

Information Behavior of International Students Settling in an Unfamiliar Geo-spatial Environment

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ABSTRACT

This paper presents the findings from a project about how international students seek and acquire information during their settlement in an unknown geo-spatial environment. Through semi-structured interviews, questionnaires, and cognitive mapping with twenty international students, this study examines their information needs, information sources, and settlement experiences in the host country. Findings of the study include their (1) focus on acquiring basic, survival-related information; (2) active use of internet-based information sources including online/mobile maps; (3) information behavior of wandering around and information encountering; (4) co-national social networks playing a key role as information sources. Implications are discussed in ways to further our understanding of international students' information behavior and promote its improvement.

Keywords

Information behavior, international students, online maps

INTRODUCTION

As international education is considered important and increasingly popular around the globe today, more and more international students come to the U.S. with their own cultural backgrounds (Open Doors, 2013). However, international students experience various challenges involving different cultures, languages, customs, and social networks in the host country and seek various kinds of information to help them get settled in their new, unfamiliar geo-spatial environment.

This study presents the findings from a project conducted in a public university in the eastern U.S. to examine

information behavior of new international students. The purpose of the project is to gain a better understanding of the complex information behavior of international students during settlement. To do this, we used a mixed method approach with qualitative interviews, questionnaires, and cognitive mapping. Throughout the paper the term "information behavior" is used to refer to the various aspects of the students' information practices, including both purposefully seeking information and incidentally acquiring information (Fisher, Erdelez, & McKechnie, 2005, pp.31-36). Through the findings of new international students' information needs, information sources, and perceptions of their local area, this study seeks to increase our understanding of the information behavior of international students, who are a less studied, but growing group of individuals. In addition, this study contributes to research of human information behaviors in an unknown geo-spatial environment.

PREVIOUS WORK

The number of international students in the United States increased to 819,644 in the 2012/13 academic year, a 40 percent increase compared to a decade ago (Open Doors 2013). However, although the number of international students steadily increased, research in education has continually reported various difficulties that international students face when adjusting to their new life in the host environments. Those challenges include differences in culture, language, customs, and values; loneliness; loss of existing social networks; and problems with daily life tasks, and daily living management in the host countries (Mallinckrodt & Leong, 1992; Sodowsky & Plake, 1992; Abe, Talbot, & Gellhoed, 1998; Toyokawa & Toyokawa, 2002; Zhang & Brunton, 2007). Along with the challenges that they experience, education studies have identified many factors that may affect international students' successful adjustment in new environments (Poyrazli, Arbona, Bullington, & Pisecco, 2001; Surdam & Collins, 1984; Zhai, 2004). Despite those findings, little is known about how international students seek and use information during their adjustment. What kinds of information are important and how they seek and acquire that information remains understudied.

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Some information behaviors of international students have been studied by researchers in the Library and Information Science (LIS) field. But many LIS studies of international students focused on their use of libraries and libraries' service to this particular group of users. Liu and Redfern (1997) studied multicultural students' use of libraries at San Jose State University. Baron and Strout-Dapaz (2001) identified the major challenges that international students face through a survey, and in Bordonaro (2006) international students' use of the college library was explored as they worked to develop their English language skills in a self-directed manner.

A group of users that shares many characteristics with international students are immigrant populations, and there have been a number of LIS studies focusing on immigrant population. Caidi, Allard, and Quirke (2010, p. 495) defined immigrants as "anyone living outside their country of citizenship but the condition of permanence in the term immigrant excludes those living abroad temporarily, such as visitors, migrant workers, and international students" and described how immigrant studies in LIS addressed difficulties of immigrants as a population in transition to an unknown information environment. Fisher, Durrance, and Hinton (2004) studied how immigrants use a public library in New York using Pettigrew's (1999) notion of information grounds. Quirke (2012) examined information practices of new Afghan immigrant and refugee youth in Toronto, Komito and Bates (2011) explored Polish and Filipino immigrants' information practices in Ireland and their use of social media to maintain their social networks in their home country. Similarly, Shoham and Strauss (2007) studied how North American immigrants seek information before and after their immigration in Israel. According to Khoir and Koronios (2014), the Internet and strong social networks both online and offline are important information sources to the Asian immigrants.

Relative to the studies about information behavior of immigrants, there has been little LIS research on information behavior of international students outside the context of libraries. However, there have been a few recent exceptions that considered the information behaviors of international students. Using a broader term of "migrational individuals" that refers to people in the process of movement, such as immigrants, refugees, and exchange students, Lingel (2011) explored everyday life information seeking of migrational individuals in New York City. Using the perspective of everyday life information seeking (ELIS) (Savolainen, 1995), Lingel examines various information behaviors for the participants' acculturation in New York City. In a similar fashion, the current study explores everyday life information behaviors of new international students.

While Lingel's (2011) focus was migrational individuals, which includes international students, Sin and Kim's (2013) recent study examined international students' ELIS, especially on social networking sites (SNSs). Through their

survey, Sin and Kim found that a majority of respondents frequently used SNSs for ELIS. Although Sin and Kim's study addresses daily information behaviors of international students, it did not take into account the participants' length of stay in the host country.

Although international students have been continually studied in the education and in the LIS field, more research is needed to understand their information behavior in new, unfamiliar geo-spatial environments. To fill these gaps, this study examines international students' information behavior during settlement and aims to produce a holistic understanding of their dynamic information seeking and acquisition experiences in a new geo-spatial environment. The main research questions and the sub questions of this exploratory study are as follows:

RQ1: How do new international students seek and acquire information during settlement in an unfamiliar environment?

RQ1-1: What information is important to new international students?

RQ1-2: What information sources are used to satisfy new international students' information needs?

RQ2: What factors affect information behaviors of new international students during their settlement?

RQ2-1: Do social networks play a role in information behaviors of new international students?

RQ2-2: Do information behaviors of new international students differ across different demographic characteristics?

METHODS

To answer these research questions, this study uses qualitative interviews, based on Corbin and Strauss's (1990) grounded theory and open coding. This approach is complemented by questionnaire and cognitive mapping tasks in the interviews to create a multi-method analysis of the participants' information needs and behaviors (Hesse-Biber & Leavy, 2010, pp.278-281).

The interviews were conducted right before and during the fall 2013 semester at the University of Maryland, College Park where more than 4000 students and 13% of the total enrolled students are international (University of Maryland Office of International Student & Scholar Services, 2013). 20 international graduate students who had been in the U.S. for about one year or less were recruited through campus email lists and postings. A basic condition of participation was regular use of the Internet and online maps. The pre-interview demographic survey conducted at the beginning of the interviews showed that the frequencies of using online maps varied among the participants, ranging from "once a month" to "daily." Although this study did not intend to generalize the results over other populations,

participant characteristics such as length of stay in the United States, sex, and majors were controlled as evenly as possible.

The length of stay in the United States was deliberately decided to be about one year or one school year, so that the participants would have finished most of their settlement and at the same time could remember their information behaviors during settlement relatively well. Hence, most interviewees were international students who entered their graduate programs in the fall 2012 semester, and one participant entered the program in spring 2013.

In order to have a sample that reflected the variety of international students in the U.S., participant recruitment targeted both students from the major countries of origin and those from less common countries of origin (Open Doors, 2013). In addition to general recruiting, specific efforts were made to recruit students from the top three countries of origin of international students in the U.S.—China, India, and Korea. Additional efforts were made to recruit students from Latin American countries which are less common countries of origin for international students in the U.S. The resulting sample included students from China, India, Korea, Argentina, and El Salvador. Including participants from different countries allows this study to provide a more robust understanding of international students’ information behaviors and potentially identify different information behaviors among them.

Each interview lasted one or one and a half hours. Participants were asked questions about their initial arrival experiences and adjustment in the new environment. Participants were asked to rate the importance of various types of information during settlement and were asked about how often they used various types of information sources using 7 point Likert scales. The questionnaire items were developed based on previous studies of information behaviors of migrational individuals (Lingel, 2011; Komito & Bates, 2011). Subjects were also encouraged to add other information sources they used to the list. They were asked to use “think-aloud” protocol (Rogers, Sharp, & Preece, 2011, p.256), which encourages participants to talk aloud about what they think during the survey, instead of being silent. This technique enabled the interviewer to follow what was going on in a participants’ mind while they were answering the questionnaire, and naturally led to conversations about the contexts and reasons for their answers, which in turn allowed for a richer understanding of their information behaviors.

At the end of the interview, participants were also asked to draw maps of their local area on a blank sheet of paper. First, they were asked to draw a map based on their knowledge and perspectives of the area that they had during their “settlement period.” The term “local area” was explained to the interviewees as the area where they move around in their daily lives. When they finished drawing, they were asked to list the top five important places to them

during the settlement period. After their “settlement period” map was drawn, they were asked to draw another map of their local area based on the “current” knowledge and perspectives that they have as of the day of the interview. Also, they were asked to list the five places that are currently most important to them. The map-drawing tasks were intended to understand how new international students perceive the geo-spatial environments in the host country and how local environments are mentally represented in their “cognitive maps” (Tversky, 1993; Mark, Freksa, Hirtle, Lloyd, & Tversky, 1999). For the current study, new international students’ cognitive maps of their local area were expected to visually depict their perception of the new geo-spatial environments and help us better understand their geo-spatial information behaviors.

RESULTS

Participant Demographics

Of the 20 interviewees, 50% were male and 50% were female. Most of the participants were between 23 and 29 years old, except for one who was 35 years old. 70% of the participants were pursuing master’s degrees and 30% were pursuing doctoral degrees. The countries of origin of the participants were China (7; 3 males and 4 females), India (7; 4 males and 3 females), Korea (4; 2 males and 2 females), El Salvador (1 male), and Argentina (1 female).

Information Needs During Settlement

Of the 16 types of information, the five most important during settlement were housing, school-related places, grocery stores, transportation, and banks, in order of importance. On the bottom of the list were leisure/sports, health-related places, movies/concerts, event/festivals, and religious place information.

Through factor analysis using SPSS 21, the types of information were grouped into four (Figure 1). The most important information group was about basic and survival-related information (Group 1: housing, grocery information), followed by a group for transportation/navigation information (Group 2: transportation, street/roads). The third group was about essential place information for settlement (Group3: school-related places,

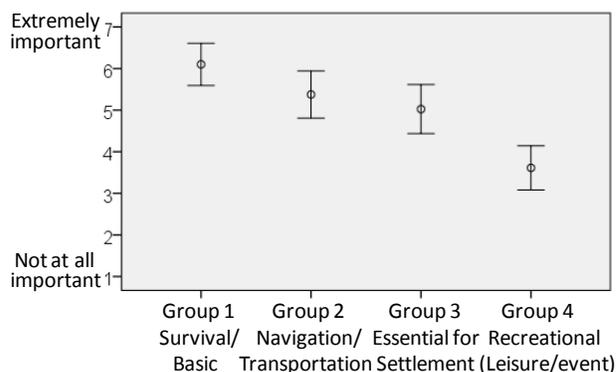


Figure 1. Importance Ratings on Each Information Type (95% Confidence Interval)

banks, mobile phone/electronics stores, health-related places). The least important group was about recreational information (Group 4: café/restaurants, leisure, movies/concerts, events/festivals). Compared to groups 1 through 3, the importance ratings of group 4 was significantly lower. These results identify the types of information which are important for new international students during settlement in their host country. The participants' high prioritization of basic, essential information and low prioritization of recreational information were reflected in comments such as:

"...I guess when I first landed here, (leisure/sports) it was probably not one of my top priority at the moment... I'd probably say different now because then I had to get settled..." (P3, 24 years old, Female, from India)

"I wasn't worried about getting my social security number. I wasn't worried about getting my driver's license. I was more worried about where I'm going to live... How do I get there, how do I get to the university. That was my primary..." (I) never use that information (of) events or festivals." (P5, 26, Male, from El Salvador)

These comments illustrate the importance of basic, essential information during the settling period and how these needs may change over time as international students adjust to living in the new environment.

However, their status as international graduate students seemed to affect their behaviors and information needs accordingly. P6 from Argentina described her busy life as a graduate student and addressed time constraints she had in her daily life:

"Let's see I'm a graduate student working in the University of Maryland taking courses. How much time can you spend in events with recreation, groceries, making the house tidy? Not even once a month." (P6, 29, Female, from Argentina)

Her representation of the situation depicts challenges and workloads that she copes with as an international graduate student.

In sum, the participants put more weight on certain types of information needs during their settlement. The result showed that information needs of the participants strongly lean toward information that is needed for their housing, navigating, and other essential aspects of settlement, at least during the time of their arrival and adjustment.

Information Sources During Settlement

In terms of frequency of using information sources, web searches, online/mobile maps, friends, and online communities were among the top five information sources (Figure 2). Except for friends, the five most frequently used information sources were all Internet-based. As social information sources, friends and online communities were frequently used, and as non-social information sources, web searches and online/mobile maps were used more frequently than other information sources.

Online/mobile Maps - Essential Sources of Local Information
Being in an unknown geo-spatial environment, participants highly relied on online maps and mobile/smartphone maps for their navigation in the host country as P8 and P16 describe:

"... Since all the street names are in English, I know it's that street but I can't remember the name, so when I was walking, I always use my smart phone to get GPS on. Usually, if I take a metro or metro bus, then I always use my smart phone... Google map." (P8, 24, Female, from Korea)

"Actually, if I want to go somewhere tomorrow I'll search for it on Google maps today. (On) laptop. I will have a sense of where it is. Although I... get out of the nearest metro station tomorrow I still don't know where it is, so I'll resort to my smartphone Google maps. I know it's quite nearby, but I don't know which direction I should go." (P16, 23, Male, from China)

These descriptions illustrate how new international students rely on online/mobile maps for seeking geo-spatial information in an unknown environment. However, in many cases, their geo-spatial information needs were not satisfied solely through online/mobile maps, but in combination with other information sources. Lack of knowledge of the place names or the right places made it difficult for P1 and P5 to simply use online maps to find the places that they wanted. Through the use of human information sources, P1 was able to learn the name of the supermarket in her local area to use it as a search keyword, and through web searching, P5 found the name of an electronics store and used it as a search keyword on Google Maps. Both P1 and P5 used multiple information sources to create the queries needed to find the places of interest on online maps.

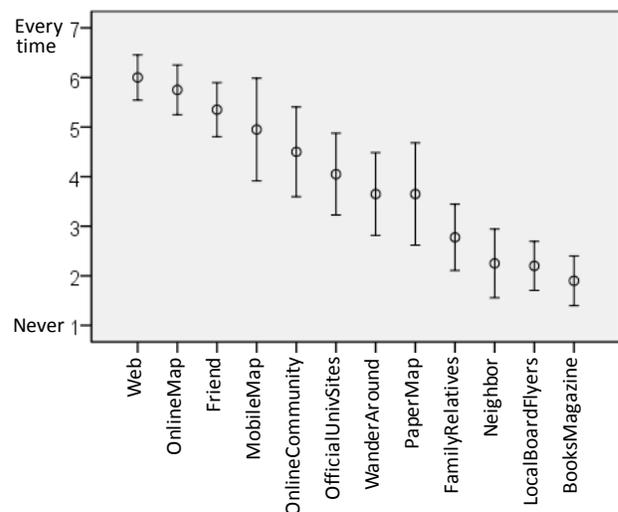


Figure 2. Frequency of Using Information Sources (95% Confidence Interval)

Wandering Around - A Way to Get Geo-spatial Information

While online sources were commonly used, many participants also reported that they just walked around and explored the unknown geo-spatial environment. There was something that they could not get just by using online maps or other information sources as P18 explains:

“Usually the map provides limited information, probably the name of the building, and the location of the building, probably the coordinate on the map. But what I feel, by walking around, physically, is not just the location, but other things around that building, around that location. Probably trees, maybe, environments, how the road looks like, how the ground elevated ... how the ground elevate goes downhill. Those kind of information.” (P18, 29, Male, from Korea)

Except for a few participants (P1, P5, and P8), most participants used “wandering around” as an information seeking tactic (Lingel, 2011) to get familiar with their new geo-spatial environment or to learn about nearby places. “Wandering around” was the only information source where there was a gender difference in the one-way ANOVA ($F = 5.642, p = .029$) for the frequency of use of information sources. Compared to male students, female students were less active in wandering around the new environment for several reasons. P5 (29, Female, from Argentina) was concerned about safety in walking around the area, and P8 never wandered around the area because she was afraid of being lost and not finding ways to come back:

“I know it’s weird, but I’m really scared of getting lost. I know I can go anywhere but then I wouldn’t know how to come back because I can’t remember how I went so I always have the thing turned on, the map turned on.” (P8, 24, Female, from Korea)

P1’s reason for not wandering around was also related with coming back home, but her focus was more about physical fatigue from walking around a large area:

“It’s a huge campus. It’s not like in Beijing. So if you walk outside, there’s no way you can go back unless you walk back. Even I walk so tired in maybe only 2 miles... but you can maybe you need to walk 20 maybe 40 minutes.” (P1, 27, Female, from China)

Social Information Sources

Compared to using non-social information sources such as online maps or web searches, getting local and geo-spatial information seemed relatively more comprehensive and effective when the participants used human information sources as described in the case of P3:

“Most of the local knowledge, I think I would have gained by talking to people who have stayed here, who were here already. I speak to them and find out which is the best place to get this. Which is the best means to get to that place? Then again, to first talk to people, find out which

other places, and again, make use of Google Maps to find out which is the best means to transport to the place and how far it is. Yeah. I would say it would be a combination of both.” (P3, 24, Female, from India)

In this comment, P3 showed her experience of seeking local information by asking people who were already living in the area and had more knowledge and information about the area than she had, to some extent, assuming that they knew best places and best means to get to those places. Similarly, P18 sought local place information by using human information sources such as senior students, who had local knowledge and experience, and peer students, who could share helpful information with each other:

“I asked the people who used to live here in the area, by talking to them, asking them which places they recommend to buy the items that I needed. Some were senior friends, some were colleagues of mine, who entered the school at the same time. Because we all had different information, so we wanted to kind of share those information ... while we adjust together.” (P18, 29, Male, from Korea)

For the participants from China, India, and Korea, “friends” mostly referred to senior or peer students with the same nationality. Those co-national senior or peer students were the most frequently used human information sources, and the interaction between them took place both offline and online:

“There is a group called The Student Council of India, they have a group and they have a forum in Facebook, so they are ready to help always.” (P4, 24, Male, from India)

As identified in P4’s comment, Indian students had a very helpful senior student group to provide various kinds of assistance to new students such as recommendations for housing, guiding throughout the campus, and providing temporary housing for a week. Participants reported that Chinese, Indian, and Korean students all had their student associations at the University of Maryland, College Park, and that their websites and Facebook groups were the online communities where the senior students and new students can connect with each other and share helpful information.

However, use of online communities differed across participants’ countries of origin (Table 1). When the frequencies of using each information source were tested by each country of origin through one-way ANOVA (excluding Latin American countries), statistically significant differences were found in the use of online communities, official university sites/services, local bulletin boards, and wandering around. Students from India used these four information sources significantly more frequently than students from other countries. Interviews with Indian students indicated that they actively use their Facebook groups and sometimes wandered around town with their co-national friends. On the contrary, the participants from El Salvador and Argentina had none or one co-national friend

	Mean	SD	Mean by each country of origin			ANOVA	
	Total (China, India, Korea)		China	India	Korea	F	p
Web search	5.94	.998	6.00	6.00	5.75	.087	.917
Online maps	5.67	1.085	5.86	5.71	5.25	.380	.690
Friends	5.56	1.294	5.29	6.29	4.75	2.373	.127
Online community	4.83	1.724	4.14	6.14	3.75	4.933	.023*
Mobile maps	4.72	2.218	5.57	3.57	5.25	1.698	.216
Official univ. sites	4.22	1.768	3.71	5.57	2.75	5.825	.013*
Paper maps	3.89	2.193	3.14	4.86	3.50	1.173	.336
Wandering around	3.83	1.757	2.71	5.14	3.50	5.086	.021*
Family/relatives	3.28	1.934	3.43	4.14	1.50	2.969	.082
Neighbors	2.39	1.501	2.57	2.57	1.75	.435	.655
Local bulletin boards	2.33	1.029	2.14	3.29	1.00	24.000	.000*
Books/paper media	2.00	1.085	2.14	2.00	1.75	.150	.862
Religious group	1.72	1.127	2.29	1.29	1.50	1.577	.239

(* p <0.05)

Table 1. Frequency of Use by Country of Origin (Descriptive statistics and ANOVA results)

in the local area of the host country, and their use of online communities as information sources were very low (P5: Never – 1 out of 7, P6: Rarely – 2 out of 7).

In brief, during settlement, the participants in this study frequently used Internet-based information sources, such as web search, online maps, mobile maps, and online communities, as well as human information sources, mostly co-national senior or peer students. Online/mobile maps were essential sources of geo-spatial and transportation information for moving around in the unfamiliar environment. Most participants, especially male students used the information tactic of wandering around as a way to learn about their local area. Also, most participants benefitted from getting local information from co-national peers who already had more local knowledge and shared common interests. These findings may explain the overall experience of using information sources, but they do not explain which specific information sources were more likely to be used for particular types of information.

Main Information Sources for Each Information Type

Although web searching was found to be the most frequently used information source, it was not considered by most participants to be the main information source during their adjustments in the host country. Figure 3 presents a matrix with the distribution of numbers of participants who mainly used the specific information sources for seeking specific types of information. The size of the circles indicates the number of participants who used the specific information source for the specific information types.

Coinciding with previous research about migrational individuals' information practices (Lingel, 2011; Komito & Bates; 2011; Khoir and Koronios, 2014), friends and the Internet were the main information sources for most participants in this study. This pattern was almost consistently observed across different groups of information types.

In short, “friends,” who were mostly co-national senior or

Main information source for each type of information	Friends	Online/mobile maps	Official Univ. sites/ emails	Web search/content	Online Community	Wander/walk around	Personnel (Staff, etc.)	Paper maps	Specialized App (Yelp, Bus)	Family/Relative	Paper media (book, etc.)
Group1 - Survival/Living	7.5	○		○	5.5	○	○				
Group2 - Navigation/ Transportation	4.5	6.5	○	○		○	○		○		
Group3 - Essential for Settlement	6.5	○	5	○	○	○	○				
Group4 - Recreational	8.3	○	3.5	○	○	○		○	○	○	○

Figure 3. Main Information Sources for Each Information Type (Values: Average number of respondents for each case)

peer students, were the main information sources for most kinds of information. However, several information sources were also used by many others in seeking certain types of information. Those sources include online communities that were used for seeking housing and living information and online/mobile maps for seeking geo-spatial/transportation information. Also, official university sites or emailing services were used by many participants as main sources for seeking information essential to new students. These results show international students' high reliance on friends as information sources and also confirm the active use of various Internet-based information sources for different types of information.

Cognitive Maps Depicting Their Significant Localities

All participants were spontaneously able to draw the two kinds of maps of the local area, and certain patterns emerged from these maps. First, when the settlement period maps and the current maps are compared, the number of places shown on maps increased (17 out of 20 participants), and the vague and conceptual maps in the settlement versions developed into more specified and realistic maps in the current versions. This transition goes with Tuan's (1977, pp.17-18) description of newcomers' experience learning about significant localities within a neighborhood. Places, areas, and routes newly added to the current version of maps are what participants identified about the neighborhood throughout their one year of living in the host environment.

Second, there were different patterns of orientations of the maps. 11 out of the 20 participants drew maps in the north up orientation, while the rest of them (9 participants) drew maps in different orientations of their own. However, there was a pattern in the maps drawn in different orientation. Interestingly, 7 out of the 9 participants drew maps in the orientation of facing school (in the upper side of the map) from their home (in the bottom side of the map), also including their commuting routes to school in their daily lives (Figure 4). This "going to school" perspective in the custom-oriented maps may indicate that their cognitive representation of the geo-spatial environments have been formed not around an abstract direction system but in terms of a valued, regularly occurring daily task—"going to school". Maps that the participants drew may reflect how new international students perceive their geo-spatial environment and what are significant localities to them in certain periods of time in the host country.

Lastly, regarding the top five important places that the participants listed for each of the two maps—settlement period map and current map—several differences were observed between the two maps. In the settlement period maps, the five most appearing places in the top five important place lists were school (20 participants), grocery (19 participants), home (14 participants), mall (7 participants), and bank, library, restaurant (6 participants each). In the current maps, the five most appearing places

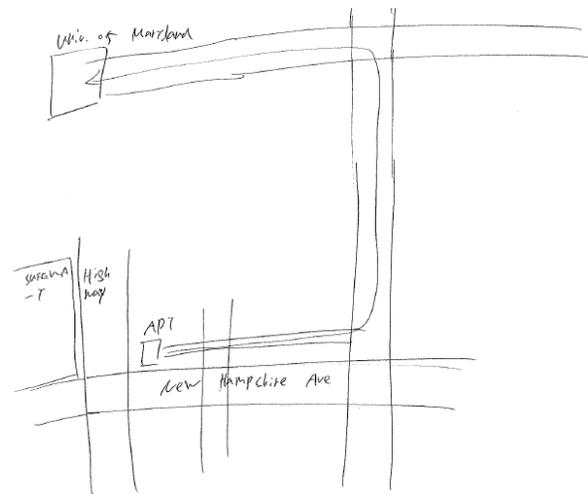


Figure 4. P19's Cognitive Map of Local Area – Settlement Period

in the top five important place lists were school (19 participants), grocery (18 participants), home (16 participants), metro station (9 participants), and restaurant (7 participants). The three most appearing places—school, grocery, and home—were the same for both the settlement period maps and the current maps. However, bank, which was the fifth most appearing place on the settlement period maps, did not appear at all in any participant's top five important place list in the current maps, and metro station, which was listed in only two participants' top five important place lists on the settlement period maps, was among the five most appearing places in the top five important place lists on the current maps. Also, there were several places that newly appeared in the top five important place lists on the current maps, including premium outlet, theater, lake, café, and park, which were never present in the top five lists associated with the settlement period maps.

DISCUSSION

Through the analysis of the findings from both qualitative and quantitative approaches, the present study explored information behaviors of international graduate students during settlement. In spite of the limitations of this study, which will be discussed in more detail below, the findings provide insight into new international graduate students' information needs, information sources, and how they seek to satisfy their information needs using various information sources in an unfamiliar geo-spatial environment.

Survival First, Recreation Next

Results from the questionnaires and interviews show that the participants put more weight on information that is essential for their living, navigating, and settling in the unknown environment than information that is helpful for recreation. This finding is different from the results in Sin and Kim (2013) where, on average, entertainment information was reported to be more important than information about food and transportation. In their study, entertainment information was among the top five most

important information needs (out of twelve types of information) for international students, both undergraduate and graduate students combined. However, the current study examined information needs of international graduate students, and their information needs leaned more towards survival-related information such as housing, groceries, and transportation than recreation-related information such as movies, exercise, and events. Thus, characteristics that differentiate undergraduate and graduate students such as socio-economic contexts, age, and academic goals should be considered as factors that potentially affect international students' information needs.

Differences between Sin and Kim's findings and those of the current study may also have occurred because of the time frames of the participants in the host environment. Sin and Kim's study did not specifically account for the international students' length of stay in the host country while the current study focused on international students who had been in the host country for about one year. Furthermore, unlike Sin and Kim's study, the current study focused on international students' information behavior during their settlement. Thus, the findings in the current study need to be understood as describing the information needs and behaviors of international students at graduate level and during their settlement in a new environment.

Results from participants' cognitive maps and the top five most important places they listed on the settlement period maps and current maps also support this tendency toward survival first, recreation next in international students' information needs. In her research Lingel (2011) used a similar method with map drawing tasks called participatory mapping. She argued that migrational individuals' own history shapes the lens through which they see their neighborhoods in New York City, and discussed a possibility that migrational individuals' conceptual maps of city space may become less individualized and more homogenous as they become increasingly acculturated. Like the maps in her study, the cognitive maps drawn by the participants in the current study seem to be drawn in diverse perspectives, having different orientations and different local places. However, unlike the maps in Lingel (2011) drawn by migrational individuals with varying demographic and occupational characteristics, these maps strongly demonstrate common interests and common information needs among international graduate students, who are a more homogeneous group of individuals. For example, in most maps, both settlement period maps and current maps, there are common components such as school, grocery stores, homes, and on/off campus restaurants. This pattern was also observed in their top five most important place lists for both settlement period maps and current maps, regardless of the time frame. This finding indicates that international graduate students share certain information needs.

On the other hand, aspects of the students' information needs changed over time. Some places included in the top

five most important place lists for the settlement period maps, such as banks, the international student office, and mobile phone/electronics stores, never appeared in the current maps. Instead, recreational places, such as theater, park, and cafes, appeared in the important place lists associated with the current maps. These disappearing places and newly appearing places on the maps suggest that there are unique information needs during settlement and changes of information needs over time.

New international graduate students share some information needs and their information needs change over time, shifting from survival to recreation. These findings imply that information that is necessary and important to international students may follow predefined and predictable patterns. Based on this finding of their priorities of information during their transition, it is suggested that information organizations and academic institutions can design their services or programs for international graduate students in a way to better help inform them and get them settled in the unfamiliar environment.

Internet-based, Geo-spatial Information Sources - Essential Tools During Settlement

The current study also found that Internet-based information sources and friends comprised the top five most frequently used information sources of new international graduate students during their settlement. This result intersects with previous findings on information behaviors of migrational individuals and international students in that they actively use information communications technologies and the Internet (Lingel, 2011; Komito & Bates, 2011). But in those findings, the Internet was regarded as a single type of information source, and thus specific Internet-based information sources such as web search, online maps, mobile maps, and online communities/social networking sites, were not distinguished or identified as individual information sources. Especially, online maps or mobile maps have not been paid much attention as information sources for migrational individuals and international students so far. However, findings in the current research show that online and mobile maps are among the most frequently used information sources to new international students and are main information sources for seeking local and geo-spatial information in an unfamiliar environment.

This paper examined use of Internet-based information sources by new international graduate students and the crucial role of online/mobile maps as sources of local and geo-spatial information to them in the host country. However, more research about the use of online/mobile maps and other Internet-based technologies by international students and other migrational individuals would improve our understanding of their adjustment experiences and information behavior in the host country. New international students' strong reliance on online/mobile maps and frequent use of those maps may imply that they have various tasks involving finding places and visiting those places. Additionally, in the process of seeking place and

geo-spatial information they need other information sources such as friends and web searching. This suggests that they may be benefitted by information sources where informational help and geo-spatial information are both provided or connected with each other. Further studies on the combined use of general information sources and geo-spatial information sources may be necessary to understand how they can be integrated to assist migrational individuals or newcomers in an unfamiliar environment.

Wandering Around and Information Encountering

The results showed that the behavior of wandering around the area was an important way to gain geo-spatial information. In the process of wandering around, the participants became familiar with the geography of their local area. They also serendipitously encountered geo-spatial information, such as the location of a discount mattress store or a shortcut to a grocery store. According to the information behavior literature, this behavior of wandering around could be understood by two types of information seeking—"active search" and "passive search" (Wilson, 1997). First, it can be explained by "active search" in that the individual actively seeks out geo-spatial information of the local area with a purpose of getting familiarized with the local, host environment. However, in the process of this active search, sometimes the participants happened to encounter other information that is relevant to their information needs. This case of incidental information acquisition is different from purposeful, active information search, and it can be explained by "passive search" which addresses a type of information seeking behavior leading to an acquisition of information that happens to be relevant to the person. This passive search behavior of the participants in the current study may be better explained by more specified terms such as incidental information acquisition (Williamson, 1998) or information encountering (Erdelez, 1999) which emphasize the opportunistic component of this information behavior.

As Erdelez (1999) described the characteristics of information encountering, this opportunistic information acquisition was not only experienced during the process of information seeking or information browsing as in the case of wandering around, but also during other activities that are not necessarily intended to be information-oriented. For example, P5 accidentally found an electronics store when he was heading to a restaurant as follows:

"I went to the Chipotle [a restaurant] that is near in campus. It's south of campus. Near the Chipotle, there is a Radio Shack store. So I'd say, "Oh, Radio Shack is here."" (P5, 26, Male, from El Salvador)

This unintentional finding of places was experienced by many participants (P1, P2, P3, P4, P5, P15), either during wandering around the local area or during other activities. Although this experience of incidentally acquiring local information is not an intentional information behavior, this should be also considered an important information

behavior for new international students adjusting to an unfamiliar host environment.

This suggests that "wandering around" (Lingel, 2011) in an unfamiliar geo-spatial environment can be seen as a specific type of information behavior, framed in the space of unknown environments. Wandering around may involve complex information practices of intentionally learning geo-spatial information, leisurely scanning the environment, and accidentally finding relevant information. More research is needed to understand how this active practice is performed by new international students—individually or collectively—and how this experience affects their adjustment in the unfamiliar host country.

Co-nationals and Online communities

Except for information behaviors of incidental information acquisition, most other information behaviors of new international students can be understood as "purposeful information seeking" (Williamson, 1998). Analysis of the frequency of using each information source (Figure 2) showed that the participants actively used information technologies and friends as their major information sources during their settlement in the host country, and in seeking most types of information, friends were their main information sources (Figure 3). In-depth interviews with the participants indicated that the information source "friends" referred primarily to co-national seniors or peers. Getting help and information from other co-national migrants has been reported in prior studies of migrational individuals (Lingel, 2011; Komito & Bates, 2011).

Interaction with co-national peers was a particularly prominent information source for students from India. They were well connected with other Indian senior students or peer students in most cases through their online community, which is their Facebook group. They received various types of assistance from the senior Indian students and came to know other peer Indian students in that online community. Most Indian participants reported that they assumed that a Facebook group for Indian students would exist at the University of Maryland since they knew numerous Facebook groups existed for most universities, and they easily found the group on Facebook. Although the participants from China and Korea knew and used Facebook groups and individual websites for their co-national students, their activities on those online communities were not as active as those of Indian students, as shown in Table 3. There was no significant difference in the use of "friends" as information sources, but a difference was found in the use of online communities, which is an online social information source. This tendency of difference can be explained in part by the fact that Facebook is prohibited in China, but further research may be necessary to understand this phenomenon.

In contrast, the frequency of use of online communities was very low by the participants from Latin America ('Never used' (1 on 7 point Likert scale) to 'Rarely (2 on 7 point

Likert scale)) while their use of non-social online information sources such as web searching, online maps, and mobile maps were as high as other nationalities. Although not statistically comparable due to their small sample sizes, the interviews and questionnaires suggest that Latin American students did not use online communities much as an information source during the settlement. This low use of online communities may be attributed to the small number of students from these countries (El Salvador and Argentina) on campus and therefore the lack of their co-national online communities. Although it is not strongly supported by the current study due to its small sample size, this result may suggest that the lack of social networks of co-nationals in the host country could be related to their less use of online communities as an information source compared to other nationals who have access to and benefit from the online communities where they connect with and form ties with their co-national seniors and friends. Helping new international students connect with each other, especially with their co-national senior and peer students, can contribute to their effective information acquisition and settlement. Especially for international students who do not have many co-nationals on campus, intentional efforts by the academic institutions or other organizations to foster these connections may better assist new international students' acculturation in the host country.

LIMITATIONS

As with any empirical study, there are limitations that should be taken into account when interpreting the findings and their implications. Interviewing more participants would increase confidence that the findings are representative of the larger populations of international students from many different countries. With a larger sample, some of the differences that are not statistically significant may be detectable. In particular, including more students who do not have many co-national students in the host environment would yield a more reliable comparison with international students who have large group of co-nationals on campus.

The basic condition of participation, which was regular use of the Internet and online maps, may also have had an impact on the findings that web searching and online maps are among the major information sources during their settlement. Future research could consider either removing this condition or using a different recruitment condition to include students who may not have the technology or the skills to use online maps and information sources. Also, although the participating students' memories of settlement were clear enough to conduct the interviews, questionnaires, and cognitive mapping, the retrospective approach may miss some of the details in their adjustment experiences. Future research could use a longitudinal approach with multiple interview sessions to capture international students' information needs, information behaviors, and their changes over time.

CONCLUSION

While previous work on international students identified various challenges that they face and their information practices in libraries and academic institutions, this study identified how new international students seek and acquire information during their settlement. Findings included their specific information needs and various social and non-social information sources used to meet those information needs. Also, the question about the role of social networks on international students' information behavior was in part answered through this study. Further, it was found that demographic characteristics, such as sex and countries of origin, may lead to different information behaviors in the host environment. However, more research is needed to understand why those differences develop and how those different information behaviors affect other aspects of international students' adjustment. In addition, future research may focus on social information seeking by international students who do not have their co-national communities, social capital, or appropriate information grounds in the host environment. We hope that this study will inform research in information behavior of international students and migrational individuals and stimulate more studies to extend our understanding of information behaviors of international students, an increasing population group in the U.S. As Tuan (1977) noted, learning about an unknown local area takes significant time and effort. It is our hope that a better understanding of international students' information behavior can contribute to the efforts of many individuals and organizations that support international students' adjustment and acculturation.

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