ASSESSMENT OF STUDENTS' INFORMATION LITEARCY: A CASE STUDY OF A SECONDARY SCHOOL IN HONG KONG

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INTRODUCTION

The conceptions of learning have undergone fundamental changes in recent years. The learning processes have shifted their focus to learners' understanding and application of knowledge (Riedler & Eryaman, 2010) to become critical thinkers and lifelong learners (Candy, 2002; Wong, 2010). These changes have made information literacy become an important educational mission, which aims to equip students for effective academic investigation and career development in the future (Owusu-Ansah, 2004). Information literacy, being one of the essential abilities necessary to students in the 21st century, is a set of abilities requiring individuals to "recognize when information is needed and have the ability to locate, evaluate, and use effectively the needed information" (American Library Association, 1989, p.1). Although many studies examined students' information literacy (Emmett & Emde, 2007; Green & Bowser, 2006; Maughan, 2001; Samson & Millet, 2003; Sharma, 2007), little focused on research about the students in Hong Kong. The Education Bureau of the Government of the Hong Kong Special Administrative Region has integrated inquiry project-based learning in the curriculum (Chu et al., 2012) which has high demand on information literacy (Chu, Tse, & Chow, 2011), and implemented liberal studies as one of the core subjects in the secondary schools. It is significant to assess to what extent the secondary school students possess adequate information literacy. The findings of the study will potentially contribute to the better understanding of students' current level of information literacy, and hence provide insights on how to further develop their knowledge and skills in this aspect.

LITERATURE REVIEW

Information Literacy

Information literacy, being described as a prerequisite for lifelong learning (Bundy,

2004), has become increasingly significant in teaching and learning. It is summarized as an ability to make efficient and effective use of information resources (Case, 2007; Leckie & Fullerton, 1999). And it is related to having appropriate information behavior (Case, 2007) as well as mastering certain specific skills (Allen, 2007). In recent years, the educators have been advocating the integration of the teaching of information literacy in the curriculum (Kuhlthau, 2004b; Scott & O'Sullivan, 2005). Julien & Barker (2009) claimed that students who mastered advanced information literacy had better performance in their academic result. However, several research projects showed that students from primary to postgraduate levels were lack of competence in information literacy (Branch, 2003; Chu, 2009; Chu & Law, 2005, 2007; Schacter, Chung, & Dorr, 1998).

Information Literacy Assessment

Assessment of students' information literacy has become necessary as it narrows the gap between the information literacy curriculum and actual teaching practice, learning and assessment (Johnston & Webber, 2003). There have been a wide range of methods to assess information literacy. Multiple choice questionnaire (Houlson, 2007; Riddle & Hartman, 2000; Samson & Millet, 2003) is the most popular assessment method adopted by the researchers (Walsh, 2009). Other methods include analysis of bibliographies (Green & Bowser, 2006), quiz and test (Emmett & Emde, 2007), self-assessment (Maughan, 2001), portfolio (Sharma, 2007), essay (Nutefall, 2005), observation (Dunn, 2002), simulation (Roberts, 2004) and final grades (Samson & Granath, 2004). Some of the research projects have adopted a mixed methods research design (Samson & Granath, 2004). Walsh (2009) claimed that the fundamental decision of assessment tools design depended on balancing the information needs and accurately assessing the varied transferable skills.

Some researchers have employed different theoretical framework to assess different aspects of students' information literacy. Lindauer (2004) argued that we had to look into three areas for assessment and improvement: learning environment, information literacy program components and student learning outcomes. Oakleaf (2009) demonstrated that an information literacy instruction assessment cycle served as a conceptual framework was effective to guide and diagnose information literacy. But more importantly many projects have adopted ACRL (Association of College and Research Libraries, 2000) and TRAILS (Tool for Real-time Assessment of Information Literacy Skills) (2004) as standards to do information literacy assessment for higher education students and high school students respectively (Burhanna & Jensen, 2006; Emmett & Emde, 2007; Ferguson, Neely, & Sullivan, 2006; Schloman

& Gedeon, 2007) to show the reliability and validity of the methods. The results of the assessments are significant to provide empirical evidence to educators to identify the students' current level of information literacy and are applicable to the enhancement of information literacy instruction design and pedagogical approach (Dunaway & Orblych, 2011; Oakleaf, 2009).

Inquiry Project-based Learning

Inquiry project-based learning has become a new focus in the pedagogical approach in education. It emphasizes critical thinking and questioning and in-depth project research adopted through inquiry-based learning (Harada & Yoshina, 2004). Several research projects showed that this approach had more effective learning outcomes than traditional learning approach (Guthrie et al., 2004; Hmelo-Silver, Duncan, & Chinn, 2007; Langer, 2001; Lynch, Kuipers, Pyke, & Szesze, 2005; Wu & Tsai, 2005). And the demand for information literacy in inquiry project-based learning is high (Chu, Tse, & Chow, 2011).

The Education Bureau of the Government of the Hong Kong Special Administrative Region has implemented liberal studies in the secondary schools since 2009, and integrated inquiry project-based learning in the curriculum (Curriculum Development Council, 2001). An Information Literacy Framework for Hong Kong Students (IL Framework) has been outlined which aims to enable students to master information literacy; become a reflective learner and independent learner for lifelong learning; and empower student having autonomy and social responsibility (Education and Manpower Bureau, 2005). The senior secondary school students have to complete their liberal studies projects for school-based assessment in the Hong Kong Diploma of Secondary Education Examination. Therefore it is deemed essential for students to acquire information literacy from junior level for better preparation.
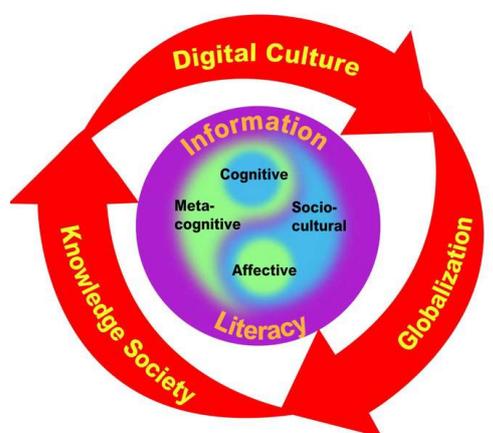
THEORETICAL FRAMEWORK

In this study, TRAILS is applied and related to Kuhlthau's Information Search Process (ISP) and Information Literacy Framework for Hong Kong Students (IL Framework) (Education and Manpower Bureau, 2005) to form a theoretical framework to assess students' information literacy. The belief introduction is as follows:

TRAILS

TRAILS (2004) is an online assessment tool for information literacy. It adopts multiple-choice questions to measure high school students' information literacy competencies based on the Ohio Academic Content Standards and Information Power:

Building Partnerships for Learning (Schloman & Gedeon, 2007). There are five main aspects of TRAILS: (a) develop topics, (b) identify potential sources, (c) develop, use, revise search strategies, (d) evaluate sources and information, and (e) recognize the use of information ethically.

Information Search Process

Information Search Process (ISP) (Kuhlthau, 2004a) refers to the action and process by which information is searched through six stages: initiation, selection, exploration, formulation, collection and presentation with the reactions of three tasks: feelings (affective), thoughts (cognitive), and actions (physical), as well as the zones of intervention (see Figure 1). It does not focus on search techniques but highlight the change of the state of mind from uncertainty to clarity and increased interest. With the guidance and assistance provided by the educators in the zones of intervention, the students can accomplish their tasks with better performance.

Figure 1: Information Search Process (Kuhlthau, 2004a)

(Kuhlthau, 2004)

Information Literacy Framework for Hong Kong Students

Information Literacy Framework for Hong Kong (IL Framework) (Education and Manpower Bureau, 2005) outlines the rationale of the information literacy development in primary and secondary schools of Hong Kong and provides a conceptual model about information literacy emphasizing four dimensions: cognitive, meta-cognitive, affective, and socio-cultural under the circumstances of globalization, knowledge society and digital culture (see Figure 2). The four dimensions can be mapped with 31 indicators to show the anticipated students' learning outcomes in four levels. The first level equals to the stage of Primary One to Three; the second level is the stage of Primary Four to Six; the third level is the stage of Secondary One to Three; and the fourth level is the stage of Secondary Four and above.

Figure 2: Information Literacy Framework (Education and Manpower Bureau, 2005)

To simplify the theoretical frameworks, the five aspects of TRAILS represent the stages of the process, the tasks of ISP and dimensions of IL Framework are integrated as five behavioral factors: 'affective feeling' means attitude, feeling, motivation and values generated during the ISP; 'cognitive thoughts' represents applying the located information in problem solving; 'meta-cognitive' means showing the ability being a reflective learner and project planner; 'physical action' is actual actions done across the ISP; and 'socio-cultural' means sharing knowledge with other, and taking social responsibility during ISP. But it is important to note that the information seeking process is not in a linear format. It is in a cyclic format. This framework is applied in this study to assess and diagnose students' information literacy in the context of their inquiry group project-based learning. It is shown in Figure 3.

Figure 3: The Theoretical Framework
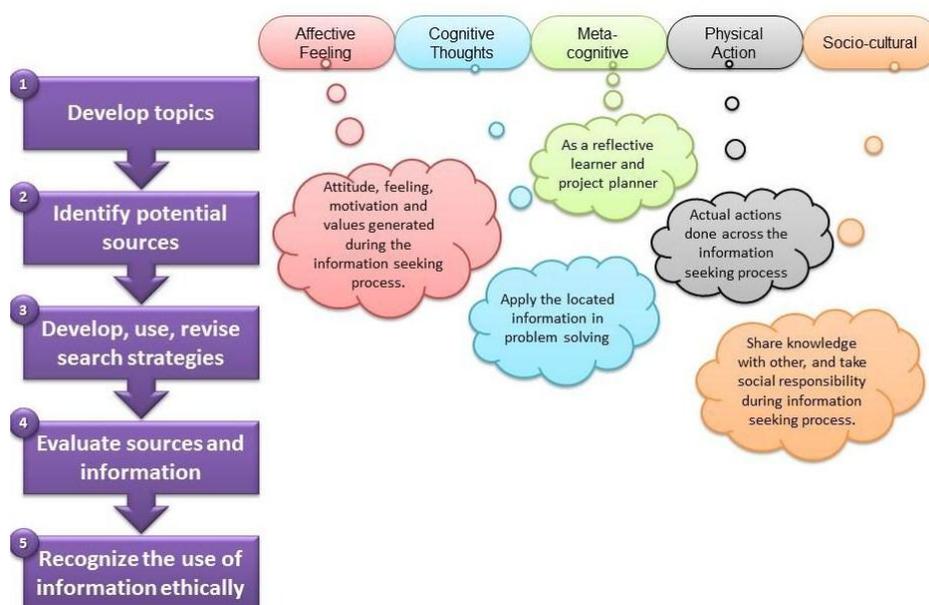
METHODOLOGY

This study adopted a mixed methods research design, combining both quantitative and qualitative methods. The research included survey, interviews and document analysis of students' group projects. The study group consists of 176 Secondary One students in the academic year 2010-11 of a local public school in Hong Kong.

To evaluate students' skills in information literacy, an information literacy test with 15 multiple-choice questions set according to TRAILS (2004) was done by 176 students. Their test results were analyzed by SPSS.

Four Face-to-face focus group interviews with 17 students in total, and face-to-face interview with 1 subject teacher were conducted to further document their knowledge and attitude towards information literacy during their inquiry group project-based learning. The content of students and teacher interviews was analyzed by NVivo. The themes of interview questions are:

1. Among the five aspects of information literacy of TRAILS, which are the most challenging to students?
2. How do students go through Kuhlthau's information search process (ISP) when undertaking their inquiry group project-based learning?
3. What are the factors that have helped the students to equip and enhance their information literacy?
4. To what extent are the students able to use information source properly and ethically?

To gain better understanding to students' information literacy skills in terms of using the information sources properly and ethically, 15 group projects done by students were examined by Small SEO Tools (SmallSEOTools.com, 2010), which is an online free plagiarism checker supporting both English and Chinese text with uniqueness indicator. As the students' group projects were posted on Google Sites, the accuracy of the uniqueness indicator might be affected. There was a further examination of each project done by the author. Five sections of the group projects were checked: background of study, literature review, design and methodology, findings, data analysis and discussion, conclusion, limitations and suggestions. The results showed how students cited information in their projects and whether they have committed plagiarism.

FINDINGS AND DISCUSSION
The Students' Learning Outcomes for Information Literacy

The judgment of students' learning outcomes for information literacy is based on the empirical data of test result, the content analysis of interviews and the examination of group projects. Table 1 showed the results after mapping the majority students' learning outcomes with 31 indicators provided by the IL Framework (Education and Manpower Bureau, 2005). This study found that the students' information literacy was primarily at Level II, which corresponds to the stage of Primary Four to Six. It was one level below the anticipated learning outcomes. This result reflected that the students were lack of competency of information literacy in Level III, which corresponds to the stage of Secondary One to Three. Many students in the interviews explained that they did not have sufficient training in their primary school. They said they did not learn topic development, citation, survey and interview skills when undertaking the projects in primary school level. In fact, the teacher said that they put a lot of effort in the higher secondary level. As a result, it is important to note that the enhancement of information literacy training to students of primary and lower secondary level is significant. It helps strengthen students' basic skills.

In the table, the students got 5 points in Level III. It showed that the students have had progress in the cognitive dimension. The teacher in the interview claimed that the objective of the group projects was to engage students in clarifying topics, sharpening their discussion, hunting for primary source such as interviews and survey, analyze information and present findings. Students' information literacy in the socio-cultural dimension is relatively immature. The students got 2 points in Level I. They said that

they did not share information actively with others due to keen competitions and they found that the citation work was very troublesome and time-consuming. However the teacher said that the students were highly motivated in the inquiry project-based learning.

Table 1: The result of students' information literacy level after mapping the learning outcomes with 31 indicators provided by IL Framework

Dimensions	Level I (P1-3) No. of indicator	Level II (P4-6) No. of indicator	Level III (F1-3) No. of indicator
Cognitive	0	10	4
Meta-cognitive	0	7	0
Affective	0	4	1
Socio-cultural	2	3	0
Total	**2**	**24**	**5**

The Strengths and The Weaknesses of Students' Information Literacy

Table 2 is the result of the information literacy test. It showed that the students did particularly well in identifying potential sources while they did not do so well in using information responsibly and ethically. In the interviews, the students claimed that they were confident in mastering the search skills; for instance, typing keywords in the search engines provided by the portals of Google and Yahoo. The students said that they seek information primarily through internet rather than from other sources such as books, newspapers due to convenience. They hold a perception that what they found in the internet could be freely used and are reliable. For instances, the students believed that the online Wikipedia was objective so that they always cited information from it. However, as Wikipedia is an instant editable online encyclopedia constructed by any web users, it does not have any guarantee authority supported by scholars and professionals.

The students were weak at using sources responsibly and ethically. For instance, the students did not do well in their information literacy test regarding this aspect and they did not cite properly in their group projects. The students in the interviews claimed that they were unfamiliar to citation. Many of them just posted hyperlinks of their mentioned articles in their projects without providing any proper citation. They did not give acknowledgement to authors when using their images and audio-visual materials. Their behaviour showed that they had inadequate knowledge in using information properly. Both students and teacher claimed that they did not pay much attention to it.

Table 2: The test results shows the strengths and weaknesses of students' information literacy

Questions	TRAILS	Secondary One Students' Average	Overall Average	Level of Strengths
Q1	**Aspect C:** Develop, Use, and Revise Search Strategies	55%	59%	Moderate
Q2		88%		
Q3		58%		
Q4		81%		
Q5		13%		
Q6	**Aspect A:** Develop Topic	60%	48.6%	Weakness
Q7		45%		
Q8		41%		
Q9	**Aspect B:** Identify Potential Sources	75%	75.3%	Most Strength
Q10		67%		
Q11		84%		
Q12	**Aspect D:** Evaluate Sources and Information	64%	63%	Strength
Q13		62%		
Q14	**Aspect E:** Recognize how to use information responsibly, ethically, and legally	53%	40.5%	Most Weakness
Q15		28%		

Information Search Process

The model of Information Search Process (ISP) (Kuhlthau, 2004a) emphasized that an individual felt uncertainty and confused at the initiation and selection stage while gradually found clarity, focused and increased interest after formulating topic with useful information. The students in this study shared similar experiences as Kuhlthau's Information Search Process during their inquiry project-based learning.

However, the students seldom seek help from teacher and the teacher seldom approach students. In the interviews, the students said that their priorities of supporters were group mates, teacher, parents and then finally librarian. This study reflected that the zones of intervention took part by the teacher and librarian of the school was inadequate. The zone of intervention is a concept proposed by Kuhlthau to ensure that the information professional such as librarian and teacher can involve in different stages to provide support to the students such as helping them develop topics, find relevant information and so on. The teachers and librarians can play important role in the students' information seeking process.

The teacher claimed that his main concern towards students' projects was the progress rather than students' emotional matter. In fact, both students and teacher in the interview claimed that their communication frequency was not abundant. And there was no collaboration in the curriculum between the subject teacher and librarian. The role of the librarian was entirely unclear and hidden.

Information Literacy Enhancement

This study found that there were much room to enhance students' information literacy. In the interview, the students claimed that they learned a lot about WiseNews and the social bookmarking web service Delicious in Secondary One in the academic year 2010-2011, and citation and searching truncation after attending the instruction class conducted in Secondary Two in the academic year 2011-2012. The students said they would apply their newly equipped information literacy skills to complete their Secondary Two group projects. The teacher said that the instruction class was insufficient because of the lack of teaching hours for training and practice, and he believed that the educators should sow seeds when students started doing projects in their primary schools. The students also complained that the school library was small, the books were old, the opening hours of library and computer lab were short, facilities were inadequate, and WiseNews which installed in school was unable to access at home. The collaborative teaching in the curriculum has positive impact to the learning process of the students (Chu, Tse, & Chow, 2011). This study reflected that there was an opportunity for the school principal to re-allocate library resources to enhance students' information literacy. For instances, the ways of improvement include enhancing information literacy training, strengthening the role of the librarian and having more collaboration between subject teacher and librarian, and providing more library resources to support students' project such as longer library opening hours and upgrading computer facilities.

Using Source Properly and Ethically

Using source properly and ethically is the weakest skill of the students towards information literacy. Table 3 is the result of the actual practices of using information found in 15 students' group projects. Eleven of them have offended different degree of plagiarism, for instances they copied others' works in terms of text, images and both. The students to a certain extent are allowed copying others' works to support their view points, but they have to give acknowledgement to the original authors. The proper ways are to have identified quoted materials, provide sources clearly and immediately after the quoted materials. The sources should list the name(s) of the authors(s), the title, the date of publication and the page reference (The University of Hong Kong, 2002). The teacher explained that the students did not understand what plagiarism was and they were lack of training. He found that the students, who are not fluent in the language used to do the work, were prone to have a habit to copy useful information and graphics from blogs and websites to complete their assignments. The students in the interviews said that they found citation was very troublesome and

time-consuming, and citation seemed to be not a compulsory work required by the teacher. However they said they were eager to learn. Therefore the educators have to increase students' awareness and knowledge of plagiarism.

Table 3: Summary of the actual practice of using information in 15 group projects

Use Information Behaviour	No. of Occasions
No copying others' works	4
Copying others' works in text without proper citation	4
Copying others' works in audio and visual materials like image, graphic, audio and video materials without proper citation	4
Copying others' work in both text, audio and visual materials without proper citation	3

LIMITATIONS

The sample of this study is only one public secondary school, her subject teacher and 176 Secondary One students in the academic year of 2010-11. They might not be generalized to represent other schools and students in Hong Kong. A further research to cover more secondary schools and students is highly recommended. In this study, the data was collected through survey, interviews, and students' group projects. There might be possible to have memory failure and subjective measurement. And this study is focused on the overview of the students' information literacy in terms of the learning outcomes, the strengths and the weaknesses, and the information search process. Other in-depth investigations for instances the plagiarism issue of the secondary school students, the empowerment of students' information literacy after the instructional and training classes might be examined.

CONCLUSION

There are some significant findings in this study. Firstly, the students' information literacy was primarily at Level II, which corresponds to the stage of the level of Primary Four to Six. Although it was one level below the anticipated learning outcomes according to Information Literacy Framework for Hong Kong Students, the result was still reasonable. The students had progress in the cognitive dimension while they needed improvement in socio-cultural dimension. Secondly, the strength of students' information literacy was to identify potential sources while the weakness was to use information responsibly and ethically. Thirdly, the students shared similar experience as stated in Information Search Process from uncertainly to clarity and increased interest, but the zones of intervention took part by teacher and librarian was

inadequate. Fourthly, there were many rooms to enhance students' information literacy such as providing instruction training and library resources support. Fifthly, the students did not use information properly in their group projects. The educators have to increase students' awareness and knowledge of plagiarism. To sum up, the students have to gear up their information literacy.

This study reflected the current level of students' information literacy. The educators can base on this empirical evidence to do further research and sharpen their focus on certain aspects to enhance students' information literacy such as providing instruction class and designing appropriate pedagogical approach. Empowering students' information literacy in the 21st century is one of the significant issues in the education.

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