Article

Information literacy challenges for Chinese PhD students in Australia: A biographical study

Jinghe Han, Senior Lecturer, Centre for Educational Research, University of Western Sydney
Email: j.han@uws.edu.au

Abstract

This study explored the information literacy (IL) development of international higher degree research (HDR) students from China as they undertook their research studies in an Australian university.

International HDR students need advanced IL skills to complete their research degree. However, IL research and training in western countries has tended to regard international HDR students no differently from their undergraduate counterparts. That is, there has been a focus on basic information skills rather than considering the more complicated and advanced IL needs within a research context. The project presented in this paper aimed to explore this gap.

Three international PhD students from China participated in this research. A biographical approach was used to collect the data, and a total of 222 reflective accounts were collected from the participants over a period of fifteen months. In these reflections, they recorded significant life and study experiences at the University of Western Sydney. This approach allowed the participants freedom to express their thoughts and feelings without interruption and enabled them to speak frankly and freely without prejudice. The approach to data analysis underpinning this study was based on Bruce's (1997) relational model of IL.

The findings indicate that these international HDR students experience significant difficulties in developing their IL skills during their research studies in their western university. The complex nature of research study, which demands high levels of IL, significantly contributes to these difficulties, as do the different language and culture of international students which pose additional challenges to their information use. This article concludes with recommendations for research supervisors and librarians to consider in the provision of IL education for international students.

Keywords

---

1. Introduction

A key challenge for the education of international higher degree research (HDR) students is developing their capability to produce "scholarly arguments that make original contributions to knowledge" (Singh 2010, p. 7) in their research thesis. Given that reviewing and using other scholars' work continues throughout a research student's entire study program, it is essential for research educators to help students develop their IL competencies, namely how to search, access and retrieve information, and more importantly how to critique, evaluate and transform information in preparation of their theses. It is problematic to assume that students at graduate level have received IL training as undergraduates or will be able to learn IL skills independently (Eckel 2010). However, research addressing the IL needs of HDR students is not widespread, particularly in relation to those with English as a second language.

This article explores the IL needs of research students from China who have undertaken doctoral studies at the University of Western Sydney. To collect in-depth data on the participants' IL needs during their studies and to capture the dynamic features of these needs while writing their theses, this research was deliberately designed to use a biographical narrative approach and focus on a small group of PhD students. The data collected were from the participants' narrative covering over fifteen months of reflections regarding their IL activities.

This research responds to a key report in Australian Higher Education which found that despite the fact that Australia has been "extremely successful in developing education as an important export industry" (Bradley et al. 2008, p. 9), its education of international HDR students has been under-addressed. The key challenges that have been identified include lower satisfaction ratings by international students (including HDR students) compared to local students; lower growth in the number of students completing higher degrees by research between 2003 and 2008 and "no specific policies [or strategies] implemented to attract and retain HDR students" (Bradley et al. 2008, p. 101). Within this context it is important to provide dedicated support for international HDR students ensuring they have positive study experiences in Australia.

2. Literature review

The concept of IL has evolved from "information technology, information access and solution-oriented problem solving work" (Zurkowski 1974, p. 6) towards a recognition of the ability of people to "make effective and ethical use of information" and to "apply information to create and communicate knowledge" (Catts and Lau 2008, p. 7). Therefore to become information literate, students need to demonstrate abilities ranging from acquisition of information searching, accessing and retrieval skills to a broader perspective of "the learning of discursive practices within the context of an academic discipline" (Simmons 2005, p. 299). However, studies examining the IL needs of both undergraduate and research students have tended to focus on the students' skills of information searching and retrieval (Bruce et al. 2006; Gide and Wu 2010; Williamson et al. 2007; George et al. 2006; Barret 2005) rather than to address students' critical use of IL in their academic discipline (Simmons 2005, p. 299). Research focusing on international students' IL development has a similarly narrow focus and as such is problematic.

Most of the current studies on IL issues tend to consider tertiary international students as a homogenous group based on the assumption that there is no difference in IL needs between research and coursework students. For example, Chen and Ullen (2011) explored the IL needs of a group of international students undertaking studies in a US university and established that international students experienced a lack of knowledge in the structure and function of the library system as well as how to use library resources. Chen and Ullen (2011) also asserted that international students did not have appropriate knowledge to cite material correctly and thus to avoid plagiarism. The authors attributed this to the different citation styles in different countries. Similar research conducted in New Zealand (Mu 2007) found that Asian international students had difficulties in using academic libraries and demonstrating an awareness of the services and resources available for their study in a Western academic setting. This research points to the need for reference librarians to consider international students' characteristics, language proficiency, learning styles and subjects of interests in their future training programs.

Recently Hughes (2010) explored international students' interactions with Australian university libraries and librarians. This research found that international students were unfamiliar with library services and processes and the online library system. Many were confused about the university library's function and therefore reluctant to use it or to seek assistance from librarians. This study also revealed that IL training programmes for international students were seen to be very brief and general, whereas students expected course-related or subject-specific training. Earlier, Hughes and Bruce (2006) studied international students' problems in online information access and use. Their conclusion was that this cohort had difficulty in accessing computers and/or the internet; using hardware; selecting the 'right' information sources; and using information and science terminology. This research identified the participants' linguistic and cultural diversity. Yet there was

no exploration on whether linguistic and cultural differences may cause the students to have different IL needs, and there was no investigation on whether undertaking a research degree would lead to different IL needs for the students compared to undergraduate or coursework studies. This is despite the fact that research students must review and make critical use of a large number of other scholars' works.

There are some studies on international research students and their IL development. The focus and findings of these studies align with the research on international students in general. That is, they also focus on IL *skills* (library use) rather than students' IL *needs* in their research context. For example, Liu and Winn (2009) investigated a group of Chinese research students and their use of library services in a Canadian university. This research indicated that these international students were not able to take full advantage of the library services and resources, due in part to the limitation of their English language. Particularly, these students were not familiar with many key terms for library use and searches. This study also found that because of their cultural difference, these international students tended not to seek support or assistance from university librarians when encountering problems in library use (Liu and Winn 2009, p. 571). Similarly, Morrissey and Given (2006) undertook a study with Chinese research students enrolled in a Canadian university. Their research reported that orientation sessions on library use and IL skills provided by the university were not effective with this cohort. They argued that this failure was associated with the timing of the orientation sessions; the sessions were provided to students in the early weeks of their candidature when the students' efforts focused on adapting to a new life and immersion in an English language study and cultural environment. A further finding was that the majority of these international students from China relied on Google to meet their research needs and lacked the ability to evaluate the quality of their resources. What should be stressed here is that IL needs in a particular context (e.g. how to process/use information in one's research studies) were not explored in either of these studies.

In the UK, Bordonaro (2008) investigated the IL skills of a group of international students with English as their second language. This research did differentiate undergraduates from postgraduate students and conducted a brief but useful comparison between the two groups. Bordonaro (2008) found that students at postgraduate level had better skills in deciding what were the key words to search, when to stop the search and what to select and use in their writing compared to undergraduates. However, the focus of this research was on students' searching skills. What particular IL needs students had in transforming information into their research context was not explored. Likewise, in the US, Mehra and Bilal (2007) explored the information-seeking needs of Asian research students, focusing on search engines, the internet, the library website and online databases. Similar to both Bordonaro's (2008) and Morrissey and Given's (2006) findings, Mehra and Bilal (2007) concluded that international students had difficulty in information seeking due to language and cultural differences. They also found that being unfamiliar with the research process was another key barrier during their information seeking. However, the perspectives of information use such as information evaluation in students' research studies are missing in this research.

The literature has highlighted international HDR students' language and cultural issues as the main factor that caused problems in the use of the library and searching e-resources. However, there is little research exploring the IL needs of international HDR students within their specific research context or discipline and while writing their PhD theses, where on average they engage with 150-300 references (University of Adelaide 2008). HDR students are expected to demonstrate advanced information competencies which will enable them "to evaluate information and to critique its relevance and appropriateness to their context [and] to understand how to integrate relevant and appropriate information with what they already know to construct new knowledge" (Dorner and Gorman 2006, p. 284).

The project reported in this paper attempted to address the gaps in the existing research around the support provided to international PhD students from Asia at the beginning of their study. By collecting and analysing the participants' reflective accounts of their IL experiences during the first

fifteen months of their study in Australia, evidence is provided, highlighting where and how support by supervisors and academic librarians could make a positive impact on the study experiences of this cohort.

3. Method

This research was a longitudinal study utilising a biographical narrative approach. The current dominant evidence-based qualitative approaches such as interview and observation often miss or neglect the complexities of learning through life experiences (Merrill and West 2009). A biographical narrative approach has the potential to provide in-depth, quality data by illuminating important personal insights that are initiated by the participants themselves. As such it offers an alternative perspective to interviews and observations in which the researcher's input often drives the data collection. Biographical narratives are rooted in qualitative/naturalistic research methods where the individual, operating within a specific context and a particular time, is the focus of the study (Lincoln and Guba 1985). As a participant-centred method this approach makes a valuable contribution to the field of qualitative research. It has the potential to address the deficit within 'quantitative only' research methods which can result in the "marginalization of the human subject in research under the banner of objectivity and generalisability, modeled on the natural sciences" (Merrill and West, 2009, p. 3). A biographical narrative approach for this research was selected due to the strength and style of the data that can be generated. The researcher wanted to allow the participants freedom to express their thoughts and feelings without interruption. Specifically this method was chosen as it provided a personal forum where participants could speak frankly, freely without prejudice, informally and sincerely about the issues that were of concern to them.

Early in 2008 the newly enrolled cohort of international PhD students within an Australian university was contacted and invited to participate in this study. Participant information was forwarded to them via email and informed consents were received (the University's Ethics Committee Approval ID# EC00314). The participants were asked to keep e-journals for the first fifteen months of their PhD studies, recording reflections on 1) life and 2) study experiences which they felt were significant and impacted on them during their research studies (e.g. those which were challenging, surprising, interesting and/or un/successful experiences). There were no specific inclusions or exclusions to the type or number of entries they wished to make. The participants were not expected to record their reflective accounts as pieces of academic English writing. The genre in the writing of their reflections was akin to recollections. All participants had passed the International English Language Testing System (IELTS) at a score of eight or higher in order to enroll as PhD students. This indicates that their English proficiency was more than adequate to maintain a comprehensive and meaningful collection of reflective accounts. The researcher provided an explanation of the concept of IL, and the participants were asked to record any experiences relevant to this as well as any other issues they wished to highlight.

Three international research students from China within an education PhD program decided to participate in this study. All three were female and aged between forty and forty-five. These students had a similar educational background, having completed their graduate degrees in China in the early 1990s when text-based didactic methods were the dominant pedagogy. Their careers in China (prior to enrolling in their HDR program) were as teachers of English. Each had an established track record as a successful academic in their respective Chinese universities. In this way, the participants had homogeneity across their cultural, linguistic and educational backgrounds, as is often not the case in research with international students (Hughes 2004). Prior to the data analysis, a framework adapted from Bruce's (1997, p. 115) Seven Faces Model of Information Literacy was employed to categorise the data. These seven categories informed the development of the following three categories (Table 1):

1) Information technology learning (aligns with Bruce (1997) Face 1 - Information technology). This category was proposed to enable the researcher to code data entries concerned with software, the university's webpages, and the library as these are the prerequisite skills students need for research.

2) *Information access, process and control* (combines Faces 2, 3 & 4 - Information sources, information processes and information control). The researcher recategorised the three faces into one for streamlining the data analysis when focusing on participants' experiences with information location and management.

3) *Information transformation* (the synergy of Faces 5, 6 & 7 - Knowledge construction, knowledge extension and wisdom conception). Within this category, the researcher would be able to assign excerpts from the participants' data entries relating to their experiences with critical use of information.

Table 1: Bruce's IL categories (1997) and the IL categories in this study

Seven Faces Model of Information Literacy (Bruce 1997)			Data coding framework in this study		
Conceptual categories		Statement (a range of actions people do with or about the information) IL is:	Conceptual categories		Statement (range of actions identified in the students' reflections)
Face	Category label			Category label	
1	Information technology	Using information technology for information retrieval and communication	1	Information technology learning	Basic skills of information use, including familiarity with the academic library, computer technology and supported software programs available at their university
2	Information sources	Finding information located in information sources	2	Information access, process and control	Student reflections relating to their experiences with information location and management (incorporating the processes of 'how to' use software and the internet to locate information and manage and control information)
3	Information process	Executing a process			
4	Information control	Controlling information			
5	Knowledge construction	Building up a personal knowledge base in a new area of interest	3	Information transformation*	Student reflections relating to critical use of information; paraphrasing and interpreting information; analysing information and evaluating information critically
6	Knowledge extension	Working with knowledge and personal perspectives adopted in such a way that novel insights are gained			
7	Wisdom conception	Using information wisely for the benefit of others			

*Information transformation in this study means that the students transform the meaning of what they read into their own words. This is different from Bruce's (1997) concept of information transformation, which means an expansion of the subjects' knowledge and understanding of the world.

The data were systematically organised and analysed through a four-step process as indicated below:
Level 1 Data entries were categorised into life experiences and study experiences (Table 2)

Level 2   Data within the categories of life and study experiences emerged into three
          dimensions (Table 2)
Level 3   Data under the dimension of 'IL' (the focus of analysis and discussion in this paper)
          were categorised using the previously developed framework as a rubric (Table 3)
Level 4   Representative excerpts were selected, analysed, discussed and related to current
          literature

3.1 Limitations

The research design for this study draws on the qualitative tradition and therefore is not intended to be representative of other Chinese or other international higher degree research students. Likewise the participants in this study were in the field of education, and therefore their IL needs within their research context may be different to those of students enrolled in other disciplines.

4.   Results and discussion

A total of 222 journal entries (159 life-related reflections and 63 study-related reflections) were recorded and collected. Table 2 has summarised the complexity, timing and sequencing of the 222 reflections recorded by the participants.

Table 2: Participants' reflections: summary

Life Reflections (n=159)			Semester	Study Reflections (n=63)		
A Connection to China	B Local (Aus)	C Personal		D Theoretical Understanding	E Research Methodology	F IL
17	6	34	Semester 1	2	8	13
12	5	40	Semester 2	6	6	10
8	7	30	Semester 3	0	9	9
37 (24%)	18 (11%)	104 (65%)	Subtotal	8 (13%)	23 (37%)	32 (50%)
159			Total	63		

The data related to the participants' life experiences were divided into three dimensions. These were *Connection to China* (A), *Local – Australian* (B) and *Personal* (C). Two thirds (65%) of the reflections were associated with personal/emotional events experienced by the participants during the data collection phase. The data related to study experiences also emerged into three dimensions. These were *Theoretical Understanding* (D), *Research Methodology* (E) and *IL* (F).

Of the 63 reflections related to their studies, just over half (i.e. 32 reflections) were concerned with their IL experiences during their PhD studies. This may indicate that the participants had significant concerns with their information use during the first half of their PhD studies. Within the 32 reflections, 9 themes emerged (Column 1, Table 3). Using the researcher-developed IL framework, these were categorised into 1) *Information technology learning*, 2) *Information, access, processes and control,* and 3) *Information transformation* (Column 2, Table 3).

Table 3: Participants' reflections of IL events: summary

Column 1: Themes from the participants' reflections	Column 2: Category of IL experience*		
	1. Information technology learning (Face 1)* N = data entries	2. Information, access, processes and control (Faces 2-4)* N = data entries	3. Information transformation (Faces 5-7)* N = data entries
Learning the use of the library Learning computer technology Learning software	3 4 5		
Searching and accessing information (e.g. how to use a database for a literature review) Internet searching (e.g. how to use a search engine to locate complementary information) Using software to organise information (e.g. using NVivo to control and analyse data)		3 3 4	
Paraphrasing and interpreting information Analysing information Assessing and evaluating information critically			3 4 3
Total N=32	**12 (38%)**	**10 (31%)**	**10 (31%)**

* Categories adapted by the researcher based on Bruce's (1997, p. 115) Seven Faces Model of Information Literacy (Table 1)

The total number of reflections recorded in each of these three categories revealed that students had concerns with the basic skills of information use, including familiarity with the academic library, computer technology and supported software programs available at their university. Such issues have been explored by previous research (Bordonaro 2008; Mehra and Bilal 2007; Mu 2007). However this data revealed that 62% of the students' reflections were concerned with *Information access, processes and control* (incorporating the processes of 'how to' use software and the internet to manage and control information) and also *Information transformation* (which as explained earlier involved interpreting the information through paraphrasing brought about by critical evaluation and analysis). These issues have not been investigated to any great extent in the literature. The following section presents an analysis and discussion of representative excerpts from each theme.

4.1 Information technology learning experiences

The three themes which emerged in the category of *Information technology learning* were: 'Learning the use of the library', 'Learning computer technology' and 'Learning software'. The three participants (Hua, Feng and Ling) openly shared their experiences, examples of which provided insight into some of the challenges they faced during their studies (Table 4).

Table 4: Information technology learning: data entries

Themes from participants' reflections	Excerpts from data entries relating to: **Information technology learning**
Learning the use of the library	*Once you are familiar with the system, you don't have to think about how or where to locate that resource you need. But it didn't come to me easily. Before the library orientation, I spent quite a bit of time, doing Google searches, later on I was recommended Google Scholar. I had no idea of what a "database" was and what that was for. Data in Chinese means "number and evidence." How could articles be related to number and evidence? The orientation was quite brief and quick. But a few things I remembered after the workshop: go to "catalogue" for books, and e-resources for e-journal articles, go to "ProQuest" for articles in education. But what is "ProQuest"? What does this word mean? Back at the university where I was teaching, there are some e-resources, but they were just labelled like "Education," "History," "Language" etc. I preferred to borrow real books. Books can give more information* (Hua).
Learning computer technology	*Believe it or not. It took me a few months to get familiar with 2000 version Microsoft. There are so many icons on the top and the bottom. A clumsy story I could remember is: when I first started to summarise those articles I read, my supervisor asked me to use Font 12 which is the normal/popular size people use. I did, but it was so small and stretched my eye too much so I had to change the font to size 16 while I was typing and I changed it back to 12 after I finished the typing. I felt it was so annoying to keep doing this. One day I went down to the library and asked the librarian my stupid question: Is there any way that I don't have to do the forward and backward font change? She said: yes. I'll show you. There is magic here. You use the zoom in and out. Don't change the font size; change the white paper size ....* (Ling)
Learning software	*My mathematics is never good. That discouraged me to try SPSS training. I asked people around and they all told me it was not easy to learn. But I had no other choice because my data are statistics and numbers from published documents (not interviews and not observations). The University provided a three day training (paid an external expert to run the workshop). I went but was totally confused. I guess that was for people who had had some foundation knowledge. I found each PhD student was allowed to have five hours of tutorials. I only went for three hours because I could tell that the tutor was not happy to help more (not sure how the University paid her). I had nobody to rely on. David (Supervisor) is not a quantitative person. I finally found that online Forum. People talked about qualitative and quantitative methods there. I have been posting questions but haven't received helpful answers. I borrowed a big pile of books from the library. I am sure I will get there but not sure how* ☹…(Hua)

The research evidence confirms that these Chinese students needed support in order to gain adequate knowledge of library use in Australia. A significant issue was the limitation and/or difference with the IL education and practice they had experienced in their home country. The participants in this research had received their graduate degrees in mainland China in the early 1990s when the existing library system was based on hard copies of books and journals available within the library for borrowing. The new system of electronic-based library services proved to be a challenge for them. This finding confirms Morrissey and Given's (2006) research that reported students' previous library experiences had a significant influence on current practice of library use in Australia.

The 'Font' story (Table 4) indicated Ling's limited understanding of computer technology. For computer-literate writers, *font* and *zoom in/out* would be simple and basic, and used frequently, but

this was not the case for Ling. Eckel (2010, n.p.) argues that "It is no longer enough to assume that graduate students received this [IL] training when they were undergraduates or will learn it on their own". Academic librarians and research supervisors cannot assume that most or all international HDR students have learned computer technology or other IL skills through their undergraduate or previous postgraduate study.

In order to advance her technology skills in preparation for future data analysis, Hua registered for an SPSS training session. However, she failed to gain the necessary skills from the workshop which she felt related to her lack of the prerequisite statistical and mathematical background knowledge. This situation was further exacerbated as she found little support from her supervisor or any librarians. Liu and Winn (2009), Mehra and Bilal (2007) and Morrissey and Given (2006) all argue that language and cultural differences are two main barriers to international research students' development of IL skills. However, Hua's story indicates that language and cultural support are not enough to address the challenges they faced. This is particularly true at the level of postgraduate research, and, as indicated above, interdisciplinary knowledge across students' research contexts would need to be fostered.

4.2   Information access, process and control experiences

Three themes related to the category of *Information access, processes and control* were identified as 'Searching and assessing information', 'Internet searching and 'Using software to organise information' (Table 5).

Table 5: Information, access, processes and control: data entries

Themes from the participants' reflections	Excerpts from data entries relating to: Information access, processes and control
Searching and accessing information (e.g. how to use a database for a literature review)	*I guess my supervisor thought I knew how to do a literature review, but when I look back I didn't. I found heaps of articles relevant to my topic by using Google search. Some are newspaper articles and online forum discussions which are not formally published. I used them all in my literature review. A lot of time was wasted on that. After reading my first draft of my literature review, my supervisor realised my problems. Maybe because resources in China that can be accessed are limited, people wouldn't worry too much about how old the reference is and where it is published. Who cares whether it is published in an international quality e-journal or non-refereed local one?* (Hua).
Internet searching (e.g. how to use a search engine to locate complementary information)	*At the beginning, I couldn't tell the authors' gender according to their name. I don't have enough knowledge about name and gender. This makes the reference (anaphoric reference) difficult. It is quite daunting when you are not sure when author is "he" or "she". One day I woke up: Why not try Google search to find the author's/authors' biography before I start to read their articles? I started to search information about the author, his/her research area and sometimes I could see their online photo. Now when reading the material, I knew who I am facing and having "academic conversation" with. Sometimes when needed, I sent an email to the author to chase more related articles. Usually they are happy to help and support.* (Ling)
Using software to organise information (e.g. using NVivo to control data)	*NVivo is very complicated software. The word itself did not make much sense to me. I went to the workshop twice. The first time it was pretty overwhelming. There were too many "abnormal" words that had different meaning from what I understood. Export, import, teamwork, Node, report, project etc. all sort of lost their traditional meaning. I would prefer to manage my data manually to avoiding learning this new stuff, but my supervisor was there pushing me: "Did you go? Did you go? Go to learn and come back to teach me!" The second time I went, I got a clearer picture. I could concentrate on the data managing process rather than had to work out the meaning of those familiar but strange words. I never had similar training before either as a student or later on as a lecturer in China… When I began to analyse data, NVivo rewarded me greatly, especially in my data coding, and information search. I identified the concepts and coded the words containing the concept into a free node with the concept as the name of the node. When different interviewees mentioned that same concept, I coded their relevant words under the same node. Later I categorised the free nodes and moved them into tree nodes. It is quicker to use NVivo. It gives me an overview of who said what concepts for how many times …* (Feng).

When confronted by tasks requiring *Information access, processes and control,* the participants based their endeavours on the knowledge they had from their previous education. As can be expected, students begin with what they know and what has been successful in the past. When commencing her literature review, Hua utilised Google to search for relevant articles. This resulted in her initial literature review including non-refereed and unscholarly references. Her experience is consistent with the research conducted by Liu and Winn (2009), who reported that international research students were heavily reliant upon Google in searching and were lacking in the ability to evaluate the quality of their resources. However, there seemed to be no instruction from Hua's supervisor or from librarians about what was expected in terms of the quality of the publications that needed to be drawn upon for her research. She commenced her literature review as she always had, based on her previous experience in her home country where academics were not concerned about the publishing date and the quality of the resources. An intervention especially at

the start of her studies by research supervisors and/or librarians would have enhanced her learning experience.

Ling had problems in identifying some authors' gender for the purpose of making reference to their work using the pronoun. This may be because she lacked the knowledge of the link between name and gender in English (Liu and Winn 2009; Mehra and Bilal 2007; Morrissey and Given 2006). This problem could also be attributed to the authors of the resources referred to being from language and ethnic backgrounds other than English; hence gender identification by name could be difficult for all students (e.g. English-speaking students). For Ling it was "quite daunting", caused frustration and added one more barrier to her information use. Fortunately, by relying on a Google search, she was able to access most of those authors' profiles and photos and was able to solve the problem on her own. She also discovered that using this approach enabled personal contact with the author and resulted in the sourcing of other related articles or useful information. Visualising the author's face when processing the information and having scholarly communications with the author were both very positive experiences for Ling. Therefore this strategy could be recommended to other research students.

In learning to use *software to organise information,* Feng was challenged by the technical terms in English and the information technology itself. The terms related to data analysis had been assigned meanings other than the literal English meaning. This distracted Feng from an initial understanding of the data management and analysis process. Feng believed that her *zero* software training in China was a key factor in the difficulty she confronted. The reflections recorded by Feng indicated the need to provide hands-on workshops that meet the language and technology needs of international research students. Importantly, librarians need to be aware that providing the workshops multiple times will enhance the learning experiences of international students. In Feng's case, she learnt considerably more during her second attendance at the NVivo workshop. Liu and Winn's (2009) research also found that international students struggled with understanding the terminology and discourses of the university library. The labelling of concepts within the contexts of the university library and information science proved to be arbitrary in terms of the students' existing knowledge of these concepts. For example, Feng's attempts to come to terms with the literal meaning of "export", "import" and "node" when learning the terminology relevant to Nvivo generated a great deal of confusion. Whilst some local students may also find this challenging, international HDR students who are not familiar with this type of academic terminology in English need additional support by librarians and research educators alike.

4.3 Transforming information experiences

Throughout the fifteen months of data generation the participants reported significant challenges when attempting *Information transformation*. The specific themes emerging from their data entries included their experiences when *Paraphrasing and interpreting information, Analysing information* and *Assessing and evaluating information critically* during the drafts of their thesis writing (Table 6).

Table 6: Information Transformation: Data Entries

Themes from	Excerpts from data entries relating to:

the participants' reflections	**Information transformation**
Paraphrasing and interpreting information	*I found some of the ideas from the articles I read, I can say, I just shared those ideas therefore when I first did the literature review, I deliberately did not use in-text reference because I thought that happened to be my idea. Why do I have to cite "him"/ "her" otherwise I am a plagiarist? Plus in Chinese scholarly writing we cite in a different way. A lot of journals accept non-in-text citations, which means you don't have to acknowledge the author in the text if you didn't use direct quotes. Plus I felt embarrassed that everything I read had to be cited in the text. That would be like telling the reader that nothing is out of me. Another thing that confused me was most of the times I found the author/authors has/have perfectly described or argued for/against an idea and I don't have the ability to paraphrase it better so I leave it as direct quote* (Ling).
Analysing information	*I have read so many papers recently, but always struggled to summarise them and use them in my thesis. I need to find the right 'glue' to stick all the pieces together. I know simply collecting them together and leaving them in is not the solution and it is still loose but not sure how to make the connection. Noel (the supervisor) always made changes for me and after his magic, the piece of work always looked different and the logic appeared. I wish I could have the skills* (Hua).
Assessing and evaluating information critically	*…doing data analysis, I found 11 out of the 12 participants (University lecturers) said they would give extra support to international students when needed while only one in the group said it would be against equity policy if he does so, so he decided to treat everybody the same. I deliberately chose to ignore the one person's opinion on that issue. … An occasional chance brought me to that topic in a talk with my supervisor. I said I deleted that single idea from that person. He immediately replied: "No, no, no. Get it back. That is the most valuable data. Think about "What is equity? Does equity mean treating everyone the same? Or does it mean giving each student the help they need?" I have to admit that I had the intention to report the positive side and keep silent on the negative aspect of the world. I guess the cultural politics where I am from, influenced me on that* (Feng).

In transforming the literature into their own writing, these students experienced major *paraphrasing* and citing difficulties. It is understandable that most international HDR students would feel unable to paraphrase the idea or the sentence better than the author of the original text. For Ling, the tendency to include large volumes of direct quotations within her writing reflected the fact that she was not confident to paraphrase the information located. Another challenge for Ling was the dichotomy between the Western scholarly referencing style and that experienced in her own academic culture, where for example in-text citation was unnecessary in some Chinese academic journals. Ling's data entries lay claim to her experiences with two significant challenges. In solving the referencing issue, she could have sought assistance from an academic librarian or relied on self help by consciously noting the referencing style in current journal articles. However, to learn the skill of paraphrasing, explicit instruction provided by the research supervisor would be a viable solution. Ling's reflections did not indicate that the supervisor helped her to master such a process.

Composing a literature review requires the production of a meaningful text which goes beyond the collection of random pieces of information. When organising and incorporating the information of others into her own research context, Hua needed to demonstrate the ability to *analyse information* and present it in a cohesive, efficient and logical way. She recognised that she lacked the strategies to enable her to successfully achieve this. She noted that after the supervisor had edited her work, it had become more analytical and cohesive and thus the draft of her literature review was greatly improved. However in this situation, Hua did not learn 'why' the edits were made and 'what convention' had been applied and might need to be applied in her future work.

In *assessing and evaluating information* Hua was challenged by her previous cultural value system. That is, she deliberately chose to seek positive commonality and ignore negative difference in her data analysis. This tendency to report the positive and optimistic aspects of the context was an intrinsic approach Hua had developed. Objectively acknowledging the negative and the *missing* information was a new and challenging experience for her and likely for other international students from China. Liu and Winn (2009) argue that cultural differences result in international students keeping problems to themselves, being less likely to seek assistance from the librarian or to support initiatives designed to orient students to library use. However, Hua's reflection indicated that the cultural politics from her home country had caused her to evaluate data subjectively. The supervisor's immediate intervention prompted Hua to think more critically about information evaluation which resulted in a very positive learning experience for Hua, enabling her to apply critical competencies to later work.

5. Conclusion

This paper explored the self-reported IL experiences, challenges and needs of three international HDR students from China. The participants revealed that they experienced a series of significant IL challenges during their research studies. These included their experiences with learning information technology; accessing, processing and controlling information; and transforming information. These challenges were partly due to their unfamiliarity with the terminology of library and information science in the new learning environment and the previous academic culture and the political cultural value systems they experienced in their home country. More significantly, the challenges were derived from the nature of their research studies, which demanded an advanced level of IL. Undertaking their research degree required these students to have more comprehensive IL. For example, they needed to be able to assess the quality of the information to be used and to evaluate it critically. They also required interdisciplinary knowledge (such as knowledge in statistics and information science) to successfully process and control information. It cannot be assumed that HDR students, including those with English as a second language, have developed advanced IL skills simply because they are undertaking a 'higher' degree. The students in this study were able to implement some independent problem-solving capabilities after grappling with difficult and challenging situations. However, they clearly needed intensive intervention by the research supervisor and/or the academic librarian in this process. Based on the findings of this research some recommendations are proposed as follows:

- Clarifying the procedures of library use, including the discourses and terminology, needs to be addressed by research supervisors and liaison librarians (e.g. this is particularly important for mature international students who are likely to have had previous library experience only with hard copies of books and journals);
- An intervention by research supervisors and/or librarians when international HDR students commence their study should focus on introducing students to library databases rather than Google scholar only. Accompanying this should be information on the evaluation of quality resources;
- Offering 'repeat' workshops for IL training, where tutors or trainers realise the discourse of IL is difficult for students with English as an additional language (the literal English meaning of terms is lost);
- Interdisciplinary knowledge (for example, in operating SPSS, knowledge in statistics and information science for processing data/information) needs to be fostered within international HDR students' research contexts; and
- Research supervisors need to explicitly teach international HDR students information transformation skills such as paraphrasing and/or using direct quotations.

These recommendations are offered as a basis for further debate around enhancing quality research education and positive learning experiences for international HDR students with English as second language.

Acknowledgements

References

Barret, A. 2005. The information-seeking habits of graduate student researchers in the humanities. *The Journal of Academic Librarianship* [Online] 31(4), pp. 324-331. Available at: http://dx.doi.org/10.1016/j.acalib.2005.04.005 [Accessed: 28 April 2012].

Bordonaro, K. 2008. Exploring the connections between information literacy and writing for international students. *Journal of Information Literacy* [Online] 2(2), pp. 1-17. Available at: http://ojs.lboro.ac.uk/ojs/index.php/JIL/article/view/RA-V2-I2-2008-1/165 [Accessed: 28 April 2012].

Bradley, D., Noonan, P., Nugent, H., and Scales, B. 2008. *Review of Australian higher education report* [Online]. Available at: http://www.deewr.gov.au/highereducation/review/pages/reviewofaustralianhighereducationreport.aspx [Accessed: 24 January 2011].

Bruce, C. 1997. *The seven faces of information literacy*. Adelaide, SA: Auslib Press.

Bruce, C., Edwards, S., and Lupton, M. 2006. Six frames for information literacy education: a conceptual framework for interpreting the relationships between theory and practice. *ITALICS, Innovation in Teaching and Learning in Information and Computer Sciences* 5(1).

Catts, R. and Lau, J. 2008. Towards information literacy indicators [Online]. UNESCO: Paris. Available at: https://dspace.stir.ac.uk/bitstream/1893/2119/1/cattsandlau.pdf [Accessed: 28 April 2012].

Chen, Y., and Ullen, M. 2011. Helping international students succeed academically through research process and plagiarism workshops. *College & Research Libraries* [Online] 72(3), pp. 209-235. Available at: http://crl.acrl.org/ [Accessed: 28 April 2012].

Dorner, D., and Gorman, G. (2006). Information literacy education in Asian developing countries: cultural factors affecting curriculum development and program delivery. *IFLA Journal* 32(4), pp. 281-293. Available at: http://dx.doi.org/10.1177/0340035206074063.

Eckel, E. 2010. A reflection on plagiarism, patchwriting, and the engineering master's thesis. *Issues in Science & Technology Librarianship* [Online]. Available at: http://www.istl.org/10-summer/viewpoint.html [Accessed: 31 January 2011].

George, C., Bright, A., Hurlbert, T., Linke, E., St. Clair, G., and Stein, J. 2006. Scholarly use of information: graduate students' information seeking behaviour. *Information Research* [Online] 11(4), Paper 272. Available at: http://InformationR.net/ir/11-4/paper272.html [Accessed: 28 April 2012].

Gide, E., and Wu, M. 2010. Strategies to teach information technology courses to international students as future global professionals: an Australian case. *Procedia Social and Behavioral Sciences* 2, pp. 4793–4799. Available at: http://dx.doi.org/10.1016/j.sbspro.2010.03.772.

Hughes, H. 2004. Researching the experience of international students. In *Lifelong learning: Whose responsibility and what is your contribution? Refereed papers from the 3rd International Lifelong Learning Conference*. Yeppoon, Australia, 13-16 June 2004.

Hughes, H. 2010. International students' experiences of university libraries and librarians. *Australian Academic and Research Libraries* [Online] 41(2), pp. 77-89. Available at: http://search.informit.com.au/fullText;res=APAFT;dn=201100655 [Accessed: January 2012].

Hughes, H., and Bruce, C. 2006. Cultural diversity and educational inclusivity: international students' use of online information. *International Journal of Learning* [Online] 12(9), pp. 33-40. Available at: http://eprints.qut.edu.au/5024/ [Accessed: 28 April 2012].

Lincoln, Y., and Guba, E. 1985. *Naturalistic Inquiry*. Newbury Park: Sage Publications.

Liu, G., and Winn, D. 2009. Chinese graduate students and the Canadian academic library: a user study at the University of Windsor. *Journal of Academic Librarianship* [Online] 35(6), pp. 565-573. Available at: http://dx.doi.org/10.1016/j.acalib.2009.08.001 [Accessed: 28 April 2012].

Mehra, B., and Bilal, D. 2007. International students' perceptions of their information seeking strategies [Online]. Paper presented at *Information Sharing in a Fragmented World: Crossing Boundaries*. McGill University, Montreal, Quebec, 10-12 May 2007. Available at: http://www.cais-acsi.ca/proceedings/2007/mehra_2007.pdf [Accessed: 28 April 2012].

Merrill, B., and West, L. 2009. *Using Biographical Methods in Social Research*. London: Sage.

Morrissey, R., and Given, L. 2006. International students and the academic library: a case study. *Canadian Journal of Information & Library Sciences* [Online] 30(3/4), pp. 221-239. Available at: http://www.cais-acsi.ca/journal/journal.htm [Accessed: 28 April 2012].

Mu, C. 2007. Marketing academic library resources and information services to international students from Asia. *Marketing Information Services* [Online] 35(4), pp. 571-583. Available at: http://dx.doi.org/10.1108/00907320710838390 [Accessed; 28 April 2012].

Simmons, M. 2005. Librarians as disciplinary discourse mediators: using genre theory to move toward critical information literacy [Online]. *Portal: Libraries and the Academy* [Online] 5(3), pp. 297-311. Available at: http://dx.doi.org/10.1353/pla.2005.0041 [Accessed: 28 April 2012].

Singh, M. (2010). Connecting intellectual projects in China and Australia: Bradley's international student-migrants, Bourdieu and productive ignorance. *Australian Journal of Education* [Online] 54(1), Article 3. Available at: http://research.acer.edu.au/aje/vol54/iss1/3 [Accessed: 28 April 2012].

University of Adelaide. 2008. A PhD Thesis. Paper presented at the *Postgradforum*, University of Adelaide.

Williamson, K., Bernath, V., Wright, S., and Sullivan, J. 2007. Research students in the electronic age: impact of changing information behaviour on information literacy needs. *Communications in Information Literacy* [Online] 1(2), pp. 47-63. Available at: http://www.comminfolit.org/ [Accessed: 28 April 2012].

Zurkowski, P. 1974. *The Information Service Environment: Relationships and Priorities (Report ED 100391)*. Washington DC: National Commission on Libraries and Information Science.