Student Information Literacy: Psychometric Validation of a Self-efficacy Report

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Summary — Psychometric characteristics of the Student Information Literacy Self-efficacy Report based on responses from 498 students aged 9 to 12 years are reported. On the test students report their self-efficacy (confidence and difficulty) in 11 different phases of being information literate, i.e., developing a topic, planning, self-management, locating sources, selecting sources, retrieving information, analysing information, evaluating information, synthesising knowledge, presenting knowledge, and self-evaluation using a positively-packed rating scale. The data were strongly internally consistent (Cronbach $\alpha = .95$) with test-retest reliability of .78. Eleven information literacy phases factors, each consisting of a matching pair of self-efficacy questions, were confirmed ($\chi^2 = 529.68; df = 198; \text{RMSEA} = .058; \text{TLI} = .940$). The SILSER ratings were relatively uncorrelated with teacher ratings and test scores of information literacy skills and moderately correlated with academic self-concept. The test provides unique information about students’ information literacy self-efficacy and its use in classrooms is warranted.

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Information literacy involves knowing, within a rapidly changing, data-rich environment, how to ‘read’ information towards solving a life or learning problem (Eisenberg & Spitzer, 1991; Eisenberg & Brown, 1992). The information literate person solves problems by knowing how to access, evaluate, and use information from a variety of sources (Doyle, 1993; Moore, 1995). Brown (1999) described 11 phases associated with information literacy: identifying a problem, planning a solution process, managing the solution process, finding appropriate sources, selecting appropriate sources, locating appropriate information within each source, understanding selected information, checking the quality of information, creating a solution, presenting the solution, and evaluating the quality of the solution and the skills used to find the solution. Self-efficacy, from social cognitive theory, is belief or confidence in one’s own ability to organise and take action in order to reach a goal. It is a conviction that one can successfully do what is necessary to achieve or produce a desired set of outcomes (Bandura, 1989). The Student Information Literacy Self-efficacy Report (SILSER) measures students’ self-reported efficacy to complete the 11 different information literacy phases.

A self-rated test for evaluating and reporting information literacy was designed for two age groups (Primary age 8-10; Intermediate age 11-13) with minor differences in wording between the two forms. The format and content of these items were developed as part of the NZCER Information Skills Assessment development program (Brown, 1999; Croft, Dunn, & Brown, 2001). The items were significant revisions of earlier work (Brown, 1998) and were piloted early in 2000. Following Chapman and Tunmer (1995), a question on difficulty was added to those on confidence and the student prompts were presented as questions instead of as statements. The test requires students to rate themselves using two self-efficacy questions on confidence and sense of difficulty in completing each task stated in age-appropriate descriptions of the 11 information literacy phases. Figure 1 shows the Phase 1 prompt, questions, and response format intended for Primary students.
Figure 1. Primary level Information Literacy Phase 1: prompt and self-efficacy questions with response format

Choose a topic that you would want to know more about. Think about what you already know, and write some clear questions to answer about the topic. Make a list of the key words that you could use in your search.

1. If you had to do this task, how sure are you that you could do it?
   Very Unsure | Unsure | A Little Bit Sure | Fairly Sure | Sure | Very Sure

2. If you had to this task, how hard would it be for you to do?
   Very Hard | Hard | A Little Bit Easy | Fairly Easy | Easy | Very Easy

As part of a larger study (Brown, 2000), 498 students in 37 schools responded to twenty-two questions using a six-point positively packed (Brown, 2004) response scale (i.e., two negative, four positive responses) anchored by 1 very unsure and 6 very sure for confidence and also 1 very hard and 6 very easy for difficulty (Figure 1). High scores indicated strong confidence in completing a task or strong belief that the task was very easy. Only data from students who answered 20 or more of the 22 questions were analysed.

On the average, the two forms had robust estimates of internal consistency (Cronbach $\alpha = .95$) and a study of a three-week interval indicated test-retest Pearson correlation of .78. A maximum likelihood exploratory factor analysis with oblimin rotation produced 11 factors, each consisting of a matching pair of self-efficacy questions. The solution explained 75% of variance, and 39 of the 55 inter-factor correlations were in the range .4 to .6. Confirmatory factor analyses were conducted for three models: the first was all statements loading on one common factor ($\chi^2_{209} = 1908.72; \text{RMSEA} = .128; \text{TLI} = .710$), while the second was two first-order factors for confidence and difficulty ($\chi^2_{208} = 1901.66; \text{RMSEA} = .128; \text{TLI} = .710$), and the third was 11 first-order factors for the 11 phases each with a confidence and a difficulty question ($\chi^2_{198} = 529.68; \text{RMSEA} = .058; \text{TLI} = .940$). Note that in the third model loadings for each statement on its respective factor averaged .84 ($SD = .04$). The 11-phases model had robust fit characteristics with the data so it is argued that the students rated themselves according to each of the 11 information
phases rather than a generalised ability to solve problems or according to either their sense of confidence or difficulty.

In addition to internal evidence for the validity of the test, evidence was obtained on how it related to other measures of students’ skills in solving information problems. In a planned missing data design, SILSER ratings were compared with teachers’ ratings of students’ independent ability to complete the 11 information literacy phases, and to students’ independent performance on an NZCER paper-and-pencil achievement test of information skills (Croft, et al., 2001). Note that students only completed one test, meaning no correlations within that method were available. A multitrait-multimethod approach was used. This assumes a trait has separate reality to the way it is measured if the correlations of the same trait across methods (monotrait heteromethod) should be greater than the correlation of different traits within the same method (heterotrait monomethod) or between methods (heterotrait heteromethod) (Campbell & Fiske, 1959). Table 1 shows the average Pearson correlations by the three conditions.

Table 1.

<table>
<thead>
<tr>
<th>Measure</th>
<th>Monotrait Heteromethod</th>
<th>Heterotrait Monomethod</th>
<th>Heterotrait Heteromethod</th>
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<tbody>
<tr>
<td>1. SILSER</td>
<td>.26</td>
<td>.22</td>
<td>.50</td>
</tr>
<tr>
<td>2. Teacher Rating of Independence</td>
<td>.09</td>
<td>.73</td>
<td></td>
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<tr>
<td>3. ESA:IS Test Performance</td>
<td>na</td>
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Clearly, the divergent heterotrait monomethod correlations are substantially greater than the convergent condition so it is appropriate to conclude that these three methods of measuring students’ ability to solve information problems represent three distinct and complementary domains. This result is supported by research which demonstrated that self-reports and ratings by others are unlikely to be highly correlated (Marsh, Smith, & Barnes, 1983).
The Self-description Questionnaire I (Marsh, 1988) measures children’s self-concept in three domains of academic, social, and physical self-concept. This questionnaire was normed using Australian children ages 8 to 12 making it an ideal validation measure for research with this sample of New Zealand children. Further validation evidence for the SILSER was obtained from 511 students who completed the academic, school-related questionnaire items. The correlation between scores was .46, suggesting that these measures substantially reflect separate artefacts; one measures self-concept, while the other measures information literacy self-efficacy.

Students scored themselves highest on four phases, i.e., managing work, finding sources, choosing sources, and evaluating solutions and processes and lowest on three phases, i.e., locating information within sources, evaluating sources, and presenting information. However, the range of mean scores for these phases is narrow; 4.35 for highest to 4.0 lowest. Any student reporting scores below fairly sure or fairly easy clearly merit teacher assistance and/or intervention. Girls scored themselves higher ($F_1 = 6.46, p < .011, R^2 = .012$) than boys, but the difference is not sufficiently large to justify separate norms. There were no statistically significant differences by year. Psychometric properties are good.

Given that the SILSER provides unique information from teachers’ evaluations, tests of information literacy knowledge, and students’ academic self-concept, its use is warranted. Through self-assessment students can become aware of their own strengths and weaknesses in terms of information literacy phases which may assist them in setting appropriate learning goals. Repeated use may aid students in monitoring their own progress. The test also provides feedback to teachers about students’ strengths and weaknesses, as perceived by the students themselves; a useful adjunct to professional observation and assessment. Teachers can respond to self-reported difficulty and lack of confidence with appropriate learning assignments and training activities to build students’ skills and self-efficacy in fulfilling the information literacy phases.
References


