Abstract

Purpose: This study aimed to acquire knowledge about Singapore secondary school (ages 13 to 16 years old) students’ skills in searching, evaluating and using information.

Methodology: A comprehensive instrument encompassing the basic IL skills, as well as a new dimension of ethical usage of information and collaborative information seeking was used for data collection. From August to November 2010, a total of 8 schools comprising 3,164 students participated in this study.

Findings: It was a matter of concern that various kinds of libraries, including school libraries, were found to be under-utilized. From the test that was administered to assess the IL skills of students, the results were found to be generally unsatisfactory as each of the major categories of IL skills recorded a score that is below 50 (out of a maximum of 100) except for “task definition”. For skills related to “information seeking strategies”, “location & access” and “information use”, the types of schools, academic streams of study, and students’ family background seemed to have significant influences.

Originality/value: This study is the first large-scale survey conducted in Singapore that sought to test the IL skills of secondary school students. The findings are useful in assessing the current effectiveness of IL integration, and the need for a more planned approach towards IL competency training within the school curriculum in Singapore.

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Introduction
Information literacy (IL) is the ability to locate, access, search, evaluate and use information in various contexts (ALA, 1989). With information being increasingly digitized, coupled with the way information and communication technologies (ICTs) are being embraced in our daily lives, IL has become an increasingly necessary competency to navigate through the deluge of information to meet our information needs in both our work and leisure activities.

For students, being information literate is necessary so that they would be able to effectively sieve through and identify relevant and reliable information that they get through the Internet, television, newspapers, other sources and friends for their school related work. From as far back as the 1980s, scholars and experts have endorsed the importance of and need for information literacy (IL) in order to deal with the exponentially increasing onslaught of information that an individual is faced with everyday (Breivik, 1985; Hubbard, 1987; Mancall, et al., 1986). For instance, educators and educational researchers increasingly emphasize the importance of establishing authentic assessment, resource-based learning and creative and critical thinking approaches in the school curriculum (Grabinger and Dunlap, 1995; Herrington and Herrington, 2005). Part of this involves being independent learners, looking up information from various sources, analyzing and using appropriately the obtained information.

A proper means to measure and assess IL, as well as exploring pedagogies to improve it, are essential in understanding its educational impact and consequently its effectiveness in preparing our young with future-ready skills. In Singapore, IL education dates back to the late 1990s. Nonetheless, no large-scale assessment has been conducted so far to find out Singapore students’ level of IL skills, as well as specific IL skills that they are good at or weak in. This study aims to gather data about Singapore secondary school students’ skills in searching, evaluating and using information in general. A comprehensive test instrument encompassing the basic IL skills, including dimensions of ethical use of information and perceptions towards collaborative information seeking, was developed and used for data collection.

Related Literature
This section provides a review of the literature on IL, covering topics on the definition of IL, IL standards and guidelines, IL assessment, and IL education in Singapore.

Definition of Information Literacy
The term information literacy or IL was coined by Paul Zurkowski in the 1970s to bring attention to the needs of people working in the newly emerging technological environment (Kapitzke, 2003). Since then, the concept has been mainly used by information specialists and librarians, and promulgated worldwide through the work of the American Library Association (ALA) and the National Forum for Information Literacy (Feather and Sturges, 2003). However, there is no agreed definition of the term. Some researchers describe IL as requisites to lifelong
learning (Hancock, 1993; Moore, 2002), while others perceive it as a natural extension of the concept of literacy in our society (Bruce, 2002; Stern, 2002). Some have acquainted IL with information technology (Mitchell, 1996), while others have used these interchangeably with library skills (Kuhlthau, 1990).

The 1989 Final Report of the American Library Association’s Presidential Committee on Information Literacy defined an information literate person as one who must be able to recognise the need for information, effectively access, evaluate and creatively use information. Todd (1992) defined IL as “a holistic, interactive learning process encompassing the skills of defining, locating, selecting, organising, presenting, and evaluating information”. Goad (2002) gave a brief definition of IL as “the ability to search for, find, evaluate, and use information from a variety of sources”. Today, equipping one with IL competencies is seen as a move beyond a skills-based approach, especially in response to technological innovations such as Web 2.0 tools, mobile technologies, and cloud computing, and the focus on the acquisition and production of knowledge in collaboration with others (Alexandersson and Limberg, 2003; Lundh and Limberg, 2008; Pawley, 2003; Sundin, 2008; Tuominen, et al., 2005). It is without a doubt that IL is central to this redefinition because information takes on many forms online and is produced and communicated through multiple modalities, formats and platforms.

**Information Literacy Standards and Guidelines**

The landmark publication “Information Power: Building Partnerships for Learning” produced by the American Association of School Librarians (AASL) and Association for Educational Communications and Technology (AECT) (1998) subsequently became the basis for IL standards and guidelines in numerous educational institutions across several countries. The Association of College and Research Libraries (ACRL) extended on the standards and guidelines given in the AASL publication and produced its “Information Literacy Standards for Higher Education” (ACRL, 2000).

Moving away from the United States, the Council of Australian University Librarians (CAUL) adopted the ACRL standards, modified them and developed their own “Information Literacy Standards” for use primarily in higher education although they are applicable to other educational levels (CAUL, 2001). The standards were revised in 2003 and renamed the “Australian and New Zealand Information Literacy Framework”. Similarly, the Society of College, National and University Libraries (SCONUL) in the United Kingdom presented their position paper on “Information skills in higher education” (SCONUL, 1999). The paper proposed the “Seven Pillars Model” based on seven skill sets that stemmed from a basic competence in library and information technology skills.

**Information Literacy Assessment**

With the emergence of standards, comes the need for assessment as a way to measure performance against the standards. The objectives for assessing IL provide the impetus to increase student learning, to provide accountability, as well as to strengthen existing instructional programs (Oakleaf and Kaske, 2009).

McCulley (2009) identified 3 major assessment approaches, i.e. knowledge tests and surveys, performance assessments and informal assessment. Comparatively, knowledge survey
and test is easier to implement and widely adopted for assessing IL skills, as it is less resource-intensive, and the results can be used for comparison at different levels from the individual to institutional (Oakleaf, 2008). Examples include standardized IL tests such as Standardized Assessment of Information Literacy Skills (SAILS), Tool for Real-time Assessment of Information Literacy (TRAILS) and Research Readiness Self-Assessment (RRSA) assessing discrete information literacy skills (Abilock, 2007; Ivanitskaya, DuFord, et al., 2008; Schloman and Gedeon, 2007). These standardized tests allow efficient testing of large number of students and they can be easily adapted for use at other institutions.

Performance assessment, which includes methods such as bibliographic assessment, observation of student behaviour, and simulation, aims to test higher level skills albeit being much more resource intensive (Oakleaf, 2008). This approach uses authentic assessment and helps increase the relevance of IL instruction. Rubrics, which are also frequently used in performance assessment, involves using a set of descriptive scoring schemes to evaluate students’ work, which allows measurement of higher-order thinking and enables students to understand the expectation of their instructors (Helvoort, 2010; Oakleaf, 2008).

Informal assessments are the easiest to incorporate into IL training sessions to assess various domains such as cognitive, affective and behavioural (Radcliff et al., 2007). Classroom assessment techniques, as an example of informal assessment, provide quick snapshots of whether students adequately understood the IL concepts just being presented, which could be used to make clarifications at the time or to make improvements for the future (McCulley, 2009). However, this is also considered as the limitation of informal assessments due to its limited usefulness.

In recent years, the findings derived from various IL assessment studies across the world were somewhat unsatisfactory. Students appear to have strong reliance on Internet search engines for acquiring information, and IL is still an area to be worked on even among digital natives (Johnston, 2010; Koltay, et al., 2010; Ladbrook and Prober, 2011; Salisbury and Karasmanis, 2011; Wilkes and Gurney, 2009). Many researchers have found that not all students have the skills and knowledge to make effective use of information (Bennett, et al., 2008; Cunningham, 2010; Hargittai, 2010; Rowlands et al., 2008). Moreover, only a small portion of students would be able to formulate proper search strategies using Boolean operators, assess the credibility of a source, and differentiate citations and reference sources (Ladbrook and Prober, 2011; Salisbury and Karasmanis, 2011; Toteng, et al., 2011). According to a study conducted in the UK and the US, only half of the faculty members felt that students who have graduated had all the seven IL skills highlighted in the SCONUL assessment (DaCosta, 2010).

IL Education in Singapore

Singapore is a small and young island nation located in Southeast Asia, at the southern tip of Peninsula Malaysia. As a multi-racial and multi-religious society, Singapore is made up of the Chinese (75%), Malays (14%), Indians (9%), and other races (2%). Having gained her independence in 1965, the country has undertaken great strides in industrialization, urban planning and education. The Singapore education system is a very dynamic sector that has evolved continuously over the years, and has been recognized as one of the most successful in the world (McKinsey&Company, 2007; 2010).
Sometime in the 1990s, the School Libraries Unit of the Ministry of Education’s (MOE) Curriculum Planning and Development Division (CPDD) prepared and published a set of Information Literacy Guidelines (ILG) and an Information Literacy Supplementary Materials (ILSM) for use in Singapore schools (MOE, 1997a; 1997b) from the primary school (Grades 1 to 6) right through to secondary school level (Grades 7 to 10). The ILG provided a framework for teaching students how to manage their learning, handle increasing amounts of information (especially with the then recent availability of the Internet), and make novel and creative use of the information obtained (MOE, 1997a). The ILG document also included recommendations on how the IL program could be implemented within the school curriculum in specific subject disciplines, and rubrics for standards of performance in IL.

Another publication, The Extensive Reading and Information Literacy (ERIL) Program was also published in 1997. The focus of the ERIL document was on the incorporation of IL skills in the English Language curriculum at the secondary school level, in particular, with emphasis on reading (MOE, 1997c). The ERIL document provided suggestions on establishing the program, ways of monitoring students’ progress in the program (i.e. post-reading activities and continuous assessment and tests), and the criteria for evaluating the program. However, the integration of IL in the school curriculum was overshadowed by the introduction of information and communication technologies (ICTs) through the implementation of the ICT Masterplans in Education in three phases from 1997 to now (Mokhtar, Foo and Majid, 2007).

In 2008, the Singapore Ministry of Education’s English Unit in the Curriculum Planning and Development Division revamped the syllabus for English Language for both primary and secondary school levels. The revamped syllabus was to be used in schools from 2010 onwards and included information, media and visual literacy skills in listening, reading, viewing, speaking, writing, and representing, through the use of both print and non-print resources. After the short-lived implementation of the ILG, ILSM and ERIL in the school curriculum by the end of the last millennium, IL made a reappearance in the school curriculum after almost a decade. This was seen as a positive move by local IL researchers and activists (Mokhtar, Majid and Foo, 2008).

Around the same time, the National Institute of Education (NIE) published a report on A Teacher Education Model for the 21st Century, abbreviated as the TE21 Model (MOE, 2010a). In the report, it was identified that among the 21st Century skill sets for students are Learning and Innovation Skills, which includes critical thinking, problem solving, and innovation; and Knowledge, Information, Media and Technology Literacy Skills, which lists information literacy and ICT literacy separately. Therefore, it is seen that IL has been recognized as a separate yet necessary component from ICT literacy. IL then becomes a required basic skill set for both teachers and students of the 21st century.

In 2010, a group of researchers from Nanyang Technological University (NTU) proposed a model to help develop IL standards for schools in Singapore (Mokhtar et al., 2010). The model was constructed using existing international IL standards as a guide, and based on the paradigm of a popular information and technology literacy process model known as the Big6 (Eisenberg and Berkowitz, 2009), and steered by related educational initiatives and values-driven education that have been recently implemented in Singapore. The proposed model expounds each of the Big6 categories in terms of Techniques and Tools, and supplements those categories with three important mindsets of Ethics and Social Responsibility, Collaborative Information Behavior, and Attitudes and Perceptions (Figure 1).
Problem Statement

Although IL was introduced in the Singapore school curriculum in the late 1990s, it has somewhat ceded the ground to ICT integration in the school curriculum, largely implemented through the ICT Masterplans 1, 2 and 3 (MOE, 2010b). Although IL competencies have been advocated to be a set of essential life skills by both information science researchers and practitioners alike, grounded pragmatism that ICT skills are more important in embracing nascent new technologies, and hence, the future, has paved the way for the focus to be on ICT skills rather than IL competencies. It was only recently as part of ICT Masterplan 3 (from 2009), that IL has made its way back to the school curriculum. Hence, this research study seeks to find out if Singapore students have achieved the desired level of IL competencies as recommended by information science researchers and practitioners worldwide, for their age group.

Methodology

This section details the development of the survey instrument, sample selection as well as data collection of the research study.

Development of the Survey Instrument

Data for this study was collected through a questionnaire survey. The review of various IL assessment tools revealed that each of them had their own strengths and weaknesses. This explorative study adopted the method of knowledge test and survey, as it is an economical way to
cover larger sample size. Performance assessments can generate more reliable results but they have much higher requirement of resources.

The questionnaire was developed by a team comprising Information Studies and Education faculty members of Nanyang Technological University (NTU) in Singapore. Some instruments used by previous studies were consulted (e.g. SAILS, TRAILS), and the survey contents were carefully analysed and made more relevant to students in Singapore, through a number of focus group discussions. The questionnaire was sent to information literacy experts from Hong Kong, Kuwait and Thailand. Their suggestions regarding the length of the questionnaire and question structure were incorporated in the final questionnaire. It was subsequently pilot-tested with 276 students from two secondary schools in Singapore (Chang et al., 2012). Some improvements were made to the questionnaire based on the feedback received from the students in the pilot group. For example, several longer and complicated questions were deleted, and the language to some questions was simplified in order to minimize the effect of students’ reading and comprehension abilities. The questionnaire contained a raw total score of 50 that was converted to 100% for ease of presentation and analysis of findings.

The questionnaire was divided into three sections. Section 1 had seven questions on demographic information about the participants, their gender, year of birth, level of study, stream of study and use frequency of various libraries.

Section 2 comprised 30 multiple-choice questions to test IL skills using the framework of the Big6 model, including task definition, information seeking strategies, location and access, information use, information synthesis and information evaluation (Table 1). Information ethics (awareness of censorship) and collaborative information seeking were also enclosed as proposed by the 6+3 model (Mokhtar, et al., 2010).

Table 1: Test Areas for IL Skills

<table>
<thead>
<tr>
<th>IL. Skill</th>
<th>No. of Questions</th>
<th>Test Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Task Definition</td>
<td>2</td>
<td>Brainstorming/Defining task</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Research topics &amp; questions</td>
</tr>
<tr>
<td>Information Seeking</td>
<td>4</td>
<td>Seeking expert opinion</td>
</tr>
<tr>
<td>Strategies</td>
<td></td>
<td>Primary vs. secondary info sources</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Appropriate sources of info</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Reference resources</td>
</tr>
<tr>
<td>Location &amp; Access</td>
<td>11</td>
<td>Organization of call numbers</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Roles of reference librarians</td>
</tr>
<tr>
<td></td>
<td></td>
<td>OPAC</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Using index of a book</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Narrowing search results</td>
</tr>
</tbody>
</table>
Section 3 gathered demographic information about students’ home backgrounds, such as their parents’ highest qualifications, type of dwelling, ownership of personal computer, and Internet access at home.

Questions for testing IL skills were weighted differently according to their perceived difficulty levels. The majority of questions had only one correct answer. Correct answers to these questions earn full marks. There were also seven questions with more than one correct answer. For questions such as these, the best answer was assigned a higher mark while the 2nd (and 3rd) best answer(s) was/were allocated lower marks. For example, there was a question asking about the authoritative reference resource to be used to find out which football team won the World Cup in 1970. For this, 3 points were allocated to the best answer “almanac”, and 1 point was given to the answer “encyclopaedia”.

Sample Selection

According to the data provided by Ministry of Education (MOE), Singapore, there were a total of 167 secondary schools in Singapore with 146,644 students in 2009. Among the schools, the majority (124) were government schools with 108,766 students; 32 were government-aided schools with 31,651 students; and the rest of the 11 were independent schools with 6227 students.

With consideration of both school types and number of students, two independent schools, seven government-aided schools and 32 government founded schools were randomly selected.
Some 31,467 students from 41 schools were recruited as the sample for this study, representing 24.55% of the secondary schools and 21.46% of the students in Singapore.

Data Collection

The data was collected through SurveyMonkey, an online survey platform. In August 2010, an invitation letter stating the purpose of the survey was sent to principles of the 41 schools. Eight schools including 6 government schools and 2 government-aided schools agreed to participate in the study. This represents a response rate of 19.51%. The survey closed at the end of November where a total of 3,164 survey returns were obtained and analysed using Statistical Package for the Social Sciences (SPSS) 16.0.

Analysis Results

This section presents results from the data analysis.

Students’ Profile

Among the 3,164 students who participated in the study, 782 (24.7%) were from government-aided schools, and 2,382 (75.3%) were from government schools. The majority (2,999 or 94.8%) were born between 1995 and 1997, and the remaining 165 (5.2%) were born in 1994 or earlier. Some 1,734 (54.8%) students were male while 1,430 (45.2%) were female. The respondents’ year of study is shown in Figure 2.

![Figure 2: Respondents’ Year of Study](image_url)

Secondary Education in Singapore places students in the Special, Express, Normal (Academic) or Normal (Technical) course according to how they perform at the Primary School Leaving Examination or PSLE (MOE, 2012). The different curricular emphases are designed to match their learning abilities and interests. Figure 5 shows the respondents’ stream of study.

Students were asked their frequency of visiting and using resources in various libraries. The results are shown in Tables 2 and 3 respectively. These show that more than 40% of the
students rarely visited and used resources in their school libraries as well as public libraries, and more than 50% of them have never visited or used other libraries such as the National Library.

Table 2: Frequencies of Visiting Various Libraries

<table>
<thead>
<tr>
<th>Library</th>
<th>Missing</th>
<th>Daily</th>
<th>2-3 times a week</th>
<th>Weekly</th>
<th>2-3 times a month</th>
<th>Rarely</th>
<th>Never</th>
</tr>
</thead>
<tbody>
<tr>
<td>School</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>32</td>
<td>118</td>
<td>333</td>
<td>298</td>
<td>557</td>
<td>1501</td>
<td>325</td>
</tr>
<tr>
<td></td>
<td>(1.0%)</td>
<td>(3.7%)</td>
<td>(10.5%)</td>
<td>(9.4%)</td>
<td>(17.6%)</td>
<td>(47.4%)</td>
<td>(10.3%)</td>
</tr>
<tr>
<td>Public</td>
<td>51</td>
<td>61</td>
<td>214</td>
<td>407</td>
<td>864</td>
<td>1277</td>
<td>290</td>
</tr>
<tr>
<td></td>
<td>(1.6%)</td>
<td>(1.9%)</td>
<td>(6.8%)</td>
<td>(12.9%)</td>
<td>(27.3%)</td>
<td>(40.4%)</td>
<td>(9.2%)</td>
</tr>
<tr>
<td>Other</td>
<td>99</td>
<td>20</td>
<td>45</td>
<td>76</td>
<td>192</td>
<td>1044</td>
<td>1688</td>
</tr>
<tr>
<td></td>
<td>(3.1%)</td>
<td>(0.6%)</td>
<td>(1.4%)</td>
<td>(2.4%)</td>
<td>(6.1%)</td>
<td>(33.0%)</td>
<td>(53.4%)</td>
</tr>
</tbody>
</table>

Table 3: Frequencies of Using Resources in Various Libraries

<table>
<thead>
<tr>
<th>Library</th>
<th>Missing</th>
<th>Daily</th>
<th>2-3 times a week</th>
<th>Weekly</th>
<th>2-3 times a month</th>
<th>Rarely</th>
<th>Never</th>
</tr>
</thead>
<tbody>
<tr>
<td>School</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>0</td>
<td>85</td>
<td>244</td>
<td>252</td>
<td>515</td>
<td>1431</td>
<td>637</td>
</tr>
<tr>
<td></td>
<td>(2.7%)</td>
<td>(7.7%)</td>
<td>(8.0%)</td>
<td>(16.3%)</td>
<td>(45.2%)</td>
<td>(20.1%)</td>
<td></td>
</tr>
<tr>
<td>Public</td>
<td>0</td>
<td>63</td>
<td>192</td>
<td>320</td>
<td>704</td>
<td>1333</td>
<td>552</td>
</tr>
<tr>
<td></td>
<td>(2.0%)</td>
<td>(6.1%)</td>
<td>(10.1%)</td>
<td>(22.3%)</td>
<td>(42.1%)</td>
<td>(17.4%)</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>0</td>
<td>24</td>
<td>56</td>
<td>96</td>
<td>200</td>
<td>988</td>
<td>1800</td>
</tr>
<tr>
<td></td>
<td>(0.8%)</td>
<td>(1.8%)</td>
<td>(3.0%)</td>
<td>(6.3%)</td>
<td>(31.2%)</td>
<td>(56.9%)</td>
<td></td>
</tr>
</tbody>
</table>

Students’ Family Profile

Students were asked about their parents’ highest qualifications. More than 20% of parents had secondary (GCE ‘O’ level) as their highest qualifications, followed by university (father: 16.2%, mother: 13.0%), primary (father: 13.9%, mother: 14.3%) and diploma certification (father: 12.8%, mother: 11.8%).

Some 1,086 (34.3%) of the students were living in 4-room flats or public housing apartments constructed by the government’s Housing Development Board (HDB), followed by HDB 5-room (21.7%), 3-room (15.5%) and condominium (10.5%). A small portion of students stayed in HDB 1 or 2 room flats (4.3%) or landed properties (7.9%). About 76.8% of the students (2,429 students) owned a personal computer, and 93.5% of them (2957) had Internet access at home.

Assessment of Information Literacy Skills

All the 6 aspects of information literacy skills covered by the Big6 model were tested through multiple choice questions. As mentioned earlier, the questions were weighted differently according to their difficulty levels, and some questions had more than one correct answer. Figure
Figure 3: Histogram of Standardized Percentage Score for IL Skills
Table 4: Standardized Percentage Score for each IL Skill

<table>
<thead>
<tr>
<th>Skill</th>
<th>Mean</th>
<th>Min</th>
<th>Max</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Task Definition</td>
<td>62.24</td>
<td>0.00</td>
<td>100.00</td>
<td>32.86</td>
</tr>
<tr>
<td>Information Seeking Strategies</td>
<td>45.03</td>
<td>0.00</td>
<td>100.00</td>
<td>24.36</td>
</tr>
<tr>
<td>Location &amp; Access</td>
<td>34.67</td>
<td>0.00</td>
<td>94.87</td>
<td>14.73</td>
</tr>
<tr>
<td>Information Use</td>
<td>37.03</td>
<td>0.00</td>
<td>100.00</td>
<td>21.25</td>
</tr>
<tr>
<td>Information Synthesis</td>
<td>29.68</td>
<td>0.00</td>
<td>100.00</td>
<td>34.02</td>
</tr>
<tr>
<td>Information Evaluation</td>
<td>34.49</td>
<td>0.00</td>
<td>100.00</td>
<td>25.75</td>
</tr>
</tbody>
</table>

Female students were found to score slightly higher than male students (39.35 vs. 38.18). Students’ level of study was not found to be a factor influencing their level of IL skills. The mean percentage scores for students in Secondary 1, 2 and 3 were 37.84, 39.22 and 39.08 respectively. However, the stream of study was found to have significant impact on students’ IL scores (Figure 4). Students from the “Express” stream scored higher than students from “Normal Academic” and “Normal Technical”. Further analysis showed that the differences were significantly caused by skills related to “task definition”, “information seeking”, “location & access” and “information use” (Figure 5).

Figure 4: The Impact of Stream of Study on Students’ Total IL Scores
Students from government-aided schools scored higher than those from government schools (70.78 vs. 63.58) with the difference found to be significant. Further analysis showed “information seeking”, “location & access”, “information synthesis” and “information evaluation” contribute significantly to the difference at the 0.01 level (Table 5).

Table 5: Comparison of Specific IL Scores between Students from Government-aided and Government Schools

<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Government-Aided</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>N=782</td>
<td>67.07</td>
<td>50.97</td>
<td>38.60</td>
<td>43.22</td>
<td>30.95</td>
<td>34.27</td>
</tr>
<tr>
<td>Government</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>N=2382</td>
<td>60.65</td>
<td>43.08</td>
<td>33.38</td>
<td>35.00</td>
<td>29.26</td>
<td>34.56</td>
</tr>
<tr>
<td>Significant</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
</tbody>
</table>

Figure 5: The Impact of Stream of Study on Students’ Specific IL Scores
The parents’ highest qualifications were re-categorized as “PSLE & below”, “pre-tertiary” and “tertiary” respectively for analysis. Arising from this, they were both found to have significant impact on their child’s IL scores (Figure 6). In other words, the higher the parents’ qualifications, the higher IL scores their children were likely to obtain. Further analysis showed that only father’s highest qualification had significant impact on child’s skills related to “information seeking”, “location & access” and “information use”. The mother’s highest qualification had no significant impact on each specific IL skill of the child.

![Figure 6: The Impact of Father’s and Mother’s Highest Qualifications on Students’ Total IL Scores](image)

It was also noted that “type of dwelling” had significant impact on students’ total IL score. The more affluent the type of dwelling, the higher the IL score they were likely to obtain (Figure 7). For specific IL skills, significant impact was detected for those related to “information seeking”, “location & access” and “information use” (Figure 8).

![Figure 7: The Impact of Dwelling Type on Students’ Total IL Scores](image)
It was found that owning a personal computer did not have significant impact on students’ IL skills. However, having Internet access at home makes a difference. Students with Internet access at home scored significantly higher, especially for skills related to “information seeking”, “location & access” and “information use”.

Information Ethics and Collaborative Information Seeking

Two questions were asked respectively to test students’ knowledge about information ethics (awareness of censorship) and collaborative information seeking. The standardized mean percentage scores for the two types of schools and the study population are shown in Table 6. As in the test scores for IL skills, students from government-aided schools scored significantly higher than those from government schools. Among the rest of the demographic variables, only the “stream of study” was found to have significant impact on students’ awareness of censorship and collaborative information seeking.
Table 6: Standardized Mean Percentage Scores for Awareness of Censorship and Collaborative Information Seeking

<table>
<thead>
<tr>
<th></th>
<th>Government-Aided</th>
<th>Government Population</th>
<th>Study Population</th>
</tr>
</thead>
<tbody>
<tr>
<td>Awareness of Censorship</td>
<td>41.43</td>
<td>37.34</td>
<td>34.96</td>
</tr>
<tr>
<td>Collaborative Information Seeking</td>
<td>37.34</td>
<td>27.16</td>
<td>29.68</td>
</tr>
</tbody>
</table>

The last question asked students whether they would consult several potential human information sources to complete the information tasks covered by the Big6 model (Table 7). Around 30% of the responding students would consult their peers (classmates), friends and teachers; about 20% of them would ask for help from their family; approximately 10% of them would contact librarians or others with common interest. There were also less than 10% of students who did not consult anyone, and another 10% of students who did not conduct the listed tasks.

Table 7: Consultation of Human Information Sources for Completing Information Tasks

<table>
<thead>
<tr>
<th>Information Task</th>
<th>Peers (Classmates)</th>
<th>Friends</th>
<th>Family</th>
<th>Teachers</th>
<th>Librarians</th>
<th>Others with common interest</th>
<th>I don’t consult anyone</th>
<th>I don’t do this task</th>
</tr>
</thead>
<tbody>
<tr>
<td>Define the research topic &amp; scope</td>
<td>927</td>
<td>1096</td>
<td>705</td>
<td>1056</td>
<td>436</td>
<td>383</td>
<td>306</td>
<td>345</td>
</tr>
<tr>
<td></td>
<td>(29.3%)</td>
<td>(34.6%)</td>
<td>(22.3%)</td>
<td>(33.4%)</td>
<td>(13.8%)</td>
<td>(12.1%)</td>
<td>(9.7%)</td>
<td>(10.9%)</td>
</tr>
<tr>
<td>Identify potential sources of relevant information</td>
<td>894</td>
<td>1063</td>
<td>849</td>
<td>984</td>
<td>472</td>
<td>361</td>
<td>293</td>
<td>319</td>
</tr>
<tr>
<td></td>
<td>(28.3%)</td>
<td>(33.6%)</td>
<td>(25.8%)</td>
<td>(31.1%)</td>
<td>(14.9%)</td>
<td>(11.4%)</td>
<td>(9.3%)</td>
<td>(10.1%)</td>
</tr>
<tr>
<td>Formulate search strategy, statements &amp; retrieve information</td>
<td>893</td>
<td>1100</td>
<td>772</td>
<td>1089</td>
<td>372</td>
<td>340</td>
<td>296</td>
<td>328</td>
</tr>
<tr>
<td></td>
<td>(28.2%)</td>
<td>(34.8%)</td>
<td>(24.4%)</td>
<td>(34.4%)</td>
<td>(11.8%)</td>
<td>(10.7%)</td>
<td>(9.4%)</td>
<td>(10.4%)</td>
</tr>
<tr>
<td>Analyze quality of retrieved information &amp; select relevant information for use</td>
<td>1208</td>
<td>1175</td>
<td>808</td>
<td>1016</td>
<td>429</td>
<td>388</td>
<td>271</td>
<td>372</td>
</tr>
<tr>
<td></td>
<td>(38.2%)</td>
<td>(37.1%)</td>
<td>(25.5%)</td>
<td>(32.1%)</td>
<td>(13.5%)</td>
<td>(12.3%)</td>
<td>(8.6%)</td>
<td>(11.8%)</td>
</tr>
<tr>
<td>Organize, compile, finalize &amp; present answer to research topic</td>
<td>1040</td>
<td>1311</td>
<td>746</td>
<td>946</td>
<td>331</td>
<td>326</td>
<td>269</td>
<td>291</td>
</tr>
<tr>
<td></td>
<td>(32.9%)</td>
<td>(41.4%)</td>
<td>(23.6%)</td>
<td>(29.9%)</td>
<td>(10.5%)</td>
<td>(10.3%)</td>
<td>(8.5%)</td>
<td>(9.2%)</td>
</tr>
<tr>
<td>Evaluate the completed product &amp; process of information seeking</td>
<td>890</td>
<td>1019</td>
<td>793</td>
<td>1023</td>
<td>402</td>
<td>330</td>
<td>289</td>
<td>341</td>
</tr>
<tr>
<td></td>
<td>(28.1%)</td>
<td>(32.2%)</td>
<td>(25.1%)</td>
<td>(32.5%)</td>
<td>(12.7%)</td>
<td>(10.4%)</td>
<td>(5.1%)</td>
<td>(10.8%)</td>
</tr>
</tbody>
</table>

Discussion

It was a matter of concern that more than 40% of the students rarely visited and used resources in various kinds of libraries including their school libraries, and less than 15% of students would consult librarians while conducting information tasks. It could be due to that the current resources in the libraries were not relevant or only partially relevant to the students’ information
needs and that promotion and outreach efforts of these libraries were lacking to encourage higher use of information resources in the library.

The amount of literature on the role and importance of school libraries worldwide is quite substantial, and the majority of schools now regard the school library as an integral learning centre, especially in developed countries such as United States (e.g. Rodney, et al., 2003; Manzo, 2000), Canada (e.g. Bishop and Larimer, 1999; Oberg, 1995), Australia (e.g. Ward, 2010) and Singapore (e.g. Mokhtar and Majid, 2005). Foo (1999) emphasized the critical and crucial role the school library played in “supporting the new age education”, which is even more important in the new millennium when the nation (Singapore) propels itself towards a “truly information society”. He also recommended that adequate attention should be placed on school libraries so as to ensure that they had sufficient staff, resources and opportunities for growth and expansion.

However, school libraries or school media resource centres have long been underused and detached from students’ learning environment (Mokhtar and Majid, 2005). In addition, librarians traditionally have little contact with teachers and their classroom objectives, except to locate books and other reference materials, or baby-sit students who use the library (Manzo, 1997). Moreover, it was found that Singapore school libraries did not have full-time professionally trained librarians. Instead, the Heads of Department for IT were in charge of the school library, and more than three-fifths of them were even without any professional library training (Majid, et al., 2002).

To address the under-utilization of school libraries, school management should develop a comprehensive program, ensuring that the library is well-stocked with resources, well-staffed by professional school librarians and well-integrated into the school curriculum (Rodney, et al., 2003). In addition, the school librarians should involve teachers in developing and evaluating the school library collection, which may help minimise or even eliminate perceptions of the inadequacy of library collection, services and facilities. However, it has been found that teachers tend to feel that their respective subject department’s resources or personal collections of teaching materials were sufficient to plan lessons and other learning activities, thus discounting the role of the school librarians (Mokhtar and Majid, 2006).

IL standards proposed by previous studies had mostly assumed that the information search process is done at an individual level only. However, with the proliferation of the World Wide Web (WWW) and more recently the implementation of Web 2.0, information seeking has taken on a more interactive (Grabinger and Dunlap, 1995) or collaborative characteristic. Research also shows that collaborative information seeking was expected to achieve superior search outcomes, and students’ search behaviors were assumed to show higher proportions of self-regulatory activities (Lazonder, 2005). According to the results obtained from this study, students’ awareness of collaborative information seeking was found to be affected by their school type and stream of study. Principals and teachers from schools or classes with lower scores may want to instill a better learning culture encouraging collaboration and teamwork.

In terms of IL skills, the results were generally unsatisfactory. The findings show that among the six aspects of IL skills categories, with the exception of “task definition”, all the other skills recorded a score below 50/100. The mean score of skills for synthesizing information was even below 30/100. Based on the results of analysis, recommendations were given for skills with score lower than 50/100.
“Task definition” registered the highest score among the 6 dimensions of the Big6 IL skills. In other words, students were found to be most adept at this aspect. This may suggest that the current education system was competent in imparting students with problem identification skills. Differences due to types of schools and streams of study implied some inherent bias in competency across schools/streams in cultivating this area.

For skills related to “information seeking strategies”, “location & access” and “information use”, besides the differences in types of schools and streams of study, students’ family background (parents’ highest qualifications, type of dwellings and availability of Internet access) had significant influences. Students with highly educated parents living in more affluent conditions imply that they are positioned higher in the social capital ladder with better and more opportunities to access a wider range of information resources through acquisition or subscription. Easy and availability of Internet access in a conducive environment at home may also mean that they have more time and opportunities in engaging in more information seeking activities, hence the greater awareness and proficiency in seeking, accessing and using information. To improve students’ information searching skills, the schools should build into the curriculum the introduction of different forms of information sources to reduce any inequality arising from students’ family background, and at the same time, dialogue with parents to uncover difficulties the students may encounter in identifying, accessing and using various information sources at home.

“Information synthesis” and “information evaluation” were the two with lowest scores. This may point to a gap in IL education in schools, where there may be a lack of emphasis in these areas. Probably these could be covered earlier in students’ educational pathway, beginning at the primary school level. In addition, information synthesis and evaluation would generally require higher order thinking skills which are much more difficult to teach well in a mass setting in schools. Other forms of pedagogy, such as small group teaching along with individual mentoring or coaching, and teacher-librarian collaborative teaching, may be potential ways to improve this aspect of learning and honing the IL competencies in these areas (Chu, et al., 2011; Kuhlthau, et al., 2007; Mokhtar, et al., 2007).

In terms of limitations, we acknowledge that our study findings cannot be fully generalized due to the limited number of schools which participated in this study. Moreover, as there were uneven numbers of questions for different aspects of IL skills in the instrument, there is a scope to review the number and range of difficulty of questions for each IL skill to further enhance the accuracy of measurement.

Conclusion
Enhancing and developing a strong foundation of IL skills in the education system is critical for the next generation to remain competitive in a globalized and interconnected world of information. The use of information at work is regarded as central to the notion of a knowledge economy (Catts and Lau, 2008). Moreover, information literate individuals would be able to navigate across all facets of information from various sources, which will create a more self-sustaining, caring, compassionate, and active population for the future.

This paper reports the first comprehensive study assessing IL skills of Singapore secondary school students. The data was collected using a 44-item questionnaire based on the
6+3 IL model developed by the researchers in 2010. It was found that overall IL skills among the surveyed students were quite low. For individual IL activities, the highest was observed for “task definition” and the lowest for “information synthesis”. A set of correlations was found between “information seeking strategies”, “location & access” and “information use” and the types of schools, streams of study and students’ family background.

Subsequently, in the Ministry of Education work plan seminar in September 2011, the Minister mentioned this study in his presentation and stressed that information literacy should be considered one of the higher intellectual domains for implementing a value-driven education system (Heng, 2011). He also emphasized the need to fully integrate information literacy skills into the curriculum to help students understand the application of such skills. Thereafter, some major findings of this study were also covered by the local media which attracted the attention of the general public as well as other stakeholders (Ng, 2011).

Arising of this awareness, we are currently working closely with relevant government agencies to develop a comprehensive IL framework for enhancing IL skills of students. Part of the framework involves developing a more robust 6+3 IL model and proposing an IL curriculum for primary to pre-tertiary students. Along with the IL curriculum, three sets of survey instruments (for primary, secondary and pre-tertiary students) will also be developed to support a longitudinal assessment of IL skills across all schools in Singapore.

In the longer run, it is hoped that the sets of IL curriculum and survey instruments could be used as an IL benchmarking tool for teachers and students across Southeast Asia. The developers will identify generic and specific questions in the questionnaires, and provide guidelines on how to customize the questions to suit local contexts and requirements while preserving the focus of the questionnaires and their corresponding measurement scales so as to enable cross comparison studies to take place in the future.

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