The Information Search Process of English Language Learner (ELL) Students in a Guided Inquiry Project:
An In-depth Case Study of Two Korean High School Students in the United States

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This study seeks to understand the information-to-knowledge experience of English Language Learner (ELL) students in a Guided Inquiry project undertaken by the librarian and subject teachers. As a pilot study, it provides an in-depth examination of two Korean 11th grade students in a biology class of a high school in New Jersey, U.S. During the project, data were collected through questionnaire, surveys, search journals, search sessions, observation, students' papers, and interviews. The findings of this study will facilitate the understanding on the information seeking and knowledge construction process of ELL students so that school environments, including school libraries, can provide meaningful instructional and service interventions for them.

English Language Learner (ELL), Information Search Process (ISP), Guided Inquiry

Introduction

Immigrants with diverse linguistic and cultural backgrounds have been dramatically increasing in the United States in the last decade. According to the National Clearinghouse for English Language Acquisition (NCELA), total PK-12 enrolment has increased 3.66 % from 1995-96 to 2005-06 in the United States, whereas enrolment of students with limited English proficiency (LEP) has increased 57.17 % during the same period and becomes 10.29 % of the total number of PK-12 enrolment (NCELA, 2007). LEP students are enrolled mainly in large, urban school districts and a quarter of the 100 largest school districts have at least 15% LEP population (NCES, 2002).

The growing number of limited English proficient students has brought significant challenges to education environments, particularly low literacy level of adolescents, low rate of completing high school and providing diverse and meaningful learning experiences. Nationally, only 30 % of all secondary students read proficiently. Eighty-nine percent of

Hispanic and 86 % of African-American secondary students read below grade level (NCES, 2005). Only 4% of eighth-grade LEPs and 20% of former LEPs scored at the proficient or above levels on the reading in the 2005 National Assessment for Educational Progress. This shows that 96% of the eighth-grade LEP students scored below the basic level (Perie, Grigg, & Donahue, 2005). English language learner (ELL) students (31%) are more likely to fail to complete high school than native English speaking (NES) students (10%). Among ELL students, fluent English proficient (FEP) students (51%) show greater rate of completing high school than LEP students (18%) (NCES, 2004). Moreover, research suggests that linguistic and cultural diversity of ELL students strongly influence their learning experience in predominantly two ways. First, they have double of the work of NEPs by learning English at the same time they are studying a subject area through English (Short & Fitzsimmons, 2007) and second, they have different frameworks to interpret information due to their different linguistic and cultural backgrounds (Agosto & Hughes-Hassell, 2007; Agosto, 2001).

However, educational research on ELL students has mainly focused on reading comprehension and writing (Elley, 1991). Fewer studies have been conducted on ELLs at secondary level compared to elementary level (NREL, 2004), with even less focus on language speakers other than Spanish (Short & Fitzsimmons, 2007). Although research in library and information science has recognized the ELL population as a growing user group, it still focuses mainly on material provision especially for Hispanic students and few studies have been conducted on information seeking and use of ELLs in learning contexts.

This study aims to understand the information-to-knowledge experience of ELL students within a library-based research project implemented using a Guided Inquiry framework. Guided Inquiry, which is based on Kuhlthau's Information Search Process (ISP), is the systematic intervention of an instructional team consisting of the school librarian and subject teachers to enable students to construct deep understanding of a self-chosen topic from various information sources through curriculum based inquiry units (Kuhlthau, Maniotes & Caspari, 2007). The ISP model was first developed when Kuhlthau examined high school students' information search process to complete their research project and later verified and generalized through other sequential research (Kuhlthau, 2004). However, it has not been researched in the context of the growing number of ELL students in schools.

Various terms are used identify linguistically and culturally diverse students, including English language learner (ELL), English as a second (foreign or additional) language (ESL, EFL or EAL), limited English proficient (LEP), potentially English proficient (PEP) and language minority/international/immigrant students. The term English as a Second Language, *ESL*, emerged and was commonly used both educationally and linguistically through the 1980s, however the *ELL* has been increasingly preferred because students might be learning English as a third or fourth language (NREL, 2004). In this study, *English language learner (ELL)* is defined as students who speak a language other than English at home, including both LEP and former LEP. *Limited English proficient (LEP)* is defined as ELL students receiving specialized ELL programs without "sufficient mastery of English to meet state standards" (U.S. Department of Education, 2005, p.x), whereas *former LEP* (sometimes known as *fluent English proficient (FEP)*) is defined as ELL students "who have made the transition out of specialized ELL programs and into the regular course of study" (Short & Fitzsimmons, 2007, p. 17).

Theoretical Frameworks

The theoretical frameworks of this study are Vygotsky's Zone of Proximal Development and Kuhlthau's Information Search Process, drawn from education and library and information science. These frameworks reflect a constructivist learning paradigm.

Constructivism is a theory of learning which describes what knowing is and how people learn. It considers human as goal-directed agents who actively construct new knowledge based on their prior experience (Bransford, Brown, & Cocking, 2000). Therefore, while behaviorists view learning as "a process of expanding the behavioral repertoire" (Phillips & Soltis, 1998, p.23), constructivists view it as "a self-regulatory process of struggling with the conflict between existing personal modes of the world and discrepant new insights, constructing new representations and models of reality…" (Fosnot, 2004, p.ix). The essential core of constructivism is that learners actively construct their own knowledge based on prior experience and prior knowledge. This concept is based on subjectivism and relativism assuming that while reality may exist apart from experience, people can know reality only through their unique experiences (Doolittle, 1999) and social reality is socially constructed (Berger & Luckmann, 1966).

Vygotsky's Zone of Proximal Development (ZPD)

While constructivists such as Dewey (1933, 1944), Kelly (1963), Bruner (1973) and Piaget (1952) focused on the individual's inner process of knowledge construction, Vygotsky viewed an individual-in-context participating in an event as a meaningful unit of study rather than focusing on the individual (Miller, 2002). Vygotsky (1978) argued that learners are in a social context and learning occurs through the interactions with or within this social environment, which he called the Zone of Proximal Development. He emphasized that a child's ability should be measured not by his or her product in a certain moment, but by his or her potential ability or the process of change (Miller, 2002). Vygotsky (1978) defined the Zone of Proximal Development as "the distance between the actual developmental level as determined by independent problem solving and the level of potential development as determined through problem solving under adult guidance or in collaboration with more capable peers" (p.86). For example, a child can develop knowledge through the interaction with his or her mother in the Zone of Proximal Development. This interaction may enable the child to solve a problem which he or she cannot deal with alone. Conversely, if there is no help from a more capable person in the Zone of Proximal Development, even a potential child could remain in the existing developmental status.

Kuhlthau's Information Search Process (ISP)

Influenced by constructivists, Dewey, Kelly, and Bruner, Kuhlthau (1991, 2004) developed the Information Search Process (ISP) viewing the information searching process as the process of construction. The ISP identified feelings, thoughts and actions according to users' six information tasks, identified as initiation, selection, exploration, formulation, collection, and presentation, during the information searching process (Figure 1). This model

Tasks	Initiation	Selection	Exploration	Formulation	Collection	Presentation
Feelings (affective)	uncertainty	optimism	confusion/ frustration/ doubt	clarity	sense of direction/ confidence	satisfaction or disappointment
Thoughts (cognitive)	vague ⟶			focused	increased interest ⟶	
Actions (physical)	seeking relevant information exploring ⟶				seeking pertinent information documenting	

Figure 1. Model of the Information Search Process (ISP) (Kuhlthau, 2004, p.82)

was first developed when Kuhlthau (1983) examined high school students' information search process to complete their project and later verified and generalized through other sequential studies (Kuhlthau, 1988a, b, 1989; Kuhlthau, Turock, George, & Belvin, 1990). Kuhlthau (2004) defined the Zone of Intervention in information seeking as "that area in which an information user can do with advice and assistance what he or she cannot do alone or can do only with great difficulty" (p. 129) modelled on Vygotsky's Zone of Proximal Development.

Literature Review

Previous Studies on Information Search Process (ISP)

As a research-based and validated model showing the information search process from the initiation to the completion of a project, Kuhlthau's ISP model has been frequently used as a framework in many information behavior studies in learning and research contexts which cover elementary level through graduate and faculty level (e.g., Bilal, 2002; Harada, 2005; Jiao et al., 2006, Todd, 2006) and in working contexts (e.g., Bystrom, 2002; Vakkari, 1999).

According to Harada (2005), elementary school students showed emotional changes similar to the patterns in Kuhlthau's ISP model during their research process and keeping journals was considered as a significant tool through which to understand students' feelings and cognitive process. In addition, journals made students more confident about their ability to create meaning from information (Harada, 2002). Bilal (2000, 2001, 2002) examined 7th grade students' cognitive, affective and physical behaviors while they used a Web search engine to perform fact-based research tasks, assigned research tasks and self-generated research tasks. Through this research, it is concluded that children browse less on the assigned task than on the fact-based task and in general they have less difficulty with the self-generated research task than with the others. Moreover, the importance of the focus formulation stage in the ISP model and instructional interventions was emphasized by Todd (2006) who studied middle and high school students' knowledge change through the curriculum in New Jersey schools.

Research based on the ISP model has been more actively conducted in college and graduate research contexts than in elementary and secondary school contexts. This research covers the research process of undergraduate students (Fister, 1992; Holliday & Li, 2004; Kennedy et al., 1999; Pennanen & Vakkari, 2003; Serola & Vakkari, 2005; Sihvonen &Vakkari, 2004; Swain, 1996; Vakkari et al., 2003; Yang, 1997), changes in relevance assessment during the research process (Anderson, 2001, 2005; Tang & Solomon, 1998; Vakkari & Hakala, 2000), library anxiety (Jiao et al., 1996, 2006; Jiao & Onwuegbuzie, 1997, 1999; Onwuegbuzie, 1997; Onwuegbuzie & Jiao, 1998, 2004) and document selection (Wang & Soergel, 1993, 1998) and use (Wang & White, 1995, 1999) by faculty and graduate students. In addition, the ISP model was verified in various contexts such as Ph.D. history students' research process (Cole, 1997, 1998), online learning environments (Byron, 1999) and group-based educational setting (Hyldegard, 2006). Collectively, existing research centering on the ISP model shows that it continues to be useful for explaining information behavior in information seeking tasks that require knowledge construction. The model is also a useful research tool for designing, framing and analyzing the investigation of information seeking behavior in complex tasks. In addition, the model continues to be useful for designing user centered information services and systems, particularly for students in inquiry projects.

Previous Studies on English Language Learners (ELLs)

Educational research on ELL students tends to focus on their reading comprehension and writing. Elley and Mangubhai (1983; Elley, 1991) showed that free voluntary reading helps ELL students improve their English and learning the primary language is a short cut to the second language. However, fewer studies have been conducted on ELLs at secondary level than at elementary level (NREL, 2004), with even less focus on other language speakers than Spanish (Short & Fitzsimmons, 2007).

Research in library and information science has recognized the ELL population as a growing user group. Dame (1994, 1995) suggested school librarians should foster a positive environment in the school library for ELL students through a welcoming place, collection in their native language, resources for teachers, collaboration with other agencies, multicultural activities and literacy activities. A few studies (Alexander and Morton, 2007; Naidoo, 2005; Filson, 1992) have suggested collaborative partnerships between school librarians and subject teachers for serving ELL students, however the role of the school librarian is limited to developing and providing multi-cultural and multi-language materials. Selnik (2004) and Bordonaro (2006) consider the library as a place for ELL students to learn literacy skills. However, research on ELLs still focuses mainly on material provision especially for Hispanic and few studies have been conducted on information seeking and use of ELLs in learning contexts. With educational systems across the world giving increasing emphasis to responding innovatively to needs of learners, increasing intellectual engagement and relevance, strengthening learning and teaching, and equipping students with the skills and knowledge—cognitive and cultural, social and linguistic—that help them learn deeply, it is timely to examine how ELL students engage with information to build new knowledge in the context of library-based research tasks.

Research Objectives

The objectives of this study are: 1) to understand the information-to-knowledge experience of ELL students, who are engaged in a Guided Inquiry project, in terms of cognitive, behavioral and affective dimensions and 2) to explore interactions, if any, between ELL students' information-to-knowledge experience and their characteristics such as demographic, linguistic and cultural factors.

The specific research questions are:

I. To understand the information-to-knowledge experience of ELL students, who are engaged in a Guided Inquiry project, in terms of cognitive, behavioral and affective dimensions.

    1. *Cognitive dimension*: What primary patterns, if any, do ELL students have in their thoughts (i.e. topic selection, focus formulation, knowledge building) during the research project?

    2. *Behavioral dimension*: What primary patterns, if any, do ELL students have in their actions (i.e. search terms, operators, selection criteria) during the research project?

    3. *Affective dimension*: What primary patterns, if any, do ELL students have in their feelings (i.e. emotional changes) during the research project?

II. To explore interactions, if any, between ELL students' information-to-knowledge experience and their characteristics such as demographic, linguistic and cultural factors.

    1. *Demographic factors*: What interactions, if any, exist between ELL students' information-to-knowledge experience and their demographic factors (i.e. age, gender, length of enrolment in the U.S. schools or the schools in other countries)?

    2. *Linguistic factors*: What interactions, if any, exist between ELL students'

information-to-knowledge experience and their language proficiency (i.e. self-rated English language proficiency, linguistic isolation of the household)?

3. *Cultural factors*: What interactions, if any, exist between ELL students' information-to-knowledge experience and their socio-cultural factors (i.e. primary language, origin of birth**,** ethnicity)?

Methods

This study is an in-depth case study with multi-methods. With the growing interest in people's information seeking and use behaviors by researchers, a qualitative case study with a longitudinal dimensions and field study is considered necessary for eliciting richer understandings of the cognitive processes of information seeking and real experience (Dervin & Nilan, 1986; Kuhlthau, 2004). Since the 1990s, triangulation of research methods has been increasingly used (Julien & Duggan, 2000). As a pilot study for the dissertation, this study was conducted for the following purposes: 1) to test research design and research instruments, 2) to train the researcher in implementing research instruments in the Guided Inquiry context, and 3) to identify if potential patterns and interactions exist between the variables under study.

Sample

As a pilot study, this research centered on an in-depth analysis of the information-to-knowledge experience of two Korean 11th grade students (17-year-old boys) of a high school in New Jersey. Their experience was tracked from the initiation stage to the completion stage of a Guided Inquiry project. Among the two participating students (S1 and S2), S1 took both biology and psychology classes and S2 took only the biology class. Both participants were born in South Korea. S1 had lived in China for 3 years (from 4th to 6th grade) to learn Chinese language and came to the United States 5 years ago (from 7th grade to current). S2 had lived in South Korea until he came to the United States 3.5 years ago (from 8th grade to current). They came to the United States separately from their parents for studying. The students were living in the same house with a Korean family consisting of married couple and their two sons, who were 2 year older and 3 year older than them. No one in the house can speak English very well (linguistically isolated household) and they speak only in Korean at home.

Guided Inquiry Project: Scientific Literature Review

The high school chosen for this pilot study has a 10-year-old collaboration history, and has a well-developed instructional collaboration for the Grade 11 Scientific Literature Review, which requires students to conduct a scientific literature review of existing research about a topic in biology or psychology which is chosen by the student and approved by school librarians or the science teacher. The school librarian provides up to eighteen workshops as instructional interventions (Table 1) for students within the biology or psychology class time for nine weeks. The science teacher, as a content expert, guides students in building scientific knowledge of their chosen topic.

Students produce a research paper which contains a cove page with abstract, introduction, methodology, results of research, analysis of research, conclusion and references. They are required to use at least 12-16 sources (at least 6-8 introductory sources and at least 6-8 peer-reviewed articles). Introductory sources, including textbooks, encyclopaedia, newspapers, non-fiction works, and articles in reputable magazines, serve the purpose of enabling student to build their background knowledge, the vocabulary needed to search for scholarly journals and enable them to formulate the specific focus of their research. Peer-reviewed articles are required to be full text studies which are accessed in online

Workshop 1	The benefits of a scientific literature review
Workshop 2	The student's assignment begins
Workshop 3	Making it meaningful: Browsing databases
Workshop 4	Creating and organizing the research folder
Workshop 5	Researching the introduction
Workshop 6	How to take notes from a general press article
Workshop 7	How to write an introduction
Workshop 8	Searching for peer reviewed studies
Workshop 9	How to read and make notes from a peer reviewed journal study
Workshop 10	How to write the methodology
Workshop 11	How to write the results of research
Workshop 12	How to use and create a table, chart, or graph for the research
Workshop 13	How to write the analysis of research
Workshop 14	How to write the conclusion
Workshop 15	How to write the abstract
Workshop 16	How to write the reference list
Workshop 17	Creating a title and completing the cover page
Workshop 18	Putting it all together to turn the Scientific Literature Review in to the teacher

Table 1. Workshops for Scientific Literature Review project

databases provided by the school and in the school library or other research libraries. Students submit their first draft paper to get the school librarians' and science teacher's feedback on it and complete the project by producing the final paper with revisions and corrections. During the research process, students closely interact with school librarians and science teachers. After the completion of research, two grades are given on the final paper: a research grade given by the school librarian and a science content grade given by the science teacher.

Data Collection

Before the data collection, an authorization letter from the school principal, consent forms from the students' guardian and assent forms from the students were obtained. Data were collected through questionnaire, surveys (at the beginning, mid-point, and completion of the project), search journal, search sessions, observation, students' completed papers and semi-structured interviews with the student and the librarian.

Questionnaire. The questionnaire, administered at the commencement of the unit included questions about students' demographic information, origin of birth, the length of time living in the United States or other countries, the language(s) spoken at home, self-rated language proficiency in English and linguistic isolation of the household. *Linguistic isolation* is defined by the U.S. Census Bureau (2004) as living in a household in which all members aged 14 years and older speak a non-English language and also speak English less than "very well."

Surveys. The survey instruments used in this study were based on the Student Learning through Inquiry Measure (SLIM) toolkit (Todd, Kuhlthau & Heinstrom, 2005). These were administered at the three points (initiation, mid-point and completion) during the research project. The SLIM instrument asked the following questions:
    1. Take some time to think about your topic. Now write down what you know about it.

2. What is the name you have given to your paper at this time?
3. How interested are you in your topic? Check (✓) one that best matches your interest.
   1-not at all, 2-a little, 3-some, 4-a lot
4. How much do you know about your topic? Check (✓) one that best matches how much
   you know. 1-not at all, 2-a little, 3-some, 4-a lot
5. What do you find easy to do? Please list as many things as you like.
6. What do you find hard to do? Please list as many things as you like.
7. What did you learn in doing this research project? Please list as many as you like.
   Additional questions were added to the original SLIM toolkit in order to examine students' feelings and concerns, during the project, caused by their limited English language proficiency.
1. How do you feel about your project? Check (✓) as many boxes as apply to you.

confident [ ] disappointed [ ] relieved [ ] frustrated [ ] confused [ ]
optimistic [ ] uncertain [ ] satisfied [ ] anxious [ ] other _____

1.1 Why did you feel like that?
2. Are you worried about your English for doing this project?
   1-not at all, 2-a little, 3-some, 4-a lot
2.1 What concerns, if any, do you have with reading in English for the project?
2.2 What concerns, if any, do you have with writing in English for the project?
2.3. What concerns, if any, do you have with listening in English for the project?
2.4 What concerns, if any, do you have with speaking in English for the project?

Search Journal and search sessions. Throughout the inquiry unit, the students were required to keep the search journal by recording the date, search words, source used, place where they got the source, information intention and usefulness of each source. This proved to be problematic for these students. They easily forgot to keep search journals when they searched for sources because the search journal was an additional workload which they were asked to do by themselves throughout their research process. Therefore, when they searched for peer-reviewed articles, search journals were replaced with search sessions. Their searching was recorded by the screen capture recording software, *Morae*.

Observation. The researcher closely observed the students' research process as a participant observer from the initiation to the completion of the project through documented field notes. The observation mainly focused on students' progress, their interactions with classmates and teachers and interventions of teachers during the project.

Students' papers. After the completion of their project, the students' papers with the school librarian's comments were collected to see their information use, presentation, demonstrated knowledge outcomes.

Interviews. The students and the school librarian were interviewed to further understand the information search process of ELL students. The semi-structured interview included the questions about their difficulties in general as well as those related to their English language proficiency during the project and helps they needed and obtained to solve those difficulties. The interview was conducted in English. The student was given the interview guideline first and had five minutes to prepare the answers before the interview started.
   Data collection was performed in clear, plain English for students of all abilities to understand them. While answering the questions in the questionnaire, surveys, search journal

and interview, the participants were encouraged to ask questions to the researcher or the school librarian. When additional explanations were needed, the participants were allowed to communicate with the researcher in Korean which is their native language.

Data Analysis

The collected data through multi-method approach was analyzed qualitatively. The researchers identified codes and categorized primary patterns through content analysis of all data collected through above-mentioned methods.

Findings

Characteristics of Participants

When asked to rate their English language proficiency by themselves(1-poor, 2-okay, 3-good, 4-very good), S1 rated "okay" in writing and "good" in reading, listening and speaking and S2 rated "poor" in reading, writing, and listening and "okay" in speaking. S2 showed lower English proficiency than S1 when he communicated with the school librarian and the researcher. While S1 tried to use and improve English, S2 was strongly attached to Korean culture and friends outside the school. As S2 dropped out between the mid-point and completion of the project, data about the completion process of S2 were not collected.

Cognitive dimension

Topic selection. Students were required to choose a topic which was related to the subject (biology or psychology) and their personal experience. When the school librarian explained the project to S1, she used 'video game addiction' as an example of possible topic, because there was some indication that he was extensively involved in video games. He showed interest in the topic even though he had no idea further than that at this time. S2 in contrast had a difficult time choosing a topic because he was not sure how much the topic should be related to biology. He looked for the biology textbook and the titles of the example papers which had been completed by previous students displayed in the school library for current students. When S2 decided to study 'AIDS-HIV virus' for the project without expressing interest in the topic, the school librarian guided him to choose a topic of greater personal interest. He chose 'insomnia,' which he experienced one year ago. The school librarian asked several questions to figure out the causes of his insomnia and also see his life outside school.

Topic selection is one of very critical stages in the ISP. The school librarian carefully helped students decide if their chosen topics were appropriate (subject relatedness and personal experience/or interest) for the project and also doable for their abilities. Because of the lack of English proficiency, S2 had more limitations in choosing a "doable" topic even after he found a biology related interesting topic.

Focus formulation. Both students needed careful help in formulating the paper's focus, because there was limited time for the project and they quickly fell behind their planned schedule. The school librarian responded by providing some articles for them. However, both participants had difficulties in making links between the supplied articles and spent much time in understanding them. Although they were supposed to use only those related to their specific topic, the participants tried to use them all for their paper even by changing their intended approach because they had already spent too much time in reading

and understanding them. However, S1 said "it was really helpful because the studies she gave me at the very beginning gave me the direction of my research. At that time, I didn't have specific things I wanted to research. I just wanted something about game addiction and she gave me the direction."

Reading (and understanding), summarizing and analyzing were considered very difficult by the participants during the project. The lack of English proficiency made the students read articles very slowly and sometimes misunderstand them. Using an electronic dictionary made the process even slower. The difficulties in reading caused by the lack of English proficiency hindered the students in formulating a more specific focus as they interacted with the information.

The lack of English proficiency made the students have difficulties in summarizing. S1 said, "It's hard to read, highlight and take notes at the same time for summarizing." He preferred to do one thing at once, so he had to repeatedly read the articles to summarize them. S2 tended to read a whole article very carefully and summarized the all content of the article, which took lots of time. He highlighted every important sentence and took many notes although the school librarian suggested he highlight only what he was interested in. In addition to the lack of English proficiency, the broad topic without a specific focus made it hard for him to highlight a few key sentences. However, S2 said, "I want to cover as many things on insomnia as possible in my paper, because there should be many things to write. I had a hard time when I was doing a similar project on humanities one year ago, because there were not enough things to write." He was relying on the text rather than his understanding when he wrote a paper. That might be why he needed a broader topic to write enough pages of papers for the project.

Knowledge building. Although the estimated knowledge of S1 increased during the project (1-not at all, 2-a little, 3-some, 4-a lot) (Figure 2), his knowledge, expressed in the surveys in the mid-point and completion, dealt with similar content which he got to know from the introductory sources. They were mostly facts rather than explanations or synthesis. Even though S2 changed his topic between the initiation and the mid-point, the survey was conducted to both students when they had finished summarizing the introductory sources. Nevertheless, S2 answered he knew "2-a little" about his topic, while S1 answered "3-some." At the initiation of the project, the students estimated their interest on their topics as "3-some" of the participants, because it was self-chosen topics, and they estimated their interest as "4- a lot" after summarizing the introductory sources on the topics (Figure 3).

Knowledge labeling (title). The titles, which the students had given to their papers, changed through the research process and were analyzed according to the categories
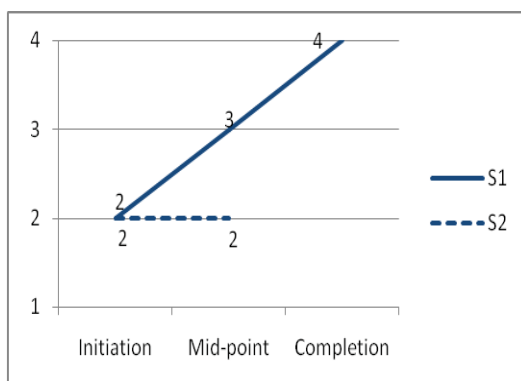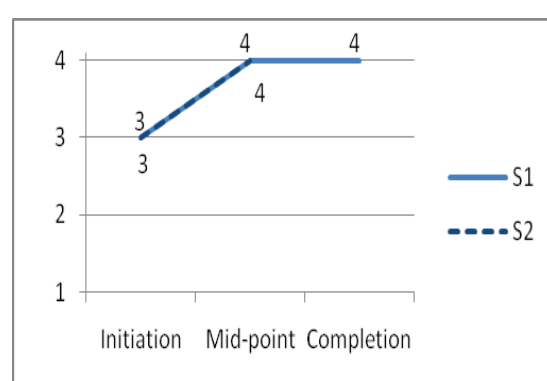

Figure 2. Estimated knowledge

Figure 3. Estimated interest

developed by Todd (2006) as follows:
1. General title (GT): A title that describes the project on a general, overall level.
2. Specific title (ST): The title brings forward a specific aspect of the project.
3. Artistic title (AT): The title is expressed in a creative or artistic way.

In the initiation of the project, S1 named his paper as *Psychology scientific literature* (GT), which was not his topic, but the project title. In the mid-point, he named it as *Is overuse of internet addiction or disorder?*(AT), because he wanted to demonstrate that he was not game-addicted through his research. However, after failing to find enough research to support his argument, his project focused on the characteristics of game addicted adolescents and he called it as *Gaming addiction* (GT). Although S2 changed his topic from HIV virus to insomnia after the initiation, he also showed the general title, *HIV virus*, in the initiation. Later, after getting background knowledge from introductory sources, he stated his title as *Causes and treatments for insomnia* (ST). Both participants established a more specific topic in the mid-point than in the initiation, however S1 went back to his general topic as he could not keep his intended focus because of the lack of research on it. According to Todd (2006), S1 showed *hourglass phenomenon*, however its relationship with language proficiency was not clear yet in this study.

Knowledge presentation. Students in the class were introduced to several ways to organize their knowledge in the paper, in the instructional session called 'How to write the results of research section.' The ways included: topicality, chronological, group characteristics, and research questions asked. Most of the displayed examples of previous students' papers were organized by topicality or by group studied, with sub-titles. The school librarian said, "Students' ways to organize their knowledge in the paper show how deeply they know and understand about the topic." However, both participants of this study organized the summaries of the peer-reviewed articles in a chronologically order without using sub-titles. Although they knew that it was a better approach to organize topically or by group studied, they were in a hurry to finalize the project because they had already fallen behind, and as a result they simply summarized the articles individually and did not have a big picture about them. Even after the completion, S1 did not have any synthesized knowledge from the peer-reviewed articles. This could be a common phenomenon in the ISP even with native English speaking students. However, it seemed clear that time delays and difficulties in understanding, through the lack of English proficiency, prevented the participants from even trying to organize their ideas and understandings in a more sophisticated way.

In terms of writing, grammar was a big concern to both participants. S1 said, "When I handed in the paper, there were so many comments on the grammatical errors, which requires a long time effort to fix them."

Behavioral dimension

Search terms and operators. Both participants used the same simple search terms through all information stages. Their search terms did not become more specific once they had established their focus. S1 mainly used 'game addiction,' 'video game addiction,' 'internet addiction' as search terms and S2 kept using only 'insomnia' and browsed the retrieved sources to select those dealing with causes, symptoms or treatments of insomnia. With the same search terms, they only marked the checkbox for *magazine* when they searched for introductory sources and marked the one for *scholarly* when they needed peer-reviewed articles. This appeared to be the result of limited meta-language, knowledge of the specific technical vocabulary related to their topics. As they did not have enough vocabulary,

they searched for the articles with a broader search term so that they could select appropriate ones among those retrieved. This search pattern did not change over the stages. Their lack of English proficiency made them prefer high recall to high precision through the project process. Moreover, they did not use any related terms from the articles, which they already found and read, for the next search. S1 explained, "I don't have to change search terms because I could get enough number of articles in various online databases provided by the school with only a few search terms." They rarely used Boolean operators in searching. S1 said, "There will be no result with Boolean operators because it's too specific." The school librarian said, "Librarians were very active in helping the student locate articles. This might represent difficulty with finding the correct keywords and building upon those words."

Selection criteria. The participating students' selection criteria included title, length of an article and vocabulary level. When selecting articles from those retrieved, they checked the title first to see if an article was pertinent to their topic. Among those pertinent sources, they chose the short articles with easy vocabularies. Although, at the initiation, S1 answered that finding sources was generally easy to do in the research project, he mentioned that searching was hard at the mid-point of the project. He said, "Because English is not my mother language but a third language, the search process is harder. I need to find short articles with easy vocabularies about the topic… if I could do the research in Korean, I don't need to try to find short articles or easy vocabularies. I will only see if an article is interesting to me or not."

Affective dimension

Emotional changes. The students showed emotional changes throughout the research process (Table 2). In the initiation of the project, S1 felt confused, uncertain and worried because he did not know much about his topic and he was worried about the quality of his performance on this project and S2 felt uncertain because he really did not have any idea what to do for this project. In the mid-point of the project, S1 felt optimistic because he had finished finding and summarizing the introductory sources and he only needed to write the introduction part of the paper and find peer-reviewed articles. However, at the same point, S2 felt anxious about this project because he could not find appropriate introductory sources about his topic. In the completion of the project, S1 was confident that he knew about what he had researched, but at the same time, he felt disappointed that few researchers argued over-playing games was not "addiction" but only "disorder" or "out of control," which was what he wanted to demonstrate through his project.

When asked if they were worried about their English for doing this project (1-not at all, 2-a little, 3-some, 4-a lot), S1 answered "2-a little" over the stages (Figure 4). S2, who had lower English proficiency than S1, started the project with a lot of worries about his English. However, after summarizing the introductory sources, he said, "it was less hard than I thought." It seems that the students who have lower self-rated English proficiency might have more concerns or pressure on their lack of English proficiency at the initiation stage of the research.

As to the ELL students' affective patterns, during the project, compared with native English speaking students, the school librarian mentioned, "The ELL student seemed to

	Initiation	Mid-point	Completion
S1	confused, uncertain, worried	optimistic	confident, disappointed
S2	uncertain	anxious	-

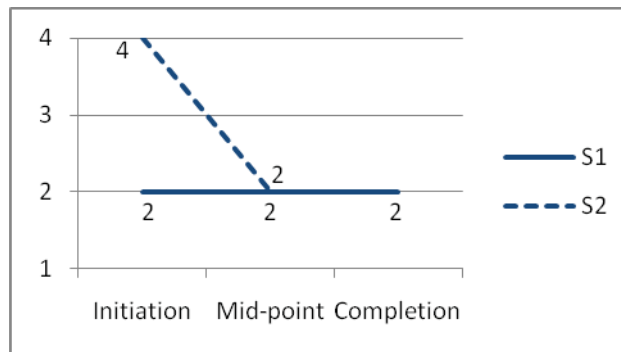Table 2. Emotional changes during the research project

Figure 4. Worried about English for the project?

mature somewhat through the process and seemed satisfied with his ability to handle this rather arduous task." This will be explored further in the dissertation study.

Summary

The students had help from three school librarians and the researcher for the project. They needed someone who could stay by them and explain what they could not understand and what an article was generally about during the project. Especially, they wanted to get help when they were working on the project at home. However, they did not have anyone who could fluently speak English. The summary of the findings in this study includes:

1. Cognitive dimension
   - *Topic selection*: The lack of English proficiency limited ELL students in choosing a "doable" topic even after they found a subject related to their interests.
   - *Focus formulation*: The supplied sources by the school librarian, at the initiation stage, gave ELL students a more specific direction in their research, however as they formulated their own focus, intervention needed to be more careful. Difficulties in reading hindered the ELL students in formulating a focus and the lack of focus, in addition to the limited English proficiency, made it harder to summarize sources and establish key ideas that they understood.
   - *Knowledge building*: Although ELL students became more interested in their topic over the stages, lower English proficiency hindered ELL students in developing their knowledge beyond descriptive and superficial levels.
   - *Knowledge labeling*: ELL students established more specific titles in the mid-point than in the initiation, however it relationship with English proficiency was not clear.
   - *Knowledge presentation*: ELL students tended to list the peer-reviewed articles in a chronologically order in their papers. They were in a hurry to finalize the project because they had already fallen behind, and as a result they simply summarized the articles individually and did not have a big picture about them.

2. Behavioral dimension
   - *Search terms and operators*: The lack of English proficiency made ELL students prefer high recall to high precision through the project process. Moreover, they did not use any related terms from the articles, which they already found and read, for the next search. They rarely used Boolean operators.
   - *Selection criteria*: ELL students needed to consider the length and vocabulary level of articles as well as topic relatedness in searching.

3. Affective dimension

- *Emotional changes*: ELL students appeared to have more concerns or pressures because of their lack of English proficiency at the initiation stage of the research.

Discussion

The reflections of this pilot study are discussed in terms of research design, research instruments and role as a researcher.

Research design

Since this study was conducted only with ELL students, it was not possible to establish if information seeking and knowledge building patterns were generated by their linguistically and culturally different background or could have happened to native English speaking (NES) students. Therefore, a comparison study between ELL students and NES students is suggested in order to understand how linguistic and cultural factors interact with the students' information search process.

As documented earlier, one student dropped out after the mid-point of the research project without completing it. Since this study is not an experimental study, but a longitudinal study in the school setting, and ELL students (31%) show higher drop-out rate than NES students (10%) (NCES, 2004), the students' drop-out rate of schools should be considered when the researcher recruits participants.

Research instruments

The students easily forgot to keep search journals when they searched for sources because the search journal was strongly perceived as an additional workload which they were asked to do by themselves throughout their research process. Therefore, when they searched for peer-reviewed articles, search journals were replaced with search sessions. Even though search sessions did not cover the whole search process, they gave more detailed data about their search terms and tactics. In the future study, two search sessions will be designed. The first search session will be conducted during the exploration phase (pre-focus formulation) of the project when students search for general sources to build background knowledge. The second search session will be conducted during the collection phase (post-focus formulation) of the project when students search for more specific, pertinent sources. Their searching will be recorded by the screen capture recording software. After searching, think-after interviews will be conducted to establish the student's information intents, selection criteria and usefulness judgment.

The pilot study showed that there were frequent changes in the students' feelings and concerns, and this was not effectively captured by collecting data just at the three times during the process. This issue raises the question, "What are unobtrusive ways for capturing students' dynamic change of feelings during the research process without bothering the class for gathering data?"

Only English was used for the data collection of this study to test if English used in the research instruments (i.e. questionnaire, surveys, search journal, interviews) was easy and clear enough for ELL students to understand. Since they already had basic abilities to perform a research project in English it was assumed that they would not have difficulties understanding and answering the instruments in English. A few times however, they used electronic dictionaries for checking spellings in answering the surveys, and needed more specific directions on how much and detailed they needed to write when they answered Q1 of the survey (Q1: Take some time to think about your topic. Now write down what you know

about it). In general, there seemed no particular difficulties for ELL students understanding and answering the research instruments in English in this study.

Role as a researcher

When the students had questions about the research instruments (i.e. questionnaire, surveys, search journal, interviews) or their research process, they were allowed to communicate with the researcher in Korean, which is their native language, in order to preclude misunderstanding and obtain richer sense about ELL students' difficulties. However, the communication with the researcher in their native language allowed too much intervention by the researcher, which might have influenced students' performance and made them rely on the researcher as someone who could help them with their research.

Conclusion

As a pilot study designed for a more extensive dissertation study, this study indicates that language proficiency may indeed influence the information-to knowledge experience of students when they undertake inquiry units of work. It shows that their lack of English proficiency limited ELL students in choosing a doable topic, made it harder to summarize sources and hindered them in developing their knowledge beyond descriptive and superficial levels. In searching, ELL students preferred high recall to high precision through the project process and rarely used Boolean operators. In addition, it appeared that they had more concerns or pressure because of their lack of English proficiency at the initiation stage of the research.

The pilot study also shows that potentially future studies about ELL students' information search process can shed light on how different linguistic and cultural background influence people's information seeking and use and contribute to enriching the existing ISP model by considering the individual's linguistic and cultural contexts. Such studies also have the potential to help teachers and school librarians understand ELL students' information search process and various information needs from their unique situations and contexts, and develop more appropriate interventions to enable them to succeed in this context. In addition, such studies can inform system designers to consider ELL students' unique needs in terms of information, system interface, search strategies and evaluation skills.

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Statement of Originality

This statement certifies that the paper above is based upon original research undertaken by the author and that the paper was conceived and written by the author(s) alone and has not been published elsewhere. All information and ideas from others is referenced.