



Assessing Information Literacy: A Case Study of Primary 5 Students in Hong Kong

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Abstract

This paper reports an exploratory investigation of the information-literacy levels of primary 5 students in Hong Kong. Factors such as gender and reading ability were also examined. Primary 5 students from four local schools completed a fourteen-item information-literacy assessment (ILA), which was adopted and modified from questions on the sixth-grade version of the Tool for Real-time Assessment of Information Literacy Skills (TRAILS). The ILA covered five TRAILS categories and three American Association of School Librarians (AASL) and Association for Educational Communications and Technology (AECT) IL standards to measure different aspects of information literacy. Reading ability was measured by questions from a local public test of reading comprehension. On average, the participants ($n = 199$) achieved a mean score of 9.12 ($SD = 2.56$), and most assessment items showed room for improvement. Female students ($n = 97$; 48.7 percent) scored higher on the ILA than their male counterparts ($n = 102$; 51.3 percent), suggesting female students' higher level of information literacy. Results also revealed a positive and significant relationship between students' information literacy and reading ability. These findings offer a preliminary understanding of the information literacy of children in Hong Kong.

Introduction

With rapidly growing technologies, access to information sources has become more economical and convenient. With the continuous advancement in technologies these days, individuals are continuously fed with new information. Honora Nerz and Lisa Bullard have pointed out that “finding information is no longer the challenge; rather, it is finding the *best* information from the *best* source available” (2006). In recent years the more-valued employees are those who are able to turn the best information into useful knowledge that can enhance business performance in a knowledge-based economy. This circumstance suggests that proficiency in information literacy (IL) is essential for individuals to remain competitive in the labor force. To prepare for their future work, students need to learn how to extract and use the “best” information through learning experiences such as school projects. IL has been defined as “the ability to find and use information” (AASL and AECT 1998, 1), and is believed to be indispensable not only to working individuals but also to students.

In a knowledge-based economy such as that of Hong Kong, a general training in IL is crucial, as it can contribute towards ensuring a secure and productive labor force in the future. IL has been identified as a component of the 21st-century skills that have been advocated by progressive

educators (Darling-Hammond 2010; Dede 2010; Kay 2010; Trilling and Fadel 2009) and that have been touted to be the ones students need to succeed in learning, career, and life in this century. National governments and educational authorities around the world have recognized the importance of IL, as demonstrated by its introduction as a component of educational systems. For instance, it has become customary for university libraries to design their own IL tests to evaluate their students' IL proficiency (Mueller 2010). Beginning June 4, 2012, even the Graduate Management Admission Test (GMAT), an admission requirement for most graduate business programs, will include a new section to measure candidates' ability to evaluate information from multiple sources (Graduate Management Admission Council 2010). More and more postsecondary schools and educational authorities around the world are introducing IL education and setting IL standards for students at younger ages (Moore 2002).

The government of Hong Kong has also recognized the growing importance of IL. A framework for IL education at primary and secondary levels has been drawn up and circulated as the *Information literacy Framework for Hong Kong Students: Building the Capacity of Learning to Learn in the Information Age* (HKSAR Ed. and Manpwr. Bur. 2005). Although this document provides a thorough analysis of information literacy and gives relatively clear guidelines on the implementation of IL education, the assessment of students' IL is not been included. In the absence of a standard means of measuring students' IL level, it remains unclear whether the younger generation is attaining sufficient IL proficiency for effective searching, comprehension, evaluation, and citation of information sources. Teachers and schools need such information to design syllabi and address the gaps in students' IL skills. Moreover, clear and rigorous standards enhance understanding and comparability of students' IL levels across different countries. To initiate the evaluation of the IL proficiency of Hong Kong students and to develop the Information Literacy Assessment (ILA) tool used in this study, researchers adopted and modified the Tool for Real-time Assessment of Information Literacy Skills (TRAILS), a project of Kent State University Library. The ILA tool was used to evaluate the IL levels of Primary 5 (P5) students from a Hong Kong primary school. Concurrent tests of reading ability were also conducted, and it was hypothesized that reading ability would be associated with IL proficiency.

Literature Review

What Is Information Literacy?

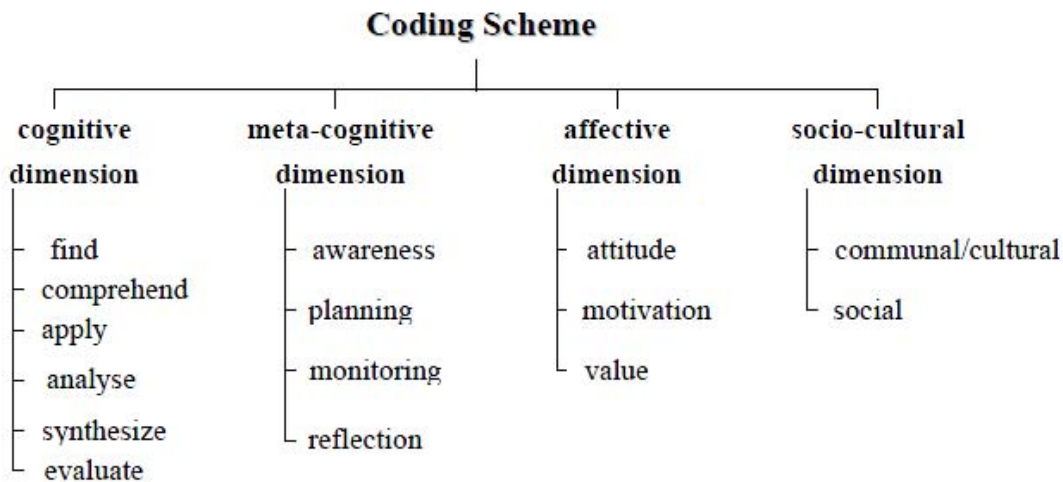
The term "information literacy" was first proposed in the 1970s by Paul Zurkowski of the Information Industry Association and applied to the skill set of individuals who are "trained in the application of information resources to their work" (cited in Mokhtar and Majid 2006, 48). The importance of IL was later recognized by the Association of College and Research Libraries (ACRL), a division of the American Library Association. In 1989 the final report of the ACRL's Presidential Committee on Information Literacy clearly stated that an information-literate person "must be able to recognize when information is needed and have the ability to locate, evaluate, and use effectively the needed information" (ACRL 1989). Numerous definitions with different emphases have been proposed over the past decades (Webber and Johnston 2000), but most of these have followed the core ideas of the ACRL.

Several terms can be included under the broad umbrella of IL; these terms include "library literacy," "media literacy," and "computer literacy" (Bawden 2001). "Library literacy" can refer either to the traditional sense of involving libraries in literacy education or to students' ability to use libraries. "Media literacy" concerns "critical thinking in assessing information gained from

the mass media: television, radio, newspapers and magazines, and (increasingly) the Internet” (Bawden 2001, 225). “Computer literacy” generally refers to competence in using commonly used software programs (Bawden 2008). These concepts often intertwine with IL, but can be viewed as integral components of IL.

The Education and Manpower Bureau, now called the Education Bureau (EDB) of the Hong Kong Special Administrative Region of the People’s Republic of China (HKSAR) has set forth the value of IL education in the territory through the *Information Literacy Framework for Hong Kong: Building the Capacity of Learning to Learn in the Information Age* (2005). To develop this framework, models of IL in different regions were analyzed. Models examined included those developed by Association of College and Research Libraries (ACRL), by American Association of School Librarians (AASL) with Association for Educational Communications and Technology (AECT), and by the Australian and New Zealand Institute for Information Literacy (ANZIL). As shown in figure 1, the standards of different frameworks were grouped into four categories of learning: cognitive, meta-cognitive, affective, and socio-cultural dimensions. These four categories were considered relevant in determining an assessment tool for this study.

Figure 1. A coding scheme for analysing the selected models of information literacy [reproduced from Information Literacy Framework for Hong Kong Students: Building the Capacity of Learning to Learn in the Information Age (HKSAR Education and Manpower Bureau 2005)]



The cognitive dimension encompasses five out of nine IL standards set by AASL/AECT. Core skills involved in completing an information-search task include the skills of effectively selecting, understanding, and applying information, and are important elements of the cognitive dimension. In addition, the ability to learn independently is also emphasized. The meta-cognitive dimension involves “knowing about knowing.” In addition to having the necessary skills and knowledge in processing information, information-literate people should be aware of such knowledge and reflect on it. They should also understand what kinds of attitudes and actions can contribute towards effective IL skills. For instance, AASL/AECT IL Standard 5 suggests that an information-literate student should actively search for the necessary techniques and criteria to appreciate information in different formats. The affective dimension is also important as a learner’s perceptions towards an inquiry process influence motivation. No one knows about an individual’s interest more than himself or herself; therefore, AASL/AECT IL Standard 4 emphasizes the responsibility of a person to search for information that suits his or her interest,

and, thus, helps maintain the habit of information seeking. Finally, the socio-cultural dimension concerns learners' understanding about their responsibilities in the process of inquiry and enhancement of an information-literate society. For instance, an information-literate individual should respect intellectual-property rights and use information technology ethically and legally.

A number of other frameworks capture other aspects of IL beyond the scope that has been adopted by the HKSAR government. For instance, Carol C. Kuhlthau's information-search process describes a person's experience in information seeking using a stage model (1991). The Big6 model is another popular IL framework for K–12 education around the world. Big6 refers to a six-step approach for tackling information problems: task definition, information-seeking strategies, location and access, use of information, synthesis, and evaluation (Eisenberg 2008).

Information-Literacy Education and Standards Worldwide

Jeremy J. Shapiro and Shelley K. Hughes (1996) used the Age of Enlightenment, in which freedom, democracy, and reason were promoted as the core values of a society, as an analogy for the twenty-first century. Given the greater freedom in accessing information, people who can effectively locate and critically evaluate useful information can enhance their general well-being and contribute to a better democratic society. IL has also been suggested as a necessary skill to face the challenges brought about by the emergence of the knowledge-based economy (KBE) dominated by “production and services based on knowledge-intensive activities that contribute to an accelerated pace of technological and scientific advance as well as equally rapid obsolescence” (Powell and Snellman 2004, 199). With growing globalization and reduction of trade barriers, it is expected that less and less manual work will be offered to the human workforce in developed countries. Therefore, a labor force equipped with sound knowledge and high levels of IL that enable workers to use knowledge will be of paramount importance.

Shifts in education paradigms have been observed worldwide. In the traditional rote-learning paradigm, students have not been encouraged to think on their own. In this conventional “teacher-centered” approach, students tend to be passive recipients of knowledge (Jonassen, Peck, and Wilson 1999). Gradually, such an approach is being replaced by modes of constructive, student-centered learning, such as inquiry-based learning and project-based learning. In these approaches, students actively search for information, and construct knowledge and concepts through teachers' guidance and interactions with peers (Chu 2009; Chu, Chow, and Tse 2011). Students need to be proficient in IL to become effective information seekers and knowledge constructors. Children are indeed active information seekers, especially through the Internet. For instance, in Hong Kong 90 percent of children aged ten to thirteen years have been found to be Internet users. Among these users, 80 percent reported that they used the Internet to search for information (Andersen et al. 2007). Although children are persistent searchers (Bilal 2000), they do not automatically have high levels of Web literacy. For example, children have been found to be unable to save their successful search queries for future use (Hirsh 1999).

Given the growing awareness of the importance of IL education, recent research has been conducted in many other countries, representing a global IL perspective and awareness (Johnson, Sproles, and Detmering 2010). Among the studies in this area, many have focused on looking at the establishment of IL standards at various education levels, including primary and secondary education. Back in 1999, the United Nations Educational, Scientific and Cultural Organization (UNESCO) and the International Federation of Library Associations and Institutions (IFLA) developed the School Library Manifesto, a framework document that laid the foundations for

defining the role of school libraries in IL education. It suggested that “when librarians and teachers work together, students achieve higher levels of literacy, reading, learning, problem-solving and information and communication technology skills.”

In the USA the AASL/AECT information-literacy standards were incorporated into the education systems of many states at different grade levels. Oregon, for example, adopted the AASL/AECT IL standards for developing the state’s curriculum and setting IL goals. Other states, such as Virginia, undertook a comprehensive review of IL and formulated their own guidelines and standards. In Montana, with the use of *Information Power* (AASL and AECT 1998) and the Big6 information problem-solving process as primary guiding documents, content and performance standards for school library programs were established in 2000 (Bartow 2009).

Other countries have also incorporated IL into their education systems to varying degrees. In Denmark IL is emphasized strongly as a student-learning outcome. In the Sultanate of Oman the development of an information-skills curriculum for grades one through six was included as part of the five-year plan for the new education policy (Moore 2002).

The Case of Hong Kong

Hong Kong has been described as a territory that has been moving rapidly towards a knowledge-based economy (Enright 2000). The publication *Hong Kong as a Knowledge-Based Economy: A Statistical Perspective* prepared by the HKSAR Census and Statistics Department pointed out that “a KBE is characterized by the need for continuous learning of both codified information and the competencies to use information” (2009, 4). In light of this reality, in 2004 the HKSAR government determined to “draw up an Information Literacy framework for primary and secondary students...so that teachers and students have a clearer picture on the learning targets of using IT in education” (HKSAR Ed. and Mnpwr Bur. 2004, 28). IL in primary education was segregated into two stages: Primary 1 (P1) to Primary 3 (P3) for Stage I, and Primary 4 (P4) to Primary 6 (P6) for Stage II. Guidelines were detailed in terms of learning targets, knowledge, skills, and attitude for each stage. A survey among school librarians, teachers, curriculum coordinators, and principals later revealed that 95 percent of the 2,608 respondents confirmed the need for IL education in Hong Kong (Kong 2008). The IL framework introduced in 2004 provided general guidelines on the kinds of skills that students need to acquire at different stages of IL development. The framework suggested that schools should implement the framework according to their unique situations.

In addition to understanding the IL-education framework developed by the EDB, teachers must also know students’ strengths and weaknesses so instructors can adapt their teaching according to students’ needs. However, no standardized territory-wide assessment for IL exists, thus limiting the ability of educators to determine the IL abilities of their students.

Several attempts have been made to examine the IL levels of Hong Kong students. For example, using questionnaires, search diaries, and interviews, Jan van Aalst et al. (2007) explored the habits and abilities of secondary school students in Hong Kong. Most students reported feelings of uncertainty and confusion at the beginning of an inquiry project, and many remained frustrated after the search process. Secondary school students rated online webpages as the most important source of information. The diaries of some students expressed feelings of being overwhelmed by information overload.

With a view to promoting IL in primary and secondary education, the EDB commissioned the Centre for Information Technology in Education (CITE) of the University of Hong Kong to develop tools for evaluating students' information-literacy levels (CITE 2009). The following eight IL-competence dimensions were identified in the project: define, access, manage, integrate, create, communicate, evaluate, and ethical use. Based on these dimensions, the project team developed a set of generic IL rubrics, which can be used by students as a self- or peer-evaluation checklist. In addition, a Key Stage rubric, which describes the expected IL performance of students at each key stage, was also suggested for curriculum intervention. These rubrics have proven to be useful at student- or individual-school levels. Both students and teachers reported that the rubrics were helpful in facilitating students' IL development and assessing their skills. Moreover, data collected from the assessment developed in the project revealed significant improvements in students' IL competence after the intervention project. However, given the self-evaluation nature of the rubrics, they could not be applied at the aggregate level as a tool for assessing students' IL levels.

Another study conducted by Kon-ying Ning and David M. Kennedy (2008) found that primary school students in Hong Kong generally have very limited exposure to IL education. Under the existing syllabus, IL is taught only in Computer and General Studies at Primary Four (P4) and Five (P5) levels. An IL test, although not precisely modeled after any of the internationally recognized tests, was adopted to test students' knowledge concerning the Big6 skills. The study results showed that, on average, only 20.8 percent and 23.6 percent of P4 and P5 students respectively showed promising knowledge of the Big6 components. No differences were found between test performance at the two levels, and most students were generally weak in defining a search task. Through class observations, students' application of IL skills was also assessed. It appeared that most students' IL skills were poor, although P5 students seemed to have better practical skills than the younger P4 students. However, scores in the Big6 tests were not associated with IL skills application; this finding implied that knowledge in IL does not necessarily translate into successful skills application. Nevertheless, students tended to have positive attitudes towards Big6 skills, which they learned through computer lessons.

Factors Affecting Information Literacy

Because students must be able to interpret the meaning of a text, reading ability is believed to be one of the important factors that contribute to high IL levels (Sayed 1998). Similarly, Maria Pinto, Anne-Vinciane Doucet and Andres Fernández-Ramos (2008) suggested that abstracting is a core skill in IL. Successful abstracting requires skills in five areas: reading and comprehension, analysis and interpretation, synthesis, organization and representation, and writing up. IL and abstracting skills are mutually dependent; abstracting skills and IL have bidirectional enhancing effects on each other. While such an argument seems logical, no empirical evidence has been established to support it. Nevertheless, the importance of reading ability for IL competence has been emphasized and is thus examined in this study.

Gender has also been believed to influence information-technology skills and usage of computer resources. For instance, an earlier study (Meredyth et al. 2000) examined the information-technology skills of Australian students, and girls were found less capable than boys in computer skills, both basic (e.g., deleting files, creating new documents, etc.) and advanced (e.g., using spreadsheets, sending e-mail messages, etc.). In particular, girls performed worse in information search using the Web. Self-exploration at home was found to be an important way of acquiring advanced information-technology skills, yet girls tended to depend more on school for learning

information technology. Alternative explanations have also been suggested such as: girls are less capable in spatial performance (Contreras and Colom 2001), tend to be more anxious about using computers (Siann et al. 1990), or are affected by stereotypes depicting information technology as a masculine area (Meredyth et al. 2000; Nielsen et al. 1998).

While it could be likely that there are gender differences in terms of IL competence, only a few studies have examined such differences. Moreover, the gender differences in technology are likely to have changed over recent decades due to rapid technological advancement and increasing emphasis on gender equality. This study examined whether gender has an effect on the IL competence of children in the context of modern society.

Purpose

Given the lack of a standardized assessment for measuring Hong Kong primary school students' levels of IL, this study adapted and modified the Tool for Real-time Assessment of Information Literacy Skills to evaluate the IL of a group of primary school students. The findings of this study provide preliminary information that could serve as baseline information about the IL competence of the participating students. The relationship of reading ability to IL skills was also examined, and potential gender difference was explored. The research objectives of this study are thus summarized as follows:

1. To measure the IL levels of P5 students from primary schools in Hong Kong, using an information-literacy assessment (ILA) adopted and modified from TRAILS.
2. To investigate the relationship of IL to reading ability and gender.

Method

Participants

This study is part of a wider project, which has recruited four primary schools in Hong Kong whose academic standing is ranked as average. The participants of this study consisted of 199 Primary 5 (grade 5) students from these four schools; participants' parents returned signed informed-consent forms. While all P5 students from each school were invited to participate, the actual number of participants varied per school (see table 1) because participation was voluntary and dependent on parental consent. To protect their identities, in this paper the four participating schools are represented by letters A through D.

Table 1. Sample information.

School	Total Number of Students	Number of Participants	Participation Rate	Number of Females	Number of Males
A	131	46	35.11%	18	28
B	67	58	86.56%	29	29
C	74	42	56.76%	22	20
D	149	53	35.57%	28	25
Total	421	199	47.27%	97	102

Instruments

Information-Literacy Assessment

The ILA instrument for this study was modified from the Tool for Real-Time Assessment of Information Literacy Skills (TRAILS). As one of the projects of the Institute for Library and IL Education (ILILE), TRAILS was developed by Kent State University faculty with the assistance of school librarians. The goal was to assess the levels of information literacy of third-, sixth-, ninth-, and twelfth-graders (Kent State University Libraries 2010). The ILA was designed as “a class assessment tool that was standards-based; provided both class and individual outcomes; assured privacy; and was Web-based, easy-to-use, and available at no cost” (Schloman and Gedeon 2007, 45). Since its availability for public use in 2006, TRAILS has gradually been adopted within the United States. The advantage of using TRAILS is that results of the tested students can be compared to the national average in the United States. However, no study has adopted TRAILS as an assessment for non-U.S. participants. The current study would be the first to adapt and use TRAILS for a non-American population.

The IL framework set by the HKSAR government has incorporated the AASL/AECT IL standards by classifying them into four categories. The “eight IL competence dimensions” developed by CITE (2009) also correspond to these standards, except the ones (i.e. Standards 4 and 5) that fall under the affective dimension of the EDB IL framework. These three IL frameworks (HKSAR, AASL/AECT, and CITE) resemble each other to a great extent, with only minor differences regarding the degree of emphasis on students’ perceptions of the inquiry process.

The ILA tool used in this study assesses the information-literacy level of students in five TRAILS categories, which correspond to the major IL standards set by AASL and AECT. The questions in TRAILS assess students’ information literacy in the cognitive, meta-cognitive, and socio-cultural dimensions of the EDB IL framework, covering seven out of eight IL dimensions suggested by CITE. TRAILS encompasses most of the standards and dimensions of the three frameworks deemed relevant in this study, leaving out only the evaluation of students’ level of enjoyment in finding and using information, which is beyond the scope of this study. The consistency of TRAILS components with the Hong Kong IL framework made it potentially applicable to primary school students in the territory. The TRAILS 6th General Assessment 1 consists of twenty-five questions, fourteen of which were extracted based on the expert opinion of two school librarians from the participating schools. The reasons for excluding the other questions were 1) the wording was too complicated, and 2) the context was considered remote to Hong Kong students. The relationship between the TRAILS categories and the three frameworks is summarized in table 2.

Table 2. TRAILS Categories and AASL/AECT Information Power standard corresponding to the questions in the ILA.

Question number on ILA	AASL/AECT Information Power	TRAILS Categories	EDB IL Framework	CITE 2009
1, 2	Standard 1, Indicator 3 Formulate questions based on information needs	Category 1 Develop Topic	Cognitive 1 Determine the extent of and locate the information needed	Define
8, 11	Standard 1, Indicator 4 Identify a variety of potential sources of information	Category 2 Identify potential sources	Cognitive 1 Determine the extent of and locate the information needed	Access
13	Standard 1 Access information efficiently and effectively			
4, 5	Standard 1, Indicator 5 Develop and use successful strategies for locating information	Category 3 Develop, use, and revise search strategies	Meta-cognitive 2 Plan and monitor the process of inquiry	
12	Standard 2, Indicator 1 Determines accuracy, relevance, and comprehensiveness	Category 4 Evaluate sources and information	Meta-cognitive 3 Reflect upon and regulate the process of inquiry	Evaluate
9, 10	Standard 2, Indicator 2 Distinguish among fact, point of view, and opinion		Cognitive 3 Analyze the collected information and construct new concepts or understanding	Integrate
14	Standard 2, Indicator 4 Select information appropriate to problem or question at hand		Cognitive 2 Apply information to problem solving and decision making	Create
7	Standard 2 Evaluate information critically and competently		Cognitive 4 Critically evaluate information and integrate new concepts with prior knowledge	Evaluate
3, 6	Standard 8, Indicator 2 Respect intellectual property rights	Category 5 Recognize how to use information responsibly, ethically, and legally	Socio-cultural 2 Understand and respect the ethical, legal, political and cultural contexts in which information is being used	Ethical Use

The selected questions were translated into Chinese by the research team behind the project to ensure that all P5 students could understand the items properly. Although most students in Hong Kong start to learn English in kindergarten, Chinese is their native language. Most questions were directly translated without any further elaboration, but some included the original English terms to avoid possible misinterpretation in the Chinese translations. To facilitate students' understanding further, a few questions were modified according to the local context. For example, American figures were replaced by Chinese ones who receive comparable degrees of

social recognition. Three amendments of this kind were made. Benjamin Franklin was replaced by Dr. Sun Yat-Sen, the cofounder of the Republic of China. Christopher Paul Curtis, an American author of children's literature, was replaced by Jin Yong, a popular Chinese fiction author in the "martial arts and chivalry" genre. To make one of the questions more specific, the popular Harry Potter series by J. K. Rowling was mentioned instead of "a book on a subject in any type of library." To ensure that the terminology used in the tool was suitable for P5 students, the language of the questions was further modified and edited based on discussions with teacher representatives from the participating schools. The back-translated version of the IL assessment tool is attached as Appendix A.

To collect students' answers, the ILA tool was uploaded to SurveyMonkey, an online survey tool. The assessment was administered by each school's IT teacher, and students answered the questions through a Web browser during regular class hours. All questions were close-ended, and students had to choose a correct answer from two to four options. Each correct answer was worth 1 point, and the maximum possible ILA score was 14.

Test of Chinese Reading Comprehension

Two passages from the 2008 Territory-Wide System Assessment (TSA) – P6 Chinese reading paper were used to form the Test of Chinese Reading Comprehension (CRC), a measure of students' reading-comprehension ability. The TSA was one of the two parts of the Basic Competency Assessment developed by the Hong Kong Examinations and Assessment Authority (HKEAA) in 2001. The main goal of the TSA is to measure P3, P6, and Secondary 3 (S3) students' proficiency in key learning areas: Chinese language, English language, and mathematics. Since 2006 all students in P3, P6, and S3 have had to take part in the TSA. The Chinese reading paper tests various comprehension skills, many of which are also IL fundamentals. With reference to the official marking scheme of the 2008 TSA, the questions were designed to assess students' abilities in 1) understanding vocabulary, 2) understanding the meaning of and connections between paragraphs from narrative and expository passages, 3) understanding the implied meaning of events described in the passage, 4) understanding the conclusion deduced by the author, and 5) understanding the examples in the passage. The CRC is available at <gefblp.pbworks.com>.

The CRC was administered by the Chinese language teachers during regular class hours, and students were given thirty minutes to complete the test. Each of the two Chinese passages in the test consisted of 700 to 800 characters. The narrative passage expressed the author's feelings towards his primary school. The expository passage described and explained some observed phenomena related to a type of plant. Students had to answer fifteen multiple choice questions and five open-ended questions in total. Except for one multiple-choice question with three correct answers, all other questions had a single correct answer. Adopting the official marking scheme of the TSA exam, each correct answer was treated as equally important and worth 1 point, such that the total possible score on the test was 22.

Instrument Reliability

Kuder-Richardson Formula 20 was used to assess the reliability of the ILA tool and CRC test. Results showed that the reliability was 0.61 for the ILA tool, which is considered acceptable (Nunnally and Bernstein 1994). For the CRC test, all open-ended questions were graded by two independent markers according to the students' use of language to address the problem accurately, and express ideas in a clear and concise way. Discrepancies were resolved by mutual

agreement or judgment from an independent third marker. All markers for the open-ended questions were research assistants pursuing undergraduate or graduate studies.

Results

Overall ILA Performance

Table 3 summarizes the descriptive statistics of the participants' ILA scores. Out of the fourteen questions, the mean correct number of questions was 9.12 (SD = 2.56). No significant difference in the level of information literacy among the four schools was observed [$F(3, 195) = 2.481, p = .062$], so the subsequent analyses were performed on the entire sample.

Table 3. Descriptive statistics of ILA scores for the participating schools.

School	n	Mean (SD)	Median	Max	Min
A	46	9.54 (2.49)	10	14	3
B	58	8.48 (2.69)	9	13	3
C	42	8.88 (2.59)	9	14	4
D	53	9.62 (2.32)	10	13	4
Total	199	9.12 (2.56)	9	14	3

Performance on Specific AASL/AECT IL Standards

The ILA questions were categorized according to the associated AASL/AECT IL standards for analysis. In the ILA tool, seven questions related to AASL/AECT IL Standard 1, while five questions related to Standard 2. Figures 2 and 3 illustrate the distribution of scores for the questions on these two AASL/AECT IL standards. Both score distributions were negatively skewed. The mean score on Standard 1 was 4.63 (SD = 1.52). Only 13 percent (26 out of 199) of students were able to answer all the questions related to Standard 1 correctly. For Standard 2 the mean score was 3.29 (SD = 1.25), and about 20 percent (41 out of 199) of students answered all questions related to Standard 2 correctly. These results do not appear impressive. Although it was possible that the questions on the ILA might have been misinterpreted, it is more likely that the results are indicators that students' levels of information literacy were inadequate.

Figure 2. Distribution of total scores for questions related to AASL/AECT ILS Standard 1.

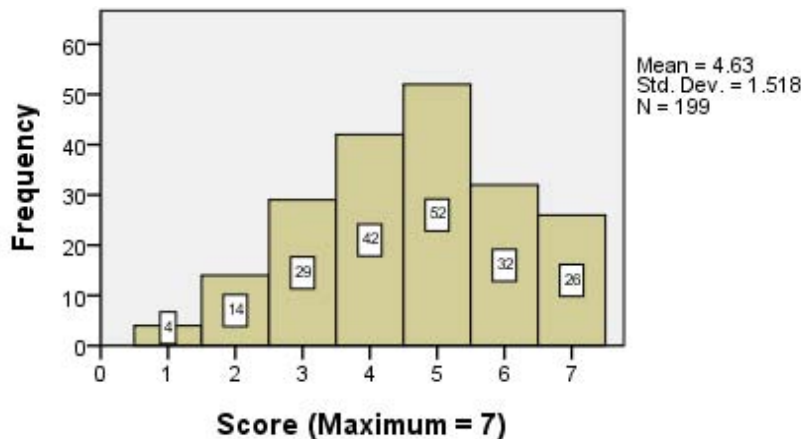
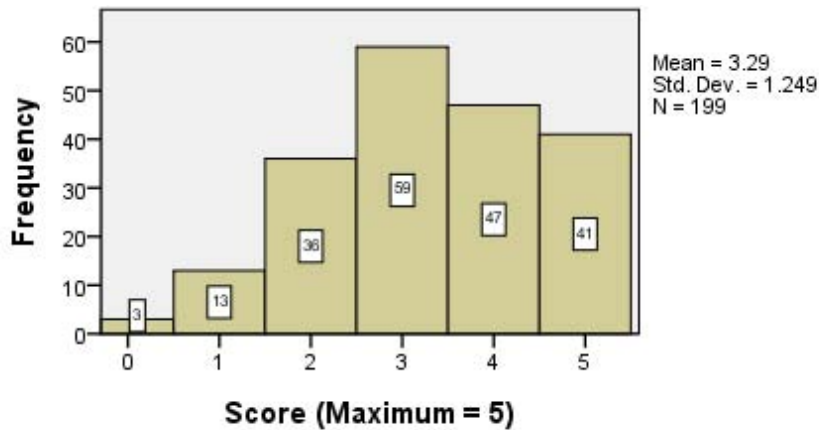


Figure 3. Distribution of total scores for questions related to AASL/AECT IL Standard 2.

Performance on Specific ILA Questions

Since no benchmark has been established for the TRAILS, one way to determine students' performances on the ILA was by comparing the expected percentage of correctness for mere guessing, or the "baseline," with the observed percentage of correctness on each question. The formulas for calculating the expected number and percentage of correctness in the case of mere guessing are as follows:

$$\text{Expected Number of Correct Answers} = \frac{\text{Number of Questions} \times \text{Number of Correct Options}}{\text{Total Number of Options}}$$

$$\text{Expected Percentage of Correctness} = \frac{\text{Expected Number of Correct Answers}}{\text{Number of Questions}} \times 100$$

These expected figures based solely on guessing would be referred to as the baseline in the analyses. For instance, the probability of choosing the right answer would be 25 percent if all students randomly picked an answer from four options. The greater the positive deviation between the observed percentage and the expected "guesswork" percentage, the better in terms of students' overall performance.

Table 4 shows the comparisons between the observed number of students answering correctly and the expected number of students answering correctly if they were only guessing. For each question, the observed number of students answering correctly was sufficiently greater than the expected number of students who would have answered correctly by only guessing. The comparison results of all questions, except question 3, were statistically significant, implying that the observed number of correct answers were not the result of mere guessing for these questions. The performances on some of questions will be further discussed in a later section.

Table 4. Comparison between the observed and expected numbers of students for each ILA question.

Question number	Observed number (%) of students answering correctly	Expected number (%) of students answering correctly in case of mere guessing – the “baseline”	χ^2
1	135 (67.8%)	49.75 (25%)	194.78***
2	146 (73.4%)	99.50 (50%)	43.46***
3	57 (28.6%)	49.75 (25%)	1.41
4	152 (76.4%)	49.75 (25%)	280.20***
5	135 (67.8%)	66.33 (33.3%)	106.64***
6	166 (83.4%)	66.33 (33.3%)	224.65***
7	101 (50.4%)	49.75 (25%)	70.39***
8	158 (79.7%)	49.75 (25%)	314.05***
9	187 (94.0%)	99.5 (50%)	153.89***
10	139 (69.8%)	99.5 (50%)	31.36***
11	110 (55.3%)	66.33 (33.3%)	43.13***
12	103 (51.8%)	49.75 (25%)	76.00***
13	85 (42.7%)	49.75 (25%)	33.30***
14	125 (62.8%)	49.75 (25%)	151.76***

*** $p < .001$

Information Literacy, Gender, and Reading Ability

Table 5 shows the results of independent sample t-tests for comparing male and female students' performance on the ILA. Female students had a significantly higher level of information literacy than male students [$t(197) = 3.77, p < .001$]. The mean scores were 8.47 (SD = 2.56) and 9.79 (SD = 2.39) for male and female students respectively. Female students performed better than male counterparts on questions relating to both AASL/AECT IL Standards 1 and 2: access information efficiently and effectively [$t(197) = 2.859, p = .005$], and evaluate information critically and competently [$t(197) = 3.221, p = .001$].

Table 5. Gender comparison on the ILA tool.

	Mean (SD)		t	p
	Male	Female		
ILA – All questions	8.47 (2.56)	9.79 (2.85)	3.77	<.001
ILA – AASL/AECT IL standard 1 only	4.33 (1.56)	4.94 (1.42)	2.86	.005
ILA – AASL/AECT IL standard 2 only	3.02 (1.22)	3.58 (1.22)	3.22	.001

Table 6 shows the correlations between the ILA tool and CRC test. All correlations were statistically significant. In general, students' CRC score was positively related to the results of the ILA. Compared with AASL/AECT IL Standard 1, Standard 2 is more closely related to Territory-Wide System Assessment (TSA) performances. The total of the whole TSA score is the best parameter, even better than the score of Standard 1, to predict a student's performance on Standard 2. It is likely that effective comprehension contributes to the ability to evaluate information critically and competently. Ethical standards, on the other hand, do not seem to have much to do with a student's reading ability.

Table 6. Correlations between students' CRC scores and ILA scores.

	CRC – Total	CRC – Narrative only	CRC - Expository only
ILA – All questions	.42**	.42**	.27**
ILA – AASL/AECT IL standard 1 only	.28**	.30**	.16*
ILA – AASL/AECT IL standard 2 only	.42**	.37**	.33**

Note: * $p < .05$; ** $p < .01$

The ILA total scores were also subjected to a 2 x 2 analysis of variance with two genders (male, female) and two groups by reading ability (BA, AA). Students who scored below the sample average on both narrative and expository passages of the CRC belonged to the BA (“below average”) group. Students who scored above the sample average on both narrative and expository passages of the CRC belonged to the AA (“above average”) group. The BA and AA groups contained 68 and 54 students, respectively.

The main effect of reading group yielded an F ratio of $F(1, 118) = 32.59, p < .001$, indicating that the ILA total score was significantly greater for the AA group ($M = 10.22, SD = 0.26$) than for the BA group ($M = 7.87, SD = 0.31$). The main effect of gender yielded an F ratio of $F(1, 118) = 10.15, p = .002$, indicating that the ILA total score was significantly higher for female students ($M = 9.79, SD = 2.85$) than for male students ($M = 8.47, SD = 2.56$). The interaction effect was insignificant: $F(1, 118) = .07, p = .80$.

Discussion and Implications

Limited Understanding of IL Demonstrated

The current study revealed the IL levels of a sample of P5 students in Hong Kong. Students showed some understanding of information literacy, such that their performances on the ILA were better than in the case of taking wild guesses. Their performances regarding AASL/AECT IL Standards 1 (accesses information efficiently and effectively) and 2 (evaluates information critically and competently) were similar. Students in general could correctly answer only about half of the questions associated with each standard, and only a very few students could answer all questions correctly.

Need for Curricular Focus on IL

Comparative descriptions of the students' level of information literacy like “low” or “high” seem unfair to them, but it appears that they still have much room for improvement. However, the current education system in Hong Kong has no standard curriculum dedicated to IL. Although the theoretical framework and importance for IL education has been explained in the handbook published in 2005 by the Education Bureau of the Hong Kong Special Administrative Region of the People's Republic of China, the actual implementation of IL in the existing curriculum at primary levels remains unclear. If IL is not included as part of the regular curriculum, seeing significant improvements in the level of IL of Hong Kong students in general is unlikely (Ning and Kennedy 2008). Therefore, there is an urgent need for Hong Kong to develop an organized and systematic curriculum for IL education.

Previous efforts have been made to find an effective IL education program. It has been shown that through inquiry-based learning projects, in which three kinds of teachers (General Studies, Language, and Information Technology) and the school librarian are in charge of teaching specific areas, the perceived and actual levels of information literacy among Hong Kong primary students could improve significantly (Chu 2009; Chu et al. 2012; Crow 2007; Narvaez and Rest 1995).

Other than Hong Kong, many countries have taken various initiatives to incorporate IL education into their systems. For instance, all school librarians in Denmark are teacher-librarians who are required to teach in classrooms in addition to managing libraries (Moore 2002).

Positive Correlation between IL Knowledge and Reading Skill

Positive correlations between the ILA and CRC results were observed in this study, implying an association between students' IL and reading-comprehension ability. Although no causal relationship can be claimed, the significant correlation implies that the two variables may have a reinforcing effect on each other. Better language ability can help students extract and process information more effectively, and higher IL levels allow students to access better sources.

Female students showed better performance than their male counterparts in both the ILA and the narrative passage of the CRC. The fact that girls outperformed boys in reading narratives is not surprising as this finding has been observed in previous research. According to the IEA Reading Literacy study carried out in 32 countries, girls performed substantially better than boys in both narrative and expository domains, although the difference for the latter domain is much smaller (IEA 2011). A recent study that covered forty-three countries, including Hong Kong, showed that girls outscored boys in reading abilities, and the difference was partially explained by reading enjoyment (Wagemaker et al. 1996). This finding highlights the importance of the affective component of the IL framework.

Sherry R. Crow (2007) emphasized the importance of intrinsic motivation in inquiry. Even without any reward or punishment, learners with intrinsic motivation will spontaneously search for knowledge and reflect on their abilities. The motivation in inquiry, just like the motivation in reading, is probably a crucial impulse for improvement. Omitting such an element could be problematic in evaluating IL. Further modification of the ILA tool might be needed to incorporate fully the affective component of the Hong Kong IL framework.

Issues Relating to Specific Questions

A few issues related to specific questions are worth discussing. The first is an issue of question style; students tended to perform poorly in interpreting negative questions that required them to pick an option opposite to the statement. For instance, question 3 (see Appendix A) asked students to choose one option out of four that is not the purpose of citing sources. Most of the students were unable to point out that "Citing tells readers where to purchase the complete work that you used" is *not* a reason for citing sources. Another reasonable explanation for the poor result on question 3 is that students lacked an understanding of citation, as they might not have been properly taught about citing references as part of the curriculum. Students also performed badly in another negative question (question 13) that asked the students "which source *would not* provide information on the library's checkout procedures."

The second issue relates to difficulty distinguishing fact from opinion. Although questions 9 and 10 are similar in nature, students performed worse in question 10. Almost all students could tell that “smoking is bad for health” is a fact, yet 30 percent of students also believed “smoking *should* be banned” is a fact. This result implies that the current education system does not provide sufficient training for students on differentiating between an opinion and a fact.

Another related issue is the extent to which moral understanding is linked to the ethical use of information. Understanding about moral values is of course the basis of any social behavior, yet many factors are involved in determining whether an understanding can lead to corresponding action. Frameworks like the Four-Component Model of Morality try to explain important stages of a moral action (Rest, Bebeau, and Volker 1986; Rest et al. 1999; Moores and Chang 2006). First, a person must have the *moral sensitivity* to tell how different actions will affect the welfare of others. Then, *moral judgment* is needed to tell which action is the most justified. The judgment can never be realized unless one has the *moral motivation* to do so. However, even if one is motivated to behave morally, *moral characteristics* like self-efficacy (to what extent one believes he/she can achieve the desired outcome) will be the final determinant of whether one actually behaves morally.

Based on the Four-Component Model, Trevor T. Moores and Jerry C.-J. Chang (2006) tried to study Hong Kong residents’ ethical decision making in relation to software piracy. These researchers came to the conclusion that recognition does not lead to judgment, and gender plays no role in ethical decision-making. Therefore, even if students have high levels of information literacy in the ethical domain, they may not make corresponding decisions. Elements supporting students’ judgment, motivation, and characters should also be included in the teaching of information literacy.

Limitations to Consider

Although the results reported serve as important precursors for future research, limitations of the study should be considered in interpreting the results. First, the participating schools were selected based on convenience sampling. Nevertheless, the participating schools’ characteristics, such as curriculum and teacher-to-student ratio, were similar to those of any local primary schools of average academic standing. With further revision of the ILA tool, future studies should aim to administer the instrument to a larger sample population, thereby improving the validity and utility of the instrument for evaluating IL knowledge of primary school students in Hong Kong.

Second, both the ILA tool and the CRC test were modified from questions of TRAILS and TSA, both of which were designed for Primary 6 students. It is hard to judge whether the poor performance in certain questions was due to the difficulty in comprehension, or whether students had not yet been exposed to knowledge about the topic.

Third, the ILA did not fully cover all the AASL/AECT IL standards. In future studies, additional questions, for example on assessing the understanding of intellectual-property rights, could be included to improve the scope of the assessment tool.

Usefulness of Study

Despite its limitations, however, the current study is the first to measure the IL of Hong Kong primary school students using a standardized testing procedure. It is also the first to investigate

the relationships of IL to gender and reading ability among Hong Kong students. This study suggests that the ILA tool could potentially be used to generate territory-wide baseline information about the IL levels of primary school students in Hong Kong, and future research should develop this tool further.

Summary and Conclusion

The study used a fourteen-item ILA tool to investigate the current levels of a sample of P5 students in Hong Kong. Though IL has been emphasized in the Hong Kong school curriculum in recent years, the results of the study show that the participating students have not achieved high IL levels, suggesting the need for improvement. The study also showed that female students generally scored higher on the ILA than their male counterparts, implying their higher level of IL. The female students also had higher scores in the CRC when compared to the male students, showing higher levels of reading ability. A significant positive association was also found between IL and reading ability.

The findings of this study provide insights towards the IL development of primary school students in Hong Kong. As IL has been deemed essential in 21st-century society and has been found to reinforce students' development in other skills, the incorporation of IL into formal curricula needs to be valued and carefully considered.

Finally, it is noted that a systematic and well-informed IL curriculum together with a comprehensive assessment tool are needed to facilitate and monitor students' development.

Appendix A

The back-translation of the ILA tool (The Chinese version of ILA can be found at gefplp.pbworks.com.)

Question 1 (TRAILS, Sixth Grade General Assessment 1, Q1)

Your teacher asks you to choose one religion and create a hand-out on that religion to introduce it. Which of the following subtopics below would you not include in the hand-out?

- A. World population
- B. Countries where the religion is found
- C. Customs and holidays
- D. Religious symbols

Question 2 (TRAILS, Sixth Grade General Assessment 1, Q2)

When you are assigned a research project, the topic of the project is often too broad. You will have to narrow the topic. In each pair of the topics below, select the topic that is narrower.

- A. Outer space
- B. Planets

Question 3 (TRAILS, Sixth Grade General Assessment 1, Q22)

Which of the following is not a reason why you should cite your sources?

- A. Citing gives credit to the author or the first person of the idea.
- B. Citing shows that you have researched the idea.
- C. Citing allows another person to identify the complete work that you used.
- D. Citing tells readers where to purchase the complete work that you used.

Question 4 (TRAILS, Sixth Grade General Assessment 1, Q6)

The assignment for health class is to find facts on childhood obesity. You want to save time. Before typing “childhood obesity” into the Google search engine, which website should you check first?

- A. “Healthy Adults”—www.healthyliving.org—health information for adults
- B. “Lose Weight Now”—www.dietnow.com—several diet plans are explained
- C. “Kid’s Health”—www.kidshealth.org—children’s health topics are discussed
- D. “Food For Life”—www.foodgoodforyou.com—healthy food choices

Question 5 (TRAILS, Sixth Grade General Assessment 1, Q9)

If you want to find books by Cha Leung Yung, what kind of catalogue search should you try?

- A. Title search
- B. Author search
- C. Subject search

Question 6 (TRAILS, Sixth Grade General Assessment 1, Q12)

Your friend tells you about a website where you can download the latest songs that you hear on the radio for free. If you use this website for this purpose, which of the following will you violate?

- A. Right of privacy
- B. Copyright
- C. Freedom of information

Question 7 (TRAILS, Sixth General Assessment 1, Q10)

You are asked to create an informational pamphlet on animals. Your topic is giraffes. Select from below the website with the most credible information about giraffes.

- A. www.ourgiraffes.org – A site created by scientists studying mammals
- B. www.sunnyschool.p6.hk/chan -- A site about zoo animals created by Mr. Chan’s sixth grade students
- C. www.visitanddiegozoo.org -- A site created by supporters of the San Diego Zoo
- D. www.safaripictures.com -- A site created by a tourist visited Africa

Question 8 (TRAILS, Sixth General Assessment 1, Q14)

If you want to find Joanne Kathleen Rowling’s “Harry Potter”, which library resource would you use?

- A. library catalogue or online catalogue
- B. video collection
- C. reference tool
- D. periodical database

Question 9 (TRAILS, Sixth General Assessment 1, Q16)

Read over the following sentence and select whether the sentence is Fact or Opinion.

“Smoking is bad for health.”

- A. Fact
- B. Opinion

Question 10 (TRAILS, Sixth General Assessment 1 Q16)

Read over the sentence and select whether the sentence is Fact or Opinion.

“Smoking should be banned.”

- A. Fact
- B. Opinion

Question 11 (TRAILS, Sixth General Assessment 1, Q18)

On a recent hike you saw an unfamiliar bird. You want to hear what sound this bird produces.

Which library source would allow you to identify the bird and also hear the bird’s sound?

- A. a bird identification DVD
- B. a printed field guide on bird
- C. a general encyclopaedia

Question 12 (TRAILS, Sixth General Assessment 1, Q15)

You have used a search engine to locate Web sites on the negative effects of drugs on teenagers.

Below are some Websites that your search retrieved. Read over the site description and choose the one that would best meet your information need.

- A. www.addictionscare.com – a 24-hour hotline regarding drug addiction in your community
- B. www.teendrugabuse.org – describe how illegal drugs affect teens’ brains
- C. www.teenscenezeen.org – explain how to say “no” to drugs at a party
- D. www.teendrugabusers.us – provide assistance to parents with troubled teens

Question 13 (TRAILS, Sixth General Assessment 1, Q23)

You are unsure about how to check out materials from the school library. Which source would not provide information on the library’s checkout procedures?

- A. Read the school newspaper
- B. Read a pamphlet describing the library’s rules and procedures
- C. Ask the librarian
- D. Read the information signs at the checkout desk

Question 14 (TRAILS, Sixth General Assessment 1, Q24)

Your teacher wants you to write a report about Dr. Sun Yat Sen. Read the paragraph below and select the information that would help you answer this question: What did Dr. Sun Yat Sen accomplish during his presidency?

Dr. Sun Yat Sen was an important figure in modern Chinese history. He was the first provisional president of the Republic of China. Sun played an instrumental role in inspiring the overthrow of the Qing Dynasty and established the Republic of China, which makes him as a world-renowned revolutionist. In 1925, Sun passed away because of liver cancer.

- A. Sun passed away because of the liver cancer.
- B. Sun was the first provisional president of the Republic of China.
- C. Sun played an instrumental role in inspiring the overthrow of the Qing Dynasty and established the Republic of China.
- D. Sun is a world-renowned revolutionist.

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