28). *Hierarchical structure of self-efficacy in terms of generality levels and its relations to academic performance: General, academic, domain-specific, and subject-specific self-efficacy* [Paper presentation]. American Educational Research Association Annual Meeting, New Orleans, LA, United States. ED446119. ERIC. <https://files.eric.ed.gov/fulltext/ED446119.pdf>
- Klassen, R. M., & Chiu, M. M. (2010). Effects on teachers' self-efficacy and job satisfaction: Teacher gender, years of experience, and job stress. *Journal of Educational Psychology*, 102(3), 741–756. <https://doi.org/10.1037/a0019237>
- Kline, R. B. (2016). *Principles and practice of structural equation modeling* (4th ed.). Guilford Press.
- Kurbanoglu, S. S. (2003). Self-efficacy: A concept closely linked to information literacy and lifelong learning. *Journal of Documentation*, 59(6), 635–646. <https://doi.org/10.1108/00220410310506295>
- Kurbanoglu, S. S., Akkoyunlu, B., & Umay, A. (2006). Developing the information literacy self-efficacy scale. *Journal of Documentation*, 62(6), 730–743. <https://doi.org/10.1108/00220410610714949>
- Leu, D. J., Kinzer, C. K., Coiro, J., Castek, J., & Henry, L. A. (2017). New literacies: A dual-level theory of the changing nature of literacy, instruction, and assessment. *Journal of Education*, 197(2), 1–18. <https://doi.org/10.1177/002205741719700202>
- Levitin, D. J. (2017). *Weaponized lies: How to think critically in the post-truth era*. Dutton.
- Lynch, M. P. (2016). *The internet of us: Knowing more and understanding less in the age of big data*. Liveright Publishing.
- Marsh, E. J., & Yang, B. W. (2017). A call to think broadly about information literacy. *Journal of Applied Research in Memory and Cognition*, 6(4), 401–404. <https://doi.org/10.1016/j.jarmac.2017.09.012>
- Messick, S. (1987). *Validity* (Research Report No. RR-87-40). Educational Testing Service. <https://doi.org/10.1002/j.2330-8516.1987.tb00244.x>

- Metzger, M. J., & Flanagin, A. J. (2015). Psychological approaches to credibility assessment online. In S. S. Sundar (Ed.), *The Handbook of the Psychology of Communication Technology* (pp. 445–466). Wiley Blackwell. <https://doi.org/10.1002/9781118426456.ch20>
- Robertson, D. S., & Felicilda-Reynaldo, R. F. D. (2015). Evaluation of graduate nursing students' information literacy self-efficacy and applied skills. *Journal of Nursing Education*, 54(3), S26–S30. <https://doi.org/10.3928/01484834-20150218-03>
- Ross, M., Perkins, H., & Bodey, K. (2013). Information literacy self-efficacy: The effect of juggling work and study. *Library & Information Science Research*, 35(4), 279–287. <https://doi.org/10.1016/j.lisr.2013.04.008>
- Ross, M., Perkins, H., & Bodey, K. (2016). Academic motivation and information literacy self-efficacy: The importance of a simple desire to know. *Library & Information Science Research*, 38(1), 2–9. <https://doi.org/10.1016/j.lisr.2016.01.002>
- Society of College, National and University Libraries. Working Group on Information Literacy (2011). The SCONUL seven pillars of information literacy: Core model for higher education. <https://www.sconul.ac.uk/sites/default/files/documents/coremodel.pdf>
- Smith, T. D. & McMillan, B. F. (2001, February 1–3). *A primer of model fit indices in structural equation modeling* [Paper presentation]. Southwest Educational Research Association Annual Meeting, New Orleans, LA, United States. ED449231. ERIC. <https://files.eric.ed.gov/fulltext/ED449231.pdf>
- Sparks, J. R., Katz, I. R., & Beile, P. M. (2016). *Assessing digital information literacy in higher education: A Review of existing frameworks and assessments with recommendations for next generation assessment* (Research Report No. RR-16-32). Educational Testing Service. <https://doi.org/10.1002/ets2.12118>
- Tang, Y., & Tseng, H. W. (2013). Distance learners' self-efficacy and information literacy skills. *The Journal of Academic Librarianship*, 39(6), 517–521. <https://doi.org/10.1016/j.acalib.2013.08.008>
- Tella, A. (2009). Correlates of undergraduates' information-seeking behavior. *College & Undergraduate Libraries*, 16(1), 1–19. <https://doi.org/10.1080/10691310902754221>

- Usluel, Y. K. (2007). Can ICT usage make a difference on student teachers' information literacy self-efficacy. *Library & Information Science Research*, 29(1), 92–102. <https://doi.org/10.1016/j.lisr.2007.01.003>
- Wiley, J., Goldman, S. R., Graesser, A. C., Sanchez, C. A., Ash, I. K., & Hemmerich, J. A. (2009). Source evaluation, comprehension, and learning in internet science inquiry tasks. *American Educational Research Journal*, 46(4), 1060–1106. <https://doi.org/10.3102%2F0002831209333183>
- Wineburg, S., & McGrew, S. (2019). Lateral reading and the nature of expertise: Reading less and learning more when evaluating digital information. *Teachers College Record*, 121(11), 1–40.
- Wolf, M. (2018). *Reader, come home: The reading brain in a digital world*. Harper.
- Wu, T. (2016). *The attention merchants: The epic scramble to get inside our heads*. Alfred A. Knopf.
- Zimmerman, B. J. (2000). Self-efficacy: An essential motive to learn. *Contemporary Educational Psychology*, 25(1), 82–91. <https://doi.org/10.1006/ceps.1999.1016>

## Appendix A

**Table A1: Descriptive Statistics for the Information Literacy Self-Efficacy Scale**

Item (Stem: "I feel confident and competent to")	<i>M</i>	<i>SD</i>
1. Define the information I need	5.18	1.187
2. Identify a variety of potential sources of information	5.27	1.209
3. Limit search strategies by subject, language, and date	5.08	1.328
4. Initiate search strategies by using keywords and Boolean logic	4.99	1.462
5. Decide where and how to find the information I need	5.35	1.256
6. Use different kinds of print sources (i.e., books, periodicals, encyclopedias, chronologies, etc.)	5.00	1.484
7. Use electronic information sources	5.75	1.295
8. Locate information sources in the library	4.68	1.564
9. Use library catalogue	4.74	1.585
10. Locate resources in the library using the library catalogue	4.64	1.631
11. Use internet search tools (such as search engines, directories, etc.)	5.75	1.288
12. Use different kinds (types) of libraries	4.66	1.489
13. Use many resources at the same time to make a research	5.23	1.440
14. Determine the authoritativeness, currentness and reliability of the information sources	5.28	1.319
15. Select information most appropriate to the information need	5.49	1.227
16. Identify points of agreement and disagreement among sources	5.34	1.289
17. Evaluate www sources	5.32	1.338
18. Synthesize newly gathered information with previous information	5.41	1.210
19. Interpret the visual information (i.e., graphs, tables, diagrams)	5.51	1.305
20. Write a research paper	5.41	1.407
21. Determine the content and form the parts (introduction, conclusion) of a presentation (written, oral)	5.52	1.252
22. Prepare a bibliography	5.40	1.343
23. Create bibliographic records and organize the bibliography	5.35	1.341
24. Create bibliographic records for different kinds of materials (i.e., books, articles, web pages)	5.17	1.419
25. Make citations and use quotations within the text	5.67	1.273
26. Choose a format (i.e., written, oral, visual) appropriate to communicate with the audience	5.51	1.311
27. Learn from my information problem solving experience and improve my information literacy skill	5.41	1.320
28. Criticize the quality of my information seeking process and its products	5.37	1.349

Note.  $n = 253$ ; responses ranged from 1 (almost never true) to 7 (almost always true).

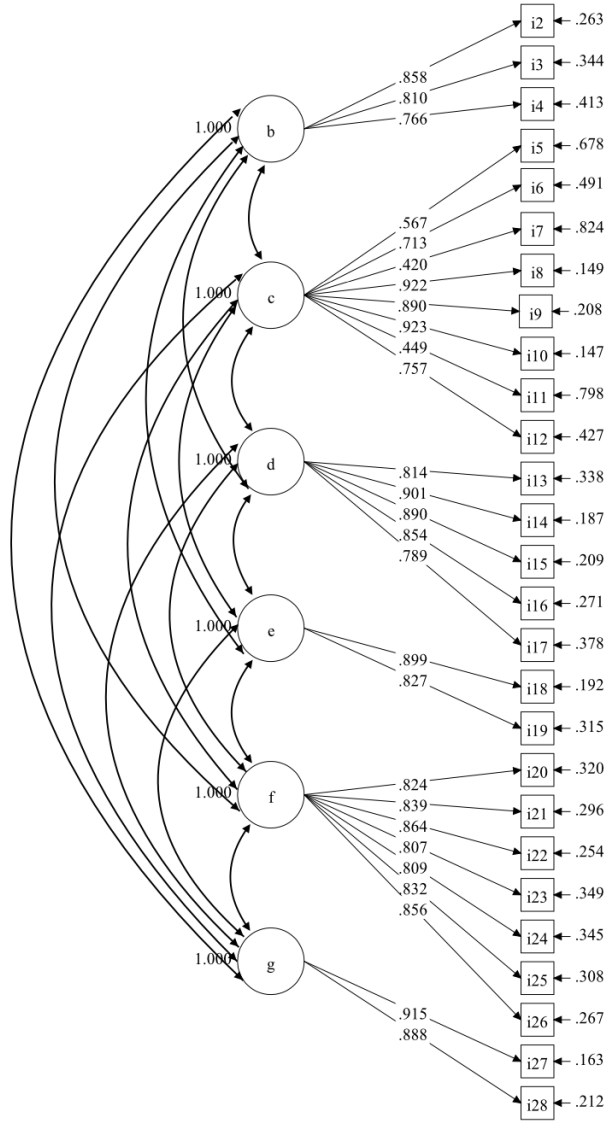
## Appendix B

**Table B1: Item-Breakdown by Factor with Corresponding Factor Loadings for Six-Factor Model**

Factor	Item (Stem: "I feel confident and competent to")	Standardized factor loading
B	2. Identify a variety of potential sources of information	0.858
	3. Limit search strategies by subject, language, and date	0.810
	4. Initiate search strategies by using keywords and Boolean logic	0.766
C	5. Decide where and how to find the information I need	0.567
	6. Use different kinds of print sources (i.e., books, periodicals, encyclopedias, chronologies, etc.)	0.713
	7. Use electronic information sources	0.420
	8. Locate information sources in the library	0.922
	9. Use library catalogue	0.890
	10. Locate resources in the library using the library catalogue	0.923
	11. Use internet search tools (such as search engines, directories, etc.)	0.449
D	12. Use different kinds (types) of libraries	0.757
	13. Use many resources at the same time to make a research	0.814
	14. Determine the authoritativeness, currentness and reliability of the information sources	0.901
	15. Select information most appropriate to the information need	0.890
	16. Identify points of agreement and disagreement among sources	0.854
E	17. Evaluate www sources	0.789
	18. Synthesize newly gathered information with previous information	0.899
F	19. Interpret the visual information (i.e., graphs, tables, diagrams)	0.827
	20. Write a research paper	0.824
	21. Determine the content and form the parts (introduction, conclusion) of a presentation (written, oral)	0.839
	22. Prepare a bibliography	0.864
	23. Create bibliographic records and organize the bibliography	0.807
	24. Create bibliographic records for different kinds of materials (i.e., books, articles, web pages)	0.809
	25. Make citations and use quotations within the text	0.832
26. Choose a format (i.e., written, oral, visual) appropriate to communicate with the audience	0.856	
G	27. Learn from my information problem solving experience and improve my information literacy skill	0.915
	28. Criticize the quality of my information seeking process and its products	0.888

## Appendix C

Figure C1: Factor Diagram for Six-Factor Model





## Appendix D

**Table D1: Item-Breakdown by Factor with Corresponding Factor Loadings for Four-Factor Model**

Factor	Item (Stem: "I feel confident and competent to")	Standardized factor loading
B	2. Identify a variety of potential sources of information	0.853
	3. Limit search strategies by subject, language, and date	0.813
	4. Initiate search strategies by using keywords and Boolean logic	0.773
D	13. Use many resources at the same time to make a research	0.807
	14. Determine the authoritativeness, currentness and reliability of the information sources	0.900
	15. Select information most appropriate to the information need	0.891
	16. Identify points of agreement and disagreement among sources	0.856
	17. Evaluate www sources	0.793
E	18. Synthesize newly gathered information with previous information	0.902
	19. Interpret the visual information (i.e., graphs, tables, diagrams)	0.824
G	27. Learn from my information problem solving experience and improve my information literacy skill	0.919
	28. Criticize the quality of my information seeking process and its products	0.884

## Appendix E

Figure E1: Factor Diagram for Four-Factor Model

