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An Investigation of Information Literacy of International Graduate Students: Skills, Challenges, and Needs

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AN INVESTIGATION OF INFORMATION LITERACY OF INTERNATIONAL
GRADUATE STUDENTS: SKILLS, CHALLENGES, AND NEEDS

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ABSTRACT

Information literacy at higher education institutions is an important issue at the local and national levels. In 2000, the Association of College and Research Libraries (ACRL) created a set of information literacy standards and asked academic institutions to incorporate them into their college curricula (ACRL, 2000). The ACRL states that, to be considered information literate, a person must be able to recognize when information is needed and be able to locate, evaluate, and use effectively the needed information (ACRL, 2000). Academic institutions follow these standards to teach their students information literacy skills and assist them to become lifelong learners. Library literature indicates that international students face some linguistic, cultural, and technological challenges in using the library and learning information literacy skills. The purpose of this study was to examine the information literacy of international graduate students. It assessed their current skills and investigated their challenges and needs. Understanding the challenges international students face and exploring the factors associated with these challenges can be helpful to understand the academic needs of this group of students. The study was conducted on international graduate students at the College of Engineering and Computer Science (CECS) at University of Central Florida (UCF). The study used a mixed methods design. Quantitative data were collected through an online survey that was sent to all U.S. and international graduate students at CECS. Qualitative data were collected through interviews with a selected number of international graduate students at CECS. The findings of the study indicated clearly that international graduate students have a relatively low level of information literacy skills. The study also showed that U.S. graduate students have a better information literacy level than the information literacy level of international graduate students. The study

presented some implications and provided recommendations for future planning and

programming of outreach programs and library services for international students on campus.

This dissertation is dedicated to my wife Khawla and my son Dr. Bassam

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Earning my doctorate degree was a very interesting experience. I gained a lot of knowledge throughout my program, and I was able to achieve my lifelong dream. I wish to thank Dr. Thomas Cox, my dissertation chair, for his guidance, valuable advice, helpful suggestions, and kindness during the course of this study. I also wish to thank Dr. David Boote and Dr. Thomas Vitale for their guidance, valuable directions, suggestions, and support throughout the program. I am also grateful to Dr. Penny Beile for her encouragement and support throughout the study and for her willingness to participate as a committee member. Thanks are also offered to everybody in the UCF Libraries for their encouragement and support throughout the program of study. A note of gratitude is also offered to my brothers who were always supportive to me in my academic endeavors. Finally, I wish to thank my wife and my son Dr. Bassam, for their encouragement, forbearance, and understanding throughout the course of my study.

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LIST OF ABBREVIATIONS

ABET	American Accreditation Board for Engineering and Technology
ACRL	Association of College & Research Libraries
ACS	Associated Colleges of the South
ALA	American Library Association
B-TILED	Beile Test of Information Literacy for Education
CDL	Center for Distributed Learning
CECS	College of Engineering and Computer Science
IKM	Institutional Knowledge Management
ISTE	International Society for Technology in Education
NCATE	National Council for Accreditation of Teacher Education
NETS•T	National Education Technology Standards for Teachers
QEP	Quality Enhancement Plan
SACSCOC	Southern Association of Colleges & Schools Commission on Colleges
SCONUL	Society of College, National, and University Libraries
UCF	University of Central Florida
UNESCO	United Nations Educational, Scientific and Cultural Organization

CHAPTER ONE: INTRODUCTION

<u>Introduction</u>

Information literacy at higher education institutions is an important issue at the local and national levels. In 2000, the Association of College and Research Libraries (ACRL) created a set of information literacy standards (see appendix D) and asked academic institutions to apply these standards and incorporate them into their college curricula (ACRL, 2000). The ACRL is the source that the higher education community looks to for standards and guidelines on academic libraries. The association promulgates standards and guidelines to help libraries, academic institutions, and accrediting agencies to better understand the components of the excellent library (ACRL, 2016). The ACRL states that, to be considered information literate, a person must be able to recognize when information is needed and be able to locate, evaluate, and use effectively the needed information (ACRL, 2000). The ACRL standards included five standards and twenty-two performance indicators for assessing the information literate. The standards also list a range of outcomes to assess student progress towards mastering information literacy skills. The five standards are 1) The information literate student determines the nature and extent of the information needed, 2) The information literate student accesses needed information effectively and efficiently, 3) The information literate student evaluates information and its sources critically and incorporates selected information into his or her knowledge base and value system, 4) The information literate student, individually or as a member of a group, uses information effectively to accomplish a specific purpose, and 5) The information literate student understands many of the economic, legal, and social issues surrounding the use of information and accesses and uses

information ethically and legally (ACRL, 2000). The standards are a complementary cluster of abilities necessary to use information effectively in the contemporary environment of rapid technological change and proliferating information resources. In such environment, individuals are faced with diverse information choices, whether in their academic studies, in the workplace, or in their personal lives. Information is abundant, and it is increasingly coming to individuals in unfiltered formats, raising questions about its authenticity, validity, and reliability (ACRL, 2000).

In 2015, the ACRL updated the standards and adopted the Framework for Information Literacy for Higher Education (see appendix E). The newly adopted framework defines information literacy as "the set of integrated abilities encompassing the reflective discovery of information, the understanding of how information is produced and valued, and the use of information in creating new knowledge and participating ethically in communities of learning" (ACRL, 2015, para. 5). The framework included six frames with supporting knowledge practices and dispositions for each frame. These frames are 1) Authority is constructed and contextual, 2) Information creation as a process, 3) Information has value, 4) Research as inquiry, 5) Scholarship as conversation, and 6) Searching as strategic exploration (ACRL, 2015).

The framework grows out of a belief that the information literacy reform movement will realize its potential only through a richer, more complex set of core ideas. The rapidly changing higher education environment and the dynamic and often uncertain information ecosystem require new attention to be focused on foundational ideas about that ecosystem. Students have a greater role and responsibility in creating new knowledge, in understanding the contours and the changing dynamics of the world of information, and in using information, data, and scholarship ethically (ACRL, 2015).

Academic institutions follow the ACRL information literacy competency standards and the framework to help their students improve their information literacy skills and meet accreditation requirements. This issue is of importance to higher education institutions as accreditation organizations underscore the importance of information literacy as a learning outcome to college graduates by including such outcomes in their accreditation standards (Saunders, 2011). "Although accreditation standards assign responsibility for information literacy instruction to program faculty, the library's ability to customize information literacy instruction to individual programs places it central to delivery of information literacy instruction in the academy" (Beile O'Neil, 2005, p. 8).

Academic libraries provide information literacy services to both undergraduate and graduate students. Bishop (2015) points out that academic libraries are increasingly expanding their services and trying to outreach to specific user groups, including services to meet the unique needs of graduate students. Graduate students, as a specific library user group have diverse and unique research needs that academic libraries are taking into consideration in planning and expanding their outreach programs. To face the changing information literacy needs of students and the unique needs of graduate students, academic libraries are paying more attention to the role of the academic librarians in the institution. Academic librarians are required to have a better understanding of the changing and unique needs of the diverse groups of students. Therefore, "to facilitate potential expansions or additions to existing library services librarians must first gain deeper insights about the perspectives, dispositions, and needs of constituent groups" (p. 6).

The role of academic librarians is changing. This includes the support services provided by subject librarians and embedded librarians. Subject librarians are assigned with academic

departments or colleges to provide a variety of library outreach and support services, including library instruction, research consultations, and collection development (Bishop, 2015). Among the new and evolving roles and services of the academic librarian is the embedded librarian service. Embedded librarianship is currently a popular topic in libraries, and librarians know how to effectively connect with their patrons at their point of need (Becker, 2010). Embedded librarian programs locate librarians in spaces of their users to become a part of their users' culture (Drewes & Hoffman, 2010). Moreover, librarians can be embedded in both face-to face and online courses to provide research and information literacy services to instructors and students in these courses.

International students need special attention in library research and information literacy skills. International students have unique needs and face different challenges on campus (Natowitz, 1995; Baron & Strout-Dapaz, 2001; Cuiying, 2007; Morrissey & Given, 2006; Liu, 1993; Song, 2004; Ademodi, 2011; Wang & Frank, 2002). The term 'international student' refers to any higher education student who is coming from other countries to study in the United States and who is in the U.S. on a student visa. International students at U.S. universities and colleges are a growing population and their number is increasing (Institute of International Education, 2015). Academic libraries in higher education institutions have to accommodate these students and meet their needs on campus. Information professionals and providers must adapt their marketing skills, workforce, print and online collections, and services in order to meet the information needs of international students (Maud & LaVerne, 2008). Like in any other U.S. higher education institution, international students studying at UCF face some linguistic, cultural, and technological challenges in using the library and learning research and information literacy skills. This is evident when these students try to search for information, retrieve information, and

use information properly in their research and academic studies. International students bring with them some skills; however, they present new challenges to higher education institutions. Therefore, libraries should pay special attention to them and support their learning process (Jackson & Sullivan, 2011). The UCF Libraries provide effective library instruction services to both graduate and undergraduate students on campus, including international students.

Studying the information literacy and academic needs of international students is important for the UCF Libraries and UCF in general. It is important for the UCF Libraries as it is related to the ACRL Information Literacy Competency Standards for Higher Education and the Framework for Information Literacy for Higher Education, which institutions of higher education are encouraged and supposed to follow to assist their students to master information literacy skills. The UCF supports the teaching and learning process and values lifelong learning among students. The UCF Libraries also teach students information literacy skills and encourage them to be lifelong learners. Students who have information literacy skills are definitely better prepared to conduct quality research and succeed in their academic studies. In this regard, Mackey and Jacobson (2004) point out that students who are information literate are better equipped for today's multifaceted information environment than students who are not. The ACRL states that information literate learners are lifelong learners, more self- directed, and are able to master content, extend their investigations, and assume greater control over their own learning (ACRL, 2000). It is central to the mission of higher education institutions to develop lifelong learners. Higher education institutions ensure that individuals have the intellectual abilities of reasoning and critical thinking and help them to construct a framework for learning. (ACRL, 2000).

In addition to supporting the teaching and learning process and promoting information literacy skills and lifelong learning, the UCF values diversity and supports a diverse student population on campus and provides learning and teaching experience to its community, including international students. One of the five visionary goals that guide UCF is "to become more inclusive and diverse" (UCF, 2016b). Thus, the information literacy of international students is important to address.

Statement of the Problem

Context/Setting

This study took place at University of Central Florida - Orlando during the spring semester of 2016. The UCF is a public multi-campus, metropolitan research university. The university plays an important role in meeting the economic, cultural, intellectual, environmental, and societal needs of Central Florida region by providing high-quality education and learning (UCF, 2016a). The UCF Libraries, as one of the important university departments, play an important role in supporting the teaching and learning process on campus; the library supports learning and teaching, research, creation of knowledge, intellectual growth, and enrichment of the academic experience (UCF Libraries, 2016b).

The UCF Libraries follow the ACRL Information Literacy Competency Standards and the Framework for Information Literacy for Higher Education, to teach students research and information literacy skills to help them succeed in their academic studies and become lifelong learners. Library literature indicates that among the students who need special attention in library and information literacy skills are international students. International students face linguistic,

cultural, and technological challenges that negatively affect their adjustment to culture and influence their learning process on campus (Natowitz, 1995; Baron & Strout-Dapaz, 2001; Morrissey & Given, 2006; Liu, 1993; Song, 2004). The UCF Libraries have a library instruction program that includes a number of information literacy modules and provides students and faculty with information literacy classes and workshops. However, these information literacy classes and modules are designed for students in general, and they do not target, in any way, international students who have unique challenges and complicated needs.

Problem

Higher education institutions provide their students and faculty members with research and information literacy services to support their learning and teaching process. The UCF Libraries are guided by ACRL Information Literacy Competency Standards and the Framework of Information Literacy for Higher Education, and teaching information literacy skills to students is central to the mission of the UCF Libraries.

The problem addressed by this research is the perceived low level of information literacy skills of international graduate students who face linguistic, cultural, and technological challenges that negatively affect their ability to effectively search for information, retrieve information, and use information properly in their research and academic studies. Librarians agree that international students face several problems in using the library, including language and communication problems, adjusting to a new educational setting, the library system, and other cultural adjustments (Natowitz, 1995; Baron & Strout-Dapaz, 2001). In this regard, Baruzzi and Calcagno (2015) argue that "international students often have limited knowledge about what

is available to them through the library and may have experienced a very different type of library system at home" (p. 403).

The information literacy issue of international students affects different groups of people on campus. The first group of people who are affected by this problem are international students themselves. Lacking research and information literacy skills, international students may not be able to effectively locate, retrieve, and properly use information for their research and academic studies. Therefore, oftentimes this group of library users are not effectively utilizing library resources available for them and may develop a low level of motivation and self-efficacy in communicating with librarians and faculty. Moreover, understanding the challenges of these students and exploring the factors associated with these challenges can be helpful to improve their motivation and self-efficacy levels and assist them to adjust to the campus culture. Additionally, this will help the university and library to better understand the academic needs of this group of students and assist them in learning and mastering the information literacy skills they need to succeed in their academic studies.

The second group of people who are affected by this issue are the faculty members who deal with international students and the academic problems they experience in their classes. Oftentimes, international students do not know how to use and cite information sources properly in their academic writings, and faculty members do not like to see these students struggling in their classes and submitting assignments and research papers that may have clear evidence of plagiarism, whether intentional or unintentional. Therefore, a good number of faculty members collaborate with the university library and partner with academic librarians to understand the academic needs of students and incorporate information literacy skills into the curriculum of their courses in order to assist their students, including international students to learn these

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necessary skills. In this regard, Morrissey and Given (2006) argue that understanding the needs of students from particular countries enables librarians to meet these students' information needs. They maintain that librarians should contact professors as they can provide substantial information about the skill levels of their students.

The third group of people who are affected by this problem are academic librarians who deal with international students and are supposed to provide them with effective library services. The literature covering services to international students clearly supports libraries taking an active role with international students, especially that effective reference and instructional services can help international students find the help they need and raise their comfort levels. (Baron & Strout-Dapaz, 2001). Therefore, to help international students to use library resources effectively and master information literacy skills, librarians have to give international students special attention to meet their unique and complicated needs. In this sense, Cuiying (2007) points out that research indicates that librarians need to consider the characteristics of these learners and understand their learning styles, language proficiency, and their subjects of interests in order to design effective teaching materials for this group of students.

Organization/People

According to the UCF Institutional Knowledge Management (IKM) website and based on fall 2015 enrollments, the UCF is the largest university in the State University System of Florida and the second largest university in the United States. The university is a public multi-campus university accredited by the Southern Association of Colleges and Schools Commission on Colleges (SACSCOC) and is classified as a doctoral university with highest research activity.

The university has 13 colleges and offers 93 Bachelor's degrees, 84 Master's degrees, three Specialist degrees, 31 doctoral degrees, and a Professional degree in Medicine. In fall 2015, total enrollment was 63,016, with 54,527 undergraduate students, 8,029 graduate students, and 460 medical students. Graduate enrollment by gender was 3,344 males and 4,685 females. Enrollment by ethnicity was 53% white, 23% Hispanic/Latino, 11% Black/African American, 6% Asian, 3% Multi-racial, and 3% Non-resident Alien, and 1% unspecified (UCF, IKM, 2015b).

The College of Engineering and Computer Science (CECS) is one of the top public graduate engineering colleges nationwide. The mission of the CECS at UCF is:

To provide high-quality and broad-based education and experience-based learning in engineering and computer science, create knowledge through pioneering scholarship and impactful research, to enrich students' development and leadership skills, and address pressing local, state, national and international issues in support of the global community. (UCF, CECS, 2016, para. 1).

As reported by the CECS website, in fall of 2015, enrollment was 9,409 students, 8,072 undergraduate students and 1,337 graduate students. The college has 51 Professors, 45 Associate Professors, 30 Assistant Professors, 27 Lecturers & Instructors, and 89 Staff. The College offers twelve master's degree programs: Aerospace Engineering; Civil Engineering; Computer Engineering; Computer Science; Digital Forensics; Electrical Engineering; Engineering Management; Environmental Engineering; Industrial Engineering; Materials Science and Engineering; Mechanical Engineering; Modeling and Simulation. The college also offers nine doctoral programs: Civil Engineering; Computer Engineering; Computer Science; Electrical

Engineering; Environmental Engineering; Industrial Engineering; Materials Science and

Engineering; Mechanical Engineering; Modeling and Simulation (UCF, CECS, 2015).

The UCF Libraries play an important role in the teaching of information literacy to

students on campus. According to the 2014 - 2015 UCF Libraries annual report, as of June 30,

2015, the UCF Libraries system had 107 employees, including library administration, librarians,

and staff. The UCF Libraries currently have 24 reference and information literacy librarians who

are involved in teaching information literacy at the main campus library and other UCF branch

libraries (UCF Libraries, 2015).

Purpose of the Study

The purpose of this mixed methods research study was to explore and investigate the

information literacy skills, challenges, and needs of international graduate students at UCF. The

specific objectives of the study were:

1. To assess the current information literacy skills of international graduate students and

    highlight the necessary skills they need to succeed in their research and academic

    studies.

2. To understand the unique academic needs of international graduate students and examine

    the linguistic, cultural, and technological challenges they face in learning information

    literacy skills and utilizing library resources to search, retrieve, and use information

    properly in their academic studies.

Research Questions

The present study aimed to find answers to the following main research questions:

1. What is the information literacy skills level of international graduate students, as measured by the B-TILED assessment?

2. What is the difference in the information literacy skills levels between international graduate students at the master's degree level and international students at the doctoral degree level, as measured by the B-TILED assessment?

3. What is the difference in the information literacy skills levels between international graduate students and U.S. graduate students, as measured by the B-TILED assessment?

4. What are the self-reported challenges that international graduate students believe they face in learning information literacy skills?

5. What are the self-reported information literacy skills and library services that international graduate students believe they need?

Rationale for Study Design

This study used a mixed methods approach. Mixed methods research approach includes collecting, analyzing, and mixing both quantitative and qualitative data in a single study (Creswell & Plano Clark, 2007). Mixed methods has been defined as "a type of research design in which qualitative and quantitative approaches are used in types of questions, research methods, data collection and analysis procedures, and/or inferences" (Tashakkori & Teddlie, 2003, p. 711). Mixed methods research can also be defined as:

The type of research in which a researcher or team of researchers combines elements of qualitative and quantitative research approaches (e.g, use of qualitative and quantitative

viewpoints, data collection, analysis, inference techniques) for the purpose of breadth of understanding and corroboration (Johnson, Onwuegbuzie, & Turner, 2007, p. 123).

One rational for collecting both quantitative and qualitative data is that it is helpful in addressing the complex problems found in social science research. Mixing data collection and analysis provides a broader understanding of the research problem (Creswell, 2009). Using both quantitative and qualitative data in this study was more useful to capture the details of the complex problem of information literacy of international students and the linguistic, cultural, and technological challenges they face, especially at the graduate level. Quantitative methods provided a process to examine graduate engineering students' information literacy scores and identified indicators related to graduate engineering and computer science students' library research skills. Moreover, qualitative methods provided in-depth information about the perceptions of participants about library research and the utilization of library services and library instruction.

The other reason to combine data collection methods includes the triangulation of data. Researches combine quantitative and qualitative research to triangulate data for mutual corroboration of findings. Moreover, research methods associated with both quantitative and qualitative research have their own strengths and weaknesses, and combining them allows researchers to offset weaknesses and draw on the strengths of both methods (Bryman, 2006).

<u>Assumptions</u>

Underpinning this study are two assumptions. The first one is that international students have unique academic needs and face some linguistic, cultural, and technological challenges that

hinder their learning of library research and information literacy skills. The second one is that gaining effective library research and information literacy skills will promote international graduate students' academic success and support lifelong learning.

Definition of Terms

As described in this dissertation, the following list of definitions is provided.

Computer literacy: is related to the ability to use computers and computer systems effectively.

Information fluency: is the nexus of information literacy, computer literacy, and critical thinking (Associated Colleges of the South, 2003).

Information literacy: is a set of skills requiring individuals to recognize when information is needed and have the ability to locate, evaluate, and use effectively the needed information (ACRL, 2000).

Information literacy modules: are online instructional resources to teach students library research and information literacy skills. At the UCF, these modules were developed as part of UCF's university-wide Information Fluency initiative.

International Student: any higher education student who is in the United States on a student visa.

Library instruction: instruction provided for students by academic librarians. It includes face-to-face instruction, online instruction, and research consultations.

Library research: refers to critical thinking abilities and skills needed to search for information in library resources. It includes the ability to locate, evaluate and properly and effectively use the needed information.

Library services: refers to library services that include reference services, library instruction, research consultation assistance, embedded librarian services, online Ask A Librarian service, Document Delivery service, and orientation and outreach services.

Significance of the Study

The present study explained the information literacy problem of international students in general and international graduate students in particular. This research has the potential to contribute to theory related to library services for international graduate students as well as practice related to planning specific library services and library instruction for this group of library users. The B-TILED scores collected in this study serve as indicators of international graduate students' current information literacy competencies related to the general library research skills and the engineering and computer science - specific resources use. This study may prove significant in contributing to the overlooked area of research related to the unique research and information literacy needs of the international graduate students. The findings of the study can be used to make recommendations about future planning for library outreach as well as the utilization of library services for international students in general and international graduate students in particular. The perceptions of international graduate students can also be useful in providing insights that academic librarians can benefit from in creating and developing customized support and library services for international students and addressing related knowledge gaps. Results of this study will be of interest to faculty involved in information literacy instructional programs, professors of engineering students, library administration, and program review personnel.

Delimitations of the Study

The present study is confined to the University of Central Florida - Orlando and one graduate college, College of Engineering and Computer Science. Participants' responses are reflections of their personal experiences in the College of Engineering and Computer Science graduate programs and in using the university library.

Limitations of the Study

The following are some limitations associated with this study:

1. The survey in this study was distributed to students using their university e-mail account. Using this method alone may have had negative effect on the response rate. Using more than one mode can improve response rate (Dillman, Smyth, & Christian, 2009; Fowler, 2009).

2. A convenience sample was used in the study. Therefore, the sample may not be representative of the population, and the results may not be generalizable to the population.

Organization of the Study

The study has five chapters. Chapter one has presented the introduction, statement of the problem, research questions, purpose of the study, assumptions, delimitations and limitations of the study, definitions of terms, and significance of the study. Chapter two contains the review of related literature and research related to information literacy of international students, including international students, library instruction, information literacy, library services, and a brief

discussion of Bolman and Deal's (2013) Framework. The methodology and procedures used to gather data for the study are presented in chapter three. Chapter four contains the results. It presents the quantitative and qualitative analyses of the study. Chapter five contains a discussion, positioning the results with Bolman and Deal's (2013) Framework, a summary of the study findings, implications, conclusions, and recommendations for further study.

CHAPTER TWO: LITERATURE REVIEW

Introduction

The literature review presents literature in four broad areas and discusses sources that focus on: 1) international students, 2) library and information literacy instruction, 3) library services for international students, and 4) Bolman & Deal's Framework. The review begins with an overview of international students studying at U.S. colleges and universities and their characteristics and provides some research studies about international students. After that, the review provides an introduction to library and information literacy instruction. The review then, discusses library services, graduate students' information literacy, and provides some studies and examples of library instruction programs and services for international students. Finally, the review briefly discusses Bolman & Deal's Framework of leadership.

International Students

International students studying at U.S. universities and colleges are a growing population. International student enrollment in U.S. institutions has increased steadily over the past five decades, and according to data in the Open Doors 2014/2015 report, the number of international students studying on campuses in the United States is 974,926. In 2014/2015, international students increased 10% over the prior year, the highest rate of growth since 1978/1979. The top 10 places of origin of international students are China (31%), India (14%), South Korea (7%), Saudi Arabia (6%), Canada (3%), Mexico (2%), Brazil (2%), Vietnam (2%), Taiwan (2%), and Japan (2%) (Institute of International Education, 2015). Figure 1 shows the increase and growth rate of international students in the United States for the years 1953/54 – 2013/2014.
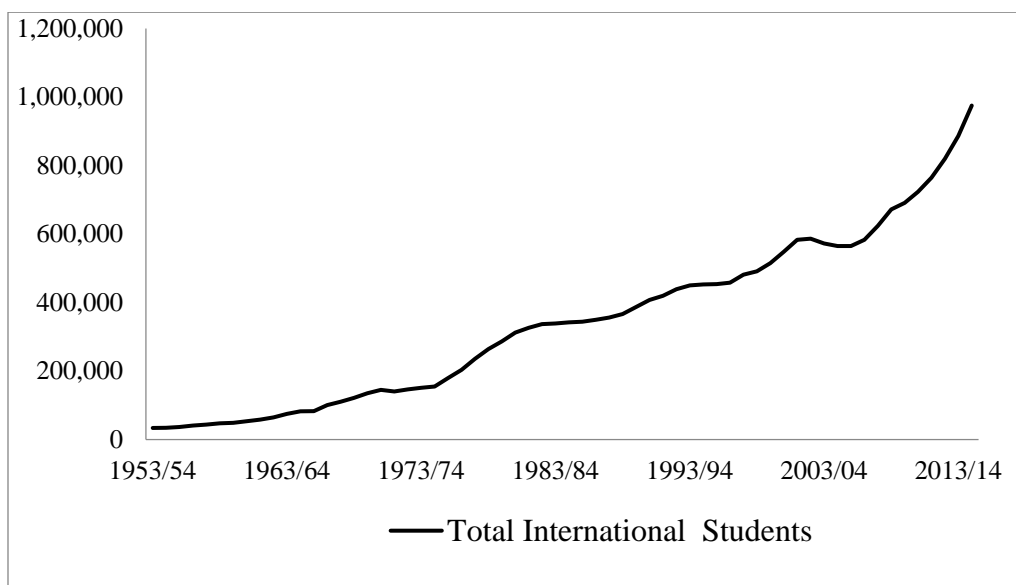
Figure 1: Growth Rate of International Students in the United States for the Years 1953/54 - 2013/2014.
Adapted from: Institute of International Education, 2015.

When international students come to the United States, they encounter cultural differences and face language and technology problems (Natowitz, 1995; Baron & Strout-Dapaz, 2001; Morrissey & Given, 2006; Liu, 1993; Song, 2004). International students, especially non-native speakers of English lack experience using library online resources, such as the database, indexes, abstracts, online catalogs, and the Library of Congress Classification System (Liu, 1993). International students bring with them special skills, but they also present unique challenges for education systems. Libraries play a critical role in connecting international students, not only to universities and colleges, but also to information literacy skills they need to succeed (Jackson & Sullivan, 2011).

Colleges and universities throughout the United States have benefited financially and culturally from the increased attendance of international students. Pandit (2013) points out that

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there is recognition that international students are valuable intellectual and economic asset, and that international students provide opportunities for domestic students to engage with students from different cultures, which allow them to explore new perspectives and gain intercultural skills. Thus, academic libraries should play an effective role in assisting these foreign students to adapt to the college environment and acquaint them with the information literacy skills they need to succeed.

International students' view of libraries and librarians may be different from what libraries look like in the Western world. This disconnect between their view of libraries and what actually exists before them in the United States can be significant (Hickok, 2011). Many of these students have not had librarians available to assist them with their research in their home counties and are often unfamiliar with the library resources and services of the Western library systems. Therefore, it is critical to clarify the role that librarians can play in their educational careers (Jackson & Sullivan, 2011).

Research on International Students

Research on international students' information literacy indicates that this group of students need special attention from academic librarians to learn information literacy skills. Many researchers have studied information literacy in general, but more attention should also be given to information literacy of international students. Baron & Strout-Dapaz (2001) point out that there is a need for a solid library skills set for international students, and they maintain that as international students become more information literate, problematic issues will be reduced. The ACRL (2000) confirms that in order to be considered information literate, a person must be

able to recognize when information is needed and be able to locate, evaluate, and use effectively the needed information. However, studies examining the information literacy needs of both national and international students have tended to focus on the students' skills of information searching and retrieval (Cuiying, 2007; Liu, 1993; Knight, Hight & Polfer, 2010) rather than students' information literacy needs in their research context.

A good number of studies on international students' information literacy were conducted in the United States and in other countries in the world. These studies focused mainly on the information seeking behaviors of internationals students and their perceptions of library services. More attention should also be given to the students' library research and information literacy skills they need in their discipline research context.

Liu (1993) conducted a study involving fifty-four mostly Asian students enrolled at the University of California - Berkeley. He collected data on students' previous library experience and academic environments, their problems in using American libraries, their strategies in solving the problems, and their suggestions for improving library services. The findings of the study indicated that students had insufficient English proficiency and unfamiliarity with Library of Congress Classification and Subject Headings. The findings also indicated that students were confused with the open stacks system in the library as well as concepts of plagiarism. The study discussed the problems and difficulties international students face on campus and made recommendations for improving library services for international students.

Baron and Strout-Dapaz (2001) discussed a project that synthesized past recommendations with a survey of academic institutions in the Southern U.S.A. regarding international students. They collected data from 123 colleges and universities. The findings indicated that both librarians and international students agreed that the major challenges

international students face are language and communication problems, adjusting to a new educational and library system, and general culture adjustments. The study confirmed that international students face certain challenges, and there is a need to meet their library and research needs, and that academic libraries need to provide training for international students.

Song (2004) examined perceptions and expectations of international students studying business at the University of Illinois at Urbana-Champaign. The study focused on using electronic resources. The survey included 143 international students, and the results indicated that a significant number of students did not have previous experience with electronic library services in their home countries, and that they had library needs.

Cuiying (2007) described information literacy programs and activities suitable to accommodate the information needs of Asian international students and what teaching methodology should be used with them. The study found that Asian international students had difficulties in using academic libraries. Students did not demonstrate an awareness of the services and resources available for their research and study in a Western academic setting. This research clearly indicated that reference librarians need to consider international students' characteristics, learning styles, language proficiency, and subjects of interests in their training programs.

Knight, Hight, and Polfer (2010) conducted a study about international students' use of academic libraries at three different college campuses. The study questioned why international students do or do not visit the library, their use of media, and their preferred information and communication resources. Data were collected from different sources that included a review of relevant literature, an analysis of academic library websites that offer information for international students, a poll of listservs, surveys of students, and focus groups. The findings of

the study indicated that international students are underserved. Also, results supported the fact that academic librarians can play a role in encouraging this group of students to use library resources and services.

A few studies explored international students in terms of the ACRL (2000) Information Literacy Competency Standards. In one of these studies, Morrissey and Given (2006) examined the experiences of Chinese graduate students using the University of Alabama Libraries. This study focused on students' information literacy skills and examined their information behaviors in the context of the ACRL (2000) Information Literacy Competency Standards for Higher Education. Qualitative interviews were conducted with nine Chinese students. The study concluded with recommendations for librarians to engage Chinese international graduate students and tailor information literacy sessions to their needs. The study highlighted the challenges international students face and the role of the library to assist them and teach them the necessary research and information literacy skills they need to succeed.

In another study, Ademodi (2011) examined reference service in academic libraries, especially as it relates to international students. The paper discussed the planning process for serving international students, the ACRL standards, the relationship of assessment to the standards, and the difficulties associated with the assessment process. In addition, the study investigated the nature, objectives, and value of reference service in academic libraries as well as the problems associated with reference service for international students.

Some studies addressed international students' problems in the areas of plagiarism and U.S. copyright law. These studies showed that plagiarism is a problem among international students, and that international students have difficulties understanding academic rules such as

plagiarism and copyright due to cultural differences (Liestman, 2000; Amsberry, 2009; Chen & Ullen, 2011; Zimmerman, 2012).

Liestman (2000) pointed out that international adult learners notably have unfamiliarity with many U.S. library services and related issues. The author discussed the cultural differences and emphasized that libraries can better meet the needs of international adult learners by determining their needs, which will improve library instruction. The author also emphasized staff training to improve the ability of library personnel to interact with this particular user group.

Chen and Ullen (2011) designed workshops on the research process and plagiarism to meet the needs of international students at the University at Albany. The plagiarism workshops focused on sources, quoting, paraphrasing, summarizing materials, citation styles, and avoiding plagiarism. The results showed that by attending the training, students achieved significant improvement and continued to apply the skills they learned several months later. The study showed that students may unintentionally commit plagiarism due to the lack of information literacy skills, especially that these students may encounter culture shock when facing instructional methods, assignment requirements, and writing styles that are different from what they experienced in their home countries.

Amsberry (2009) reviewed studies from various disciplines on plagiarism as a cross-cultural issue and examined cultural, educational, and linguistic factors that may influence the textual borrowing practices of international students. She found out that the reasons international students may employ inappropriate source use are complex, and she made recommendations for academic libraries as how to assist international students with understanding plagiarism through orientations, instruction, reference service, and web-based guides and tutorials. She pointed out that international students may have a different understanding of source use and textual

borrowing practices from the expectations held at American universities. This difference in expectations can lead to accusations of plagiarism and result in academic penalties.

Zimmerman (2012) described how plagiarism is related in the education of international students. He searched literature about plagiarism and presented some articles on the issue of plagiarism as it affects international students. He pointed out that there is a definite plagiarism problem involved in the interaction of international students in a higher education. The article noted that plagiarism is a serious problem on academic campuses, and librarians can play a significant role in deterring and preventing plagiarism, especially in regard to international students.

Gunnarsson, Kulesza, and Pettersson (2014) presented how a plagiarism component has been integrated in a research methodology course for Engineering master's students at Blekinge Institute of Technology in Sweden where the majority of the students were international students. The course director and librarians collaborated in developing the course. One part of the course was dedicated to how to cite, paraphrase, and reference, while another part stressed the legal and ethical aspects of research. In order to evaluate their approach to teaching about plagiarism, the authors conducted a survey. The results of the survey indicated students' need for education and help on how to cite and reference properly to avoid plagiarism.

The afore-mentioned studies were mainly information seeking behavior studies that showed the ways international students discover and use library services. Such studies can be used to inform how student services are implemented, but these studies have not always taken the necessary steps to implement services that will guide international students in addressing their research needs and information literacy skills, especially at the graduate level. Research at the graduate level requires advanced and sophisticated use of specialized information sources

and this applies to international students. Like other graduate students, international students need to be able to critically evaluate literature and to effectively synthesize information during their research process. As the above-mentioned studies indicate, in teaching library and information literacy to international students, academic librarians have a crucial role to play in order to provide these students with effective library services and information literacy skills. In this regard, the literature covering services to international students clearly supports libraries taking an active role with international students, especially that effective reference and instructional services can help international students find the help they need and raise their comfort levels (Baron & Strout-Dapaz, 2001). Therefore, to help this group of students to use library resources effectively and master information literacy skills, academic librarians have to give international students special attention in order to meet their unique and complicated academic needs. In this sense, Cuiying (2007) points out that librarians need to consider the characteristics of this group of learners and understand their learning styles, language proficiency, and their subjects of interests in order to design effective teaching materials for this group of library users. Additionally, librarians need to use effective and proper instruction methods in teaching information literacy to international students. This is crucial in the process of assisting this group of library users. As Mayer (2011) argues about the science of instruction, he points out that educators should be able to specify "which instructional methods work for teaching which kinds of knowledge to which kinds of learners under which kinds of circumstances" (p. 13).

Another thing these studies may indicate is that librarians have to motivate this group of students and help them develop a high sense of self-efficacy in using library resources, especially online library resources. The literature on international students and students in general indicates

that they may suffer from anxiety and may have a low sense of self-efficacy in using library resources. Grassian & Kaplowitz (2001) maintain that fear, unease, apprehension, panic are words long used to describe feelings about using libraries and library resources. Song (2004) points out that international students avoid using information technologies and online resources in the library because they feel intimidated by them, and "if they become intimidated by a variety of interfaces and formats, they may easily feel discouraged to use electronic resources any further" (p. 371). Therefore, while teaching research skills is important, "how to motivate international students to use electronic resources that they have never used before must be carefully considered when designing library instruction for them" (Song, 2004, p. 371).

Providing international students with library instruction and educating them on library resources and how to effectively utilize these resources can be very helpful to increase the self-efficacy level among this group of library users. Therefore, academic librarians should engage international students through outreach activities and events that occur on campus to encourage them to come to the library and attend information literacy classes. As Bandura (1997) points out, our self-efficacy exerts powerful effects on our levels of motivation. When students believe they are good at tasks, they work on them vigorously. Usher and Pajares (2008) argue that "understanding the sources that create and nourish self-efficacy beliefs require attending to factors that precede these factors. Even before students begin to interpret self - efficacy information, their preconceptions guide the way in which they experience that information" (p. 789). During the course of transition to studying at their host university, international students often encounter unfamiliar library processes and have to deal with new technologies. Consequently, "library professionals who are attuned to the strengths and

challenges of international students can play an important part in enabling them to become successful library users and learners" (Hughes, 2010, p. 77).

<div align="center">Library Instruction</div>

Academic institutions are working on defining information competencies and developing and integrating information skills instruction (Eisenberg, Lowe & Spitzer, 2004). Academic institutions, whether two-year or four-year colleges offer both undergraduate and graduate programs and share the same goal of educating their students for the Information Age. Academic libraries develop information literacy instruction programs and serve as support for their parent institutions. The emphasis of information literacy instruction in the academic library is on teaching the process of research. Such information literacy instruction should equip students, faculty, and staff to function independently and to meet their information needs and provide them with lifelong learning skills (Grassian & Kaplowitz, 2001).

<div align="center">*Library Instruction Background*</div>

Academic libraries of the seventeenth, eighteenth, and early nineteenth centuries in the United States often had small collections and offered patron limited physical access to collections. Librarians focused on acquiring and organizing materials, and patrons searched on their own (Saunders, 2011). By the late 1960s, library instruction, often referred to as bibliographic instruction, emerged as a vital force in academic librarianship, and the decade was regarded as the beginning of modern library instruction. Professional associations were founded and librarians were focused on providing library instruction to students. Developments in higher

education and in technology and the advent of the Internet and widespread access to information have had great influence on the evolution of library instruction and forced librarians to rethink both the content and the purpose of their instruction (Saunders, 2011). During the 1980s, these information technologies began to have a significant impact on libraries, librarians, and higher education in general. The information technologies of the 1980s accelerated changes within academic libraries by providing users direct access to more and larger information databases. Direct access to a variety of electronic databases became available to students and faculty, and librarians became concerned about teaching students the skills needed to be information literate in the Information Age (Deese-Roberts & Keating, 2000). Clearly, bibliographic instruction had the roots for what is known today as 'information literacy.' The term was coined by Paul Zurkowski in 1974 to describe the skills and abilities to use information tools that he perceived would be necessary to deal with the rapid increase in information (Saunders, 2011). With the rapid increase in the amount of information and the increasing availability of information technology, information literacy has quickly become one of the most vital sets of skills for the twenty-first century (Reidling, 2006).

Library instruction in higher education can take a variety of forms: stand-alone courses or classes, online tutorials, workbooks, course-related instruction, or course-integrated instruction (Eisenberg, Lowe & Spitzer, 2004). Academic libraries offer myriad selections of drop-in and scheduled classes for undergraduate students, ranging from a basic introduction to the library to specialized, course-specific research classes for upper-level students (Baruzzi & Calcagno, 2015).

These instruction programs usually teach library and information literacy skills in a sequential and logical way. Academic librarians always try to deliver research and information

literacy skills systematically and try to find the right combination of one-shot, course-integrated, and credit bearing information literacy classes to meet the diverse needs of students and faculty. Some libraries have library services for specific user groups such as the library services provided to students in general education programs and first-year experience programs. Some academic libraries provide credit-bearing courses to teach information literacy competencies. Some other libraries incorporate information literacy into the curriculum through multi-year instruction programs. Harrison and Rourke (2006), for example, demonstrated how the University of Guelph in Ontario provides a mentoring program that starts with students in their first year and continues as they move through their university experience. Other library instruction programs create formal relationships with academic departments on campus. For instance, some libraries arrange with English composition courses to deliver information literacy instruction, and librarians collaborate with English instructors to ensure that students receive information literacy instruction. A good example of this is what librarians at the University of Arizona did. They collaborated with the university's English composition program to develop an instructor-led, librarian facilitated approach to integrating information literacy instruction into the English composition curriculum (Sult & Mills, 2006). At UCF, librarians developed the "Introduction to Library Research Strategy" course. It is an online course for students enrolled in English Composition II courses and Strategies for Success courses, and it teaches students basic library and information literacy skills (UCF Libraries, 2016a).

Information Literacy

Information literacy is an important issue at the local and national levels. Over the past two decades, academic librarians have worked to integrate information literacy instruction into their libraries. Consequently, the last twenty years have produced numerous educational achievements in academic librarian practice and research. In spite of these numerous accomplishments, many libraries are still trying to create a comprehensive information literacy culture (Wilkinson & Bruch, 2012). Information literacy is gaining popularity on daily basis, and with the rapid increase in the amount of information technologies, information literacy has quickly become a crucial skill for lifelong learning. Moreover, information literacy has recently been recognized by both educators and business professionals as fundamental to success in a technology-intensive, information-rich, and rapidly changing environment (Beile, O'Neil, 2005). In this regard, "student reliance on the Internet to meet their information demands underscores the value in the ability to evaluate information critically and an understanding of how information is produced and disseminated" (Beile, O'Neil, 2005, p. 6).

Exner (2014) argues that "information literacy is the de facto structure around which many academic libraries currently organize their instructional programs" (p. 460). Mackey and Jacobson (2004) state that information literacy is an essential skills set that prepares students for critical thinking in college, the workplace, and everyday life. They go on to say that students who are information literate are better equipped for today's multifaceted information environment than students who are not.

According to the ACRL (2000) standards, an information literate individual:

1. Determines the nature and extent of an information need

2. Accesses needed information efficiently and effectively

3. Evaluates information and its sources critically and incorporates selected knowledge into his or her knowledge base and values system

4. Uses information to accomplish a specific purpose

5. Understands the legal, economic, social, and ethical implications of information.

In 2015, the ACRL updated the standards and adopted the Framework for Information Literacy for Higher Education (ACRL, 2015). The existing ACRL Information Literacy Competency Standards for Higher Education and the framework provide an appropriate guide for both undergraduate and graduate students and a framework for assessing students' information literacy skills. Librarians follow them for designing library instruction programs and in planning, delivering, and conducting outreach library activities and services.

A good number of researchers and scholars have discussed the importance of teaching information literacy. For example, Mackey and Jacobson (2004) introduced three scalable models for teaching information literacy that work in general education as well as upper level courses and can be utilized to inform separate assignments in distinct courses or several different courses in the curriculum. These models are 1) The Art of Annotation: Teaching students to conduct research in the library and online to synthesize and document information for the development of an annotated bibliography, 2) Research and Composition: Teaching students to incorporate discipline-specific resources (i.e., scholarly journal articles and professional web sites) in properly documented research essays, and 3) Writing for the Web: Teaching students to develop content for the Internet with a specific focus on primary and secondary research methods.

Breivik (2005) argued that education has the responsibility to help students acquire research skills. She believes that efforts to develop students' information literacy skills in college

need to take place at the institutional, program, and classroom levels. According to her, at the institutional level, there needs to be agreement on the definition of information literacy and a commitment to information literacy as a core competency for all graduates. Then, faculty members need to incorporate these skills into the general education curriculum.

Based on the ACRL (2000) Information Literacy Competency Standards, the ACRL created in the following years, different information literacy standards for different fields in higher education, such as the Information Literacy Standards for Teacher Education, Information Literacy Standards for Nursing, Information Literacy Standards for Anthropology and Sociology, and Information Literacy Standards for Science and Engineering/ Technology Science in 2006.

Information literacy competency is highly important for students in science and engineering/technology disciplines. These disciplines pose unique challenges in identifying, evaluating, acquiring and using information. Additionally, peer reviewed articles are generally published in costly journals and are not always available (ACRL, 2006). The ACRL (2006) provides the following definition for information literacy in science, engineering, and technology disciplines:

> A set of abilities to identify the need for information, procure the information, evaluate the information and subsequently revise the strategy for obtaining the information, to use the information and to use it in an ethical and legal manner, and to engage in lifelong learning. (para.1).

Waters, Kasuto, and McNaughton (2012) discussed a partnership that was formed by two academic engineering librarians and a librarian in an engineering firm to learn more about the information needs and skills necessary for their clients as they transition between the academic and work environment. Through a review of the literature and a preliminary survey of practicing

engineers, it was found that more emphasis during information literacy training should be placed on finding gray literature and a strong focus should be placed on evaluating information. The authors argued that American Accreditation Board for Engineering and Technology (ABET) has had certain criteria for engineers since 2000 that have been efficiently compared to the ACRL standards for information literacy. The authors argued that although they develop information literacy skills, librarians have limited time devoted to integrating those skills into the heavy workload that engineering students and their professors face. The authors continued to add that the lack of time leads to selective training that is aimed at the immediate academic needs of students and often tied to a single assignment.

Johnson and Simonsen (2015) tried to determine whether engineering master's students use library-provided abstracting and indexing services, and if they do, to what extent, in what manner, and for what purposes. They used a mixed methodology approach to explore electronic information-seeking patterns of engineering master's students at New Mexico State University. Usage statistics, a focus group, and a web-based survey were used. The survey contained 17 questions using a critical incident approach and direct questions to probe: reasons for search, method of search, types of materials used, means of obtaining materials and evaluations of the usefulness of five library-provided Abstracting and Indexing services. The findings of the study showed that only 15 percent of respondents used a subscription abstracting and indexing service when searching specific terms. The majority of sources used were located through known term searches, and master's students learned of these information resources through article citations or conversations with colleagues. Additionally, respondents reported using Google Scholar to find scholarly articles.

Since the creation of the ACRL Information Literacy Competency Standards in 2000, academic libraries in higher education institutions are incorporating them into their college curricula and are using them to teach their students information literacy and critical thinking skills they need to succeed in their academic studies. Academic librarians are collaborating and partnering with faculty members to incorporate information literacy into their courses and assist them in designing course - specific assignments to help students learn research and information literacy skills. In this regard, Mackey and Jacobson (2005) discussed collaboration among faculty and librarians at State University of New York, at Albany and pointed out that such collaboration is essential for information literacy initiatives to be successful. According to them, faculty and librarians work together on program planning, course development, course approval, and teaching. As they reported, this collaborative experience was positive and demonstrated that a similar model would benefit other institutions, which are considering information literacy initiatives. "Faculty must therefore communicate the importance of the research process, allot time for library instruction, monitor student progress, and hold them accountable for the quality of their work" (Beile, O'Neil, 2005, p. 8).

Information Literacy at the Local/Organizational Level

As part of the university's Quality Enhancement Plan for reaccreditation by the Southern Association for Colleges and Schools Commission on Colleges, the institution's accrediting body, the UCF adopted in 2006 Information Fluency as a campus-wide initiative (Beile, O'Neil, 2007). Associated Colleges of the South (2003) (as cited in Beile O'Neil, 2007) perceives information fluency as the nexus of information literacy, technology literacy, and critical

thinking. Four academic programs were selected to implement information fluency throughout their respective curricula. These programs included philosophy, nursing, University Honors, and the student success program. The UCF Libraries provided support for the information literacy component through collaborating with academic programs (Beile, O'Neil, 2007). Since 2006, UCF Libraries developed a number of information literacy modules and have been collaborating and partnering with faculty members in academic departments across campus to promote integrating and incorporating information literacy concepts and skills into their courses and assist them in teaching their students the necessary skills they need to effectively conduct their research.

The UCF Libraries instruction program is a comprehensive, well-established program that serves students and faculty in the teaching and learning process on campus. The program teaches undergraduate and graduate students information literacy skills to conduct their research and succeed in their academic studies. The library instruction program has grown over the last ten years, and subject librarians have worked with their respective departments to meet students and faculty needs. Librarians identify the ACRL Information Literacy Competency Standards and the Framework for Information Literacy for Higher Education, as critical to the library information literacy program.

The UCF Libraries use a variety of one-shot and course integrated instruction sessions to teach information literacy skills as students progress through their university experience. This customized library instruction depends on individual faculty members taking the initiative to request sessions in the library. Students receive library instruction in their freshman level writing classes, in their sophomore-level writing classes, and in a number of discipline-based courses with research assignments.

In teaching information literacy skills to university students, the UCF Libraries do not treat international students differently from their U.S. counterparts. The information literacy issue of international students may have been conceptualized and understood as an individual problem more than it is organizational. As an individual problem, it may have been seen as a motivational, behavioral, and cultural problem. The problem lies in that international students have their unique language, culture, communication, and technology related challenges that make it harder for them to fully utilize the available information literacy modules and master information literacy skills. International students are learning information literacy skills like other university students on campus, and there are no information literacy classes or modules designed specifically for international students.

The current UCF Libraries information literacy program provides undergraduate and graduate students and faculty members with the following services (UCF Libraries, 2016a):

Face to face instruction: Faculty can bring their class to the library and a librarian will teach them library and research skills. Students learn to select, evaluate, and use electronic and print resources for their research.

Embedded librarian services: Faculty can have a librarian in their web course. The librarian's level of interaction with the class is up to the instructor. The embedded librarian can be available to answer student questions, create a lesson and assignment within an online course, or to create a specific subject guide for the course.

Information literacy modules: There are twelve modules that cover appropriate ways for students to gather, evaluate, and use information. These modules are funded by the Information Fluency (IF) Initiative and developed by the UCF Libraries and the Center for Distributed Learning (CDL). The modules are instructional resources that faculty can integrate into

their courses to help students learn information literacy skills. Each module covers one information literacy topic. Popular topics include Avoiding Plagiarism, Citing Sources Using APA or MLA Style, Conducting a Literature Review, Evaluating Websites, Creating a Search Strategy, Understanding the Information Cycle, and Recognizing a Research Study. These modules are free-standing or embedded in Canvas, self-paced, and available online 24/7.

Library research workshops: the library provides students with research workshops. These are audience-specific drop-in sessions on particular topics, such as Endnote and Refworks, which are offered throughout the semester. There are some research workshops and services are that are designed specifically for graduate students.

Streaming videos: These videos are available 24/7 and provide step-by-step instructions for completing common library tasks such as finding peer-reviewed articles, using QuickSearch, Interlibrary Loan, or finding a book.

Library research guides: These are useful resources compiled by subject librarians. There are hundreds of existing guides on particular subjects that undergraduate and graduate students can utilize to improve their information literacy skills. These guides are available 24/7 and can be created for a specific class or assignment.

Introduction to library research strategies course: In 2011, UCF librarians and CDL staff partnered to develop the Introduction to Library Research Strategies course, which is provided in Canvas, the university's learning management system. The course was developed for students enrolled in English Composition II courses and Strategies for Success courses. Content developed for these online projects has primarily focused on instruction based on the ACRL standards (2000) and information literacy concepts for undergraduate students; however, some information literacy modules include content that may also be useful for graduate courses.

Librarians also provide information and assistance on the research and scholarly publishing process with services ranging from consultations on literature reviewing to deciding where to submit research outputs, negotiating author copyrights, and optimizing item discovery and researcher impact.

The understanding of the information literacy of international students has changed over time within the organization by developing and participating in more and more outreach events on campus and increasing international students' awareness about library services. Efforts have been taken to address the problem through developing and participating in outreach activities and events on campus where international students gather and can be reached. These efforts have been helpful in increasing international students' awareness about the library and the services provided to them.

Information Literacy at the National Level

In 1987, American Library Association (ALA) established the Presidential Committee on Information Literacy; the final report of the committee outlined the importance of information literacy (ACRL, 1989). Information literacy became more popular when ACRL created a set of information literacy standards for Higher Education in 2000 (see appendix D) and asked institutions of higher education to incorporate them into their college curricula. Information literacy is increasingly getting more and more necessary and important, especially that information technologies are growing at an alarming rate.

In addition to the Information Literacy Competency Standards (2000), the ACRL created some standards that address the instructional role of academic librarians. Among these are the

Guidelines for Instruction Programs in Academic Libraries (ACRL, 2011), Standards for

Distance Learning Library Services (ACRL, 2008), and Standards for Proficiencies for

Instruction Librarians and Coordinators (ACRL, 2007). In 2015, the ACRL updated the

standards and adopted the Framework of Information Literacy for Higher Education (see

appendix E).

The ACRL standards provide an appropriate guide for both undergraduate and graduate

students and a framework for assessing students' information literacy skills. Higher education

institutions are incorporating them into their college curricula and are using them to teach their

students information literacy and critical thinking skills they need to succeed in their academic

studies and become lifelong learners. Librarians are also using them for designing library

instruction programs and in planning and conducting outreach library activities and services. The

standards were adopted by some professional organizations. One example is the National

Council for Accreditation of Teacher Education (NCATE, 2008).

Nationally, the information literacy problem of international students may have been

conceptualized and understood as mostly individual. It may have been seen as a cognitive,

motivational, and cultural problem. Research focusing on international students' information

literacy has tended to regard international students no differently form national students, and

generally, information literacy instruction has tended to consider international students the same

as their U.S. counterparts.

As discussed earlier, a good number of studies were conducted on international students'

information literacy and revealed that this group of students have their own unique challenges

and needs (Natowitz, 1995; Baron & Strout-Dapaz, 2001; Song, 2004; Liu, 1993; Morrissey and

Given, 2006; Chen and Ullen, 2011). More and more U.S. higher education institutions are

becoming aware of the information literacy challenges that international students encounter on campus. Moreover, more and more academic libraries are developing information literacy classes, workshops, and programs for international students. This definitely increases the awareness level about the information literacy problem of international students.

Information Literacy at the International Level

Internationally, the concept of information literacy is embraced throughout the world. Numerous world countries are recognizing that education in information literacy skills is essential for the production of a workforce of flexible and lifelong learners, which is becoming a prerequisite to economic development (Eisenberg, Low & Spitzer, 2004). Additionally, information literacy is becoming more and more important issue at higher education institutions worldwide. Some international organizations have adopted the ACRL standards (2000), including the Society of College, National, and University Libraries (SCONUL, 1999) and the United Nations Educational, Scientific, and Cultural Organization (UNESCO, 2005).

A good number of studies on information literacy skills were conducted different countries. In New Zealand, Cuiying (2007) found that Asian international students had difficulties in using academic libraries. The students did not demonstrate an awareness of the services and resources available for their research and study in a Western academic setting. This research clearly indicated that reference librarians need to consider international students' characteristics, learning styles, language proficiency, and subjects of interests in their training programs.

Hughes and Bruce (2006) studied international students' online information access and use in Australian universities. The authors highlighted the importance of addressing the cultural and linguistic diversity of the student population in designing online information resources and in planning and delivering information literacy education. The authors recommended international friendly improvements to online resources and maintained that inclusive approach to information literacy education would be helpful to enhance the online use and academic outcomes of both international and local students.

Sackers, Secomb, and Hulett (2008) conducted a study on international students in Australian universities to examine their preferences regarding library services and methods of communication and how the library can enhance their learning experiences. Findings of the study identified some student needs and some library services preferred by these international students. The findings also illustrated the importance of seeking client input to ensure that future developments are guided by an active awareness of the changing population of students and their library service needs.

Hughes (2010) conducted a study on library related experiences and perceptions of international students at two Australian universities. The findings of the study indicated that international students had limited previous library use, resulting in some challenges they experience in using the library at their host university. The findings also support that library professionals should be aware of international students and their library use.

More and more studies are conducted about information literacy and more and more higher education institutions are adopting the ACRL Information Literacy Competency Standards and Framework for Information Literacy for Higher Education. Efforts have been undertaken in many countries to adopt and teach information literacy skills to college students,

and more and more academic libraries are doing that. National and international efforts in the area of information literacy definitely increased the level of awareness about information literacy and its importance to students at higher education institutions, including international students.

Library Services

Higher education institutions provide their students and faculty members with research and information literacy services to support their learning and teaching process. Academic libraries are applying the ACRL Information Literacy Competency Standards and the Framework for Information Literacy for Higher Education, to provide services to students and teach them information literacy skills. Teaching information literacy skills to college students is the main focus of the library and a central part of the mission of the academic library on campus. Academic libraries provide a variety of services for both undergraduate and graduate students, including international students. These services include library instruction, research consultations, embedded librarian services, outreach services, subject librarian and collection development services, and many other research related services. Academic librarians play an important role in teaching students research and information literacy skills, and they collaborate with faculty members to incorporate information literacy skills into their academic courses.

Library Services for Graduate Students

Library literature indicates that graduate students are not usually discussed as researchers. Most research articles have general instructional advice for graduate instruction, and although one-shot orientations are common, the library literature commends a different approach (Exner,

2014). Research on library use and information literacy of graduate students has been growing steadily. Although a tremendous amount of literature has been devoted to increasing the information literacy skills of college students, little has been written about information literacy skills of graduate students and services available for them. Much of the library literature about graduate students focuses on their information seeking behaviors. Graduate students are often inadequately supported by library instructional programs and information literacy instruction of graduate students is often neglected (Rempel & Davidson, 2008). Blummer (2009) traced library instructional programs available to graduate students in academic institutions from the late 1950s to the 2000 years. She found that graduate library instruction in the 2000s focused on information literacy and course-integrated instruction, nontraditional students, distance education, technologies, education graduate students, and professional success.

Academic librarians recognize that graduate students are an important segment of the library user population and try to connect with them in many ways and offer them a variety of workshops that focus on skills necessary for scholarly and professional success (Baruzzi & Calcagno, 2015). Libraries provide graduate students with a variety of services, including face-to-face instruction, online information literacy modules, research consultations, and other library outreach and research services. Research consultations include individualized assistance that includes consulting and researching discipline-specific resources. Baruzzi and Calcagno (2015) support this when they state that a common theme from the literature they reviewed emerged indicating that "academic libraries develop and deliver many focused, discipline specific workshops" (p. 395). Graduate students also enjoy services such as Ask A Librarian services, Interlibrary Loan services, and Document Delivery services. Libraries are also increasingly embedding librarians in graduate courses to assist graduate students, especially in the research-

oriented courses. In addition to the regular reference and subject librarians' instruction services, some libraries are now offering graduate seminars and workshops for graduate students that cover research topics and strategies. One example of this is the workshops given to UCF graduate students by UCF librarians (UCF Libraries, 2016a). Another example is the workshops given to graduate students at Oregon State University (Rempel & Davidson, 2008). In offering these workshops, Rempel and Davidson (2008) argue that they recognized the need to improve services to graduates students, and they created literature review workshops to serve graduate students from a wide range of subject disciplines. In offering these workshops, the authors wanted to improve information literacy outreach to graduate students, provide them with an understanding of the purpose of the literature review process, expose them to tools that would help them successfully carry out their research, and create an understanding of the place of the library within their continuing education process. Their strategy was successful and reached a large number of students from a wide range of subject disciplines.

Library Services for International Students

International students are a growing population in U.S. universities and colleges, and academic libraries are supposed to play an important role in meeting international students' library and information literacy needs. Academic libraries always create, develop, and design library and information literacy programs to teach their students and assist them to master information literacy skills and become lifelong learners. These library instruction programs are generally designed for both national and international students on campus. Library literature indicates that international students face linguistic, cultural, and technological challenges in

using the library and conducting research (Natowitz, 1995; Baron &, Strout-Dapaz, 2001; Cuiying, 2007; Morrissey & Given, 2006; Liu, 1993; Song, 2004).

Some academic libraries pay special attention to this group of students and already started creating programs and developing initiatives to meet the research and academic needs of this group of library users. A good number of studies have discussed some services and programs that were adopted in some academic libraries to help international students learn and master information literacy skills.

Liestman and Wu (1990) described how the library at Rutgers University has initiated a special program offering library orientations in English, Chinese, and Korean in order to meet the needs of international students at the university. The pre-and posts-tests administered to international students participating in the orientations indicated that native language instruction is an effective way to introduce new international students to U.S. libraries.

Moeckel and Presnell (1995) developed a model that can be used to expand library services for international students. The model also can be adaptable to any size institution. The model incorporates a review of the literature and survey results from Ohio institutions and includes five programs (1) promotional, (2) instructional, (3) staff development, (4) written, and (5) purchase.

Downing and Klein (2001) outlined the rationale, development, and usage of a virtual library tour program for international students at Baruch College in New York. This is a tour presented in the most commonly spoken languages at the institution and used for recruitment and orientation.

Chau (2002) discussed the "Helping Hands Project," which facilitated the translation of a two-page library handout into fourteen languages to help international students use and

understand services provided by the library. The project was a collaboration between Oregon State University Libraries in Corvallis and the International Cultural Services Program at the university. The author used quantitative data available in the library in determining what languages to include in the handout. The article pointed out some problems regarding the project. These included the number of languages to be included, the maintenance of the translated handout, and the quality of the translation. These were important issues that the library should pay attention to in designing and starting such a project. The article displayed how this service is related to the university goal of acknowledging the benefits of diverse experiences and the contributions of international students to the university. The article showed that the library can help international students in different ways, and using library guides in their own native languages is one way to facilitate their learning.

McClure and Krishnamurthy (2007) discussed how professionals at the University of Alabama created the University of Alabama's online Information Page for International Students to bridge the cultural and linguistic barriers and clarify the library experience. The online information page was an attempt to meet the needs of international students. The paper showed that the Information Page for International Students has clearly met a need and permitted the library to reach large numbers of students in a systematic way.

Hofer and Hanson (2011) discussed how librarians at Golden Gate University are embedded in a program that helps acculturate international students to the American academic setting. The study looked at how librarians developed an information literacy instruction curriculum that integrates with the program curriculum. Librarians also looked at strategies that they applied to make their instruction efforts scalable as the program has grown. The study

showed that librarians providing information literacy instruction to the program were successful in developing flexible campus partnerships, learning assessment, and student outreach.

Hensley and Love (2011) discussed how librarians at University of Illinois created a multifaceted library instruction and outreach program for international students. The program consisted of six elements and considered the varied academic needs of international students as they transition to a new campus community in a different language. The program also encouraged library faculty and staff to use the benefits of a diverse campus community. The six elements of the program included staff development, partnerships, outreach, instruction, student needs, and assessment.

Bosch and Molteni (2011) conducted a study at California State University where elements of library instruction were offered in Spanish for students in the department of Romance Languages. The study encouraged improving the literacy skills of students who are studying foreign languages. The study also encouraged establishing connections with international students by providing them with library instruction based on their different cultures and languages.

Byrne (2011) discussed how integrated programs at the university library at the University of Technology at Sydney in Australia have supported international students. The initiatives included a team of specialist librarians. The initiatives also included Chinese language web pages, resources in many languages, guides in the languages other than English most frequently spoken by students, International Cultural and News Center, information literacy programs offered in Chinese, and cultural awareness training for library staff.

Bahavar, Hanel, Howell, and Xiao (2011) discussed how librarians at University of Southern California have developed systematic information service programs in outreach,

information literacy, and reference services for international students to ensure their education and information needs are satisfied and to prepare them to succeed academically. The university has campus-wide strategic initiatives, and several information literacy programs are established with different academic departments in order to help international students.

<p align="center">Bolman and Deal's Framework</p>

Bolman and Deal's Framework (2013) consists of structural frame, human resource frame, political frame, and the symbolic frame. Bolman and Deal (1994) note that "across sectors and nations, problems of competition, cost, quality, and change have intensified efforts to penetrate the mystery that separates effective leaders from their less effective counterparts" (p.78). Bolman and Deal's Framework provides four different perspectives through which organizations can be understood. It outlines the structure and functions of organizations and leadership roles. Each described frame is a lens or perspective through which leaders can view and process their work, leadership, and organizations. Leaders can use these frames as useful tools to address organizational problems and consider organizational change and organizational learning (Bolman & Deal, 2013).

The structural frame looks beyond individuals in the organization to examine the social structure of work. It explores the important role the social architecture plays in the functioning of the organization. It describes the basic issues that leaders and managers must consider in designing the right structures for the organizations to be effective in their unique environments. Leaders and managers must consider structures that fit the goals, tasks, and context of their organizations (Bolman & Deal, 2013).

The human resource frame explores people and organizations. It centers on the relationship between organizations and people and what they can do for one another. Organizations need people for their energy, effort, and talent, and people need organizations for intrinsic and extrinsic rewards they offer. The frame emphasizes the importance of a good fit between the organization and people. If the fit is poor, one or both will suffer, but when the fit is good, both the organization and people will benefit. Individuals find their work meaningful and satisfying, and organizations find the talent and energy they need to succeed (Bolman & Deal, 2013).

The political frame focuses on decision-making, power sources, budget, and the competitive arena within an organization. In the political frame, organizations are coalitions composed of individuals and groups who endure differences and live in a world of scarce resources. This places power and conflict at the center of the decision-making process in the organization. From a political frame view, goals, structures, and policies emerge from an ongoing process of bargaining and negotiation among different major groups (Bolman & Deal, 2013).

The symbolic frame focuses on organizational culture and how the meaning behind stories, rituals, and other symbols impacts organizational change. It interprets and illuminates the basic issues of meaning and belief that make symbols so powerful (Bolman & Deal, 2013). The Bolman and Deal's four-frame model is used in this study as conceptual framework to discuss the study findings. The four frames will be discussed in more details in chapter five in the findings and implications section in relation to organizational learning and international students.

The review of literature presented literature in different areas related to library instruction and information literacy of international students. The review gave an overview of international

students studying at U.S. colleges and universities and their characteristics and provided some studies about international students. International students in the United States are clearly a growing population, and they face some linguistic, cultural, and technological challenges (Natowitz, 1995; Baron & Strout-Dapaz, 2001; Morrissey & Given, 2006; Song, 2004). International students bring with them special skills, but they also present unique challenges for our universities and colleges. Libraries play a critical role in connecting international students to universities and colleges and teaching them information literacy skills they need to succeed (Jackson & Sullivan, 2011).

The review discussed library instruction and information literacy, including library services for graduate students in general and international graduate students in particular. Although there are some programs and initiatives to support the information literacy of international students, library literature indicates that these library users have unique needs and experience low level of library skills. Wang and Frank (2002) pointed out that academic libraries should be proactive in providing effective services for international students and meeting their academic needs. The section ended with a brief discussion of Bolman & Deal's Framework (2013). This four-frame leadership model will be discussed in more details in chapter five in relation to academic organizations and the role of the library in teaching information literacy skills to international students.

CHAPTER THREE: METHODOLOGY

Purpose of the Study

The purpose of this mixed methods research study was to explore and investigate the information literacy skills, challenges, and needs of international graduate students at UCF. The specific objectives of the study were:

1. To assess the current information literacy skills of international graduate students and highlight the necessary skills they need to succeed in their research and academic studies.

2. To understand the unique academic needs of international graduate students and examine the linguistic, cultural, and technological challenges they face in learning information literacy skills and utilizing library resources to search, retrieve, and use information properly in their academic studies

Study Design

The present study employed a mixed methods approach. The study explored the information literacy skills of international graduate students and investigated their information literacy skills, challenges, and needs. Data were collected in an online survey and audio recorded interviews conducted with students enrolled in graduate programs at the College of Engineering and Computer Science. The first stage of the study was a survey to collect data about information literacy of U.S. and international graduate students. The modified Beile Test of Information Literacy for Education (B-TILED) (see appendix G) was built in the survey to assess the information literacy skills of graduate students. In the second phase of the study, a purposeful

sample was used and semi-structured, audio recorded interviews were conducted with a number of international graduate students at the College of Engineering and Computer Science. Based on the data collected and the findings of the study, some recommendations were presented for consideration in future library research and information literacy instruction planning and programming.

<u>Conceptual Framework</u>

This study explored information literacy skills of U.S. and international graduate engineering students and how library services and library instruction are utilized by international graduate students. A mixed methods approach was used to collect quantitative and qualitative data from U.S. and international graduate students at the College of Engineering and Computer Science. Mixed methods research is a procedure for collecting and analyzing both quantitative and qualitative data within a single study to provide a broader understanding of the research problem (Creswell, 2009). In this study, Bolman and Deal's Framework (2013) was used as a conceptual framework to discuss the study findings. The four-frame model provides four different perspectives through which organizations can be understood. It outlines the structure and functions of organizations and leadership roles. Each frame is a lens or perspective through which leaders can view and process their work, leadership, and organizations. Leaders can use these frames as useful tools to address organizational problems and consider organizational change and organizational learning (Bolman & Deal, 2013).

Scope of the Study

The scope of this study is to understand the information literacy of international graduate students in relation to the ACRL (2000) Information Literacy Competency Standards for higher education. The new ACRL (2015) Framework for Information Literacy for Higher Education is also considered, however, the main focus of the study is on the ACRL Information Literacy Competency Standards. Therefore, standards, discussions, and references described in this study mainly refer to the existing ACRL Information Literacy Competency Standards for Higher Education published in 2000.

As part of the university's Quality Enhancement Plan (QEP) for reaccreditation by the Southern Association for Colleges and Schools Commission on Colleges, the UCF adopted in 2006 Information Fluency as a campus-wide initiative (Beile, O'Neil, 2007). Associated Colleges of the South (2003) (as cited in Beile, O'Neil, 2007) perceives information fluency as the nexus of information literacy, technology literacy, and critical thinking. The university outlined three components of information fluency: critical thinking, computer literacy, and information literacy. Thus, information literacy of international students is important to address.

Study Participants

Participants in the first stage of the study are the entire population of U.S. and international graduate students at the College of Engineering and Computer Science. There are 1,337 graduate students enrolled in graduate programs at the College of Engineering and Computer Science. Participants in the second stage of the study were a selected number of international graduate students who volunteered to participate in the study. The College of Engineering and Computer Science was selected for this study based on the fact that there is a

54

high percentage of international graduate students enrolled in the College of Engineering and Computer Science.

<center>Instrumentation</center>

The B-TILED (see appendix C) was the quantitative instrument in this study and a modified B-TILED was used (see appendix G). Copyright permission to use the instrument in this study was granted by Beile O'Neil (see Appendix B). The B-TILED was developed by Beile O'Neil in 2005 for her Ph.D. dissertation. The B-TILED is a validated information literacy assessment designed to assess education-specific information literacy skills for undergraduate students enrolled in teacher-education programs. The test content is based on nationally recognized standards from the International Society for Technology in Education (ISTE) (See appendix F) and the ACRL. In the first phase of this test's development, Beile O'Neil (2005) designed the instrument items, then in the second phase, she validated the test items.

The original B-TILED assessment consists of 22 content items that are multiple-choice questions as well as 13 demographic and self-percept items. In the development of the B-TILED, Beile O'Neil (2005) selected specific ACRL information literacy objectives and aligned them with the NETS•T Standards (2000) to develop four content areas that included: A) identifying, evaluating, and selecting finding tools, B) demonstrating knowledge of general search strategies, C) evaluating and selecting sources, and D) demonstrating knowledge of legal and ethical practices. Following recommendations found in the assessment literature, Beile O'Neil (2005) included five to six test items in each content area based on the skills associated with the objectives and the level of importance of the skills being measured. In the validation procedures

conducted for the B-TILED assessment, a total of 172 undergraduate teacher education students completed the assessment (Beile O'Neil, 2005). A panel of experts in Beile O'Neil's study agreed that a passing score of 55.5% was an acceptable level of information literacy; however, based on some percentage adjustments to include the test error measurement and minimize the false negative scores, a final score of 57.5% was taken as an accepted level of competency. A total of 76 out of 172, or 44.19% of students, achieved that goal. The B-TILED instrument is useful to provide evidence of institutional effectiveness for program reviews and to inform curricular and instructional decisions (Beile O'Neil, 2005).

The B-TILED assessment has been used in previous doctoral research to assess the information literacy skills of both doctoral students and undergraduate students (Cannon, 2007; Magliaro, 2010, Calhoun, 2012; Bishop, 2015). In their dissertations, these researchers used the B-TILED assessment and assigned the B-TILED cut score (57.5%) to identify information literacy competencies for participants. The B-TILED cut score (57.5%) means that an individual has either attained competency or not (Beile O'Neil, 2005). Cannon (2007) used the B-TILED assessment to investigate differences between the information literacy scores of two groups of teacher education students and students' readiness to integrate information literacy into their teaching.

Calhoun (2012) also investigated an information literacy instructional subject to examine effectiveness of a multimedia audiobook as an instructional technique to manage the cognitive processing occurring during information literacy instruction for undergraduate and graduate level nursing students. Modular worked-out examples were used and pre and posttests were administered using modified versions of the B-TILED assessment. Magliaro (2010) also used the

B-TILED assessment in her dissertation research, which included modifications to several content questions.

Bishop (2015) used the B-TILED assessment as a quantitative assessment tool in her dissertation, in which she explored the organizational factors that influence how library services and library instruction are utilized in two doctoral programs in education at the University of Central Florida. In the online survey for her study, Bishop (2015) included the original 22 content questions used in the B-TILED assessment, but replaced the 13 demographic and self-percept items included in the original B-TILED assessment with four demographic questions. A total of 26 questions were included in the study survey, which was distributed as the EdD Survey and the EdD Leadership Survey with each of the surveys including identical questions.

In this study, the wording and terminology in the B-TILED assessment tool were modified to reflect Engineering and Computer Science related content and information (See Appendix G). The online survey included the modified B-TILED content questions as well as six demographic questions. Two of these demographic questions were modified from the demographic questions used in B-TELED assessment and four questions were new. A total of 28 questions were included in the survey, which was distributed to all UCF graduate Engineering and Computer Science students. The six demographic questions that were used in the survey asked students the following information: a) student academic classification, b) student academic status, c) number of credit hours finished, d) student Grade Point Average (GPA), e) student country of origin, and f) student gender (See Appendix G).

<center>Data Collection</center>

The present study involved a mixed methods approach that collected quantitative and qualitative data. Data were collected through an online survey and audio recorded interviews. Participants of the study included U.S. and international graduate students, and the study had a special focus on international graduate students enrolled at the College of Engineering and Computer Science.

<center>*Quantitative Data Collection*</center>

Information sources in this study are determined to be the students themselves. In phase one of the study, quantitative data were collected through an online survey that included the modified B-TILED assessment and was sent to all U.S. and international graduate students at the College of Engineering and Computer Science. The survey included an invitation to students to participate in a follow up, audio recorded interview with the researcher.

The data collected in the study assessed and determined the information literacy proficiency levels of international graduate students as measured by B-TILED assessment. The data collected in this study can be used for formative assessment purposes. It is useful and important to assess student information competencies. "Variations in students' information competencies represent a significant challenge in information literacy pedagogy. Methods of information literacy instruction that acknowledge students' widely varying abilities will improve librarians' instruction and students' learning" (Dunaway & Orblych, 2011, p. 1).

Formative assessment is not a single assessment. Formative assessment involves a series of activities that instructors or students or both use to adjust their teaching or learning. Using assessments is central to eliciting evidence regarding the degree to which a student has mastered

<center>58</center>

a particular skill (Dunaway & Orblych, 2011). In this sense, Popham (2011) points out that formative assessment is a process that "involves the gathering and analysis of assessment-elicited evidence for the purpose of determining when and how to adjust instructional activities or learning tactics in order to achieve learning goals" (p. 14).

Description of Quantitative Sample

The target population for the online survey distributed in this study was graduate students enrolled at the College of Engineering and Computer Science at UCF. The total population of the study was 1,337, with 707 master's level students, 620 Ph.D. level students, and 10 professional certificate students. This group of graduate students included 747 U.S. students and 590 international students (UCF, IKM, 2015a).

Quantitative Procedures

In the quantitative phase of this study, graduate students enrolled at the College of Engineering and Computer Science at UCF were invited to participate in an online survey. The survey also included an invitation for international graduate students to participate in a follow up, audio recorded interview with the researcher. After receiving the IRB approval (see appendix A), the following steps were used to collect quantitative data for this study.

1. The modified B-TILED survey (see appendix G) was placed in Qualtrics, which included a secure server.

2. During spring 2015, the Associate Dean of Academic Affairs and the Director of Academic Support Services at the College of Engineering and Computer Science were contacted and agreed to distribute the study survey to students enrolled in graduate engineering and computer science programs.

3. The author created a series of emails that included an initial email invitation and reminder emails (see appendix H) inviting students to participate in the study. The email content and survey distribution process for the invitations used the Tailored Design Method (TDM), in which an initial email invitation is distributed and multiple follow up reminder emails are also sent. To reduce the non-response rate, the TDM guidelines were taken into consideration. The initial email invitation and the follow-up reminders were relatively short and engaging, and steps were taken to ensure the e- mails are not flagged as spam. Additionally, subject lines that are professional and informative were used, clear instructions for accessing surveys were provided, and survey e-mails were carefully timed (Dillman, Smyth, & Christian, 2009). In this study, the Director of Academic Support Services and staff distributed the initial email invitation as well as the follow up email reminders. Faculty members at the College of Engineering and Computer Science were informed of the study and class visits by the researcher were arranged to encourage students to participate in the study and complete the survey. The survey invitation and the follow up reminders were distributed using the students' university required emails.

4. An initial email invitation with a link to the online survey was forwarded to the Director of Academic Support Services at the College of Engineering and Computer Science.

5. An email reminder was sent approximately one week after the initial survey invitation. The author provided the Director of Academic Support Services with the survey invitation reminder to be distributed to all graduate students.

6. Several survey reminders were sent approximately one week between each one to ensure a good number of students are participating in the study and to increase the initial low response rate for the study survey. The online survey was closed after being open for approximately six weeks. The survey data were downloaded from the server and imported into a Microsoft Excel file and stored on a secure, password-protected computer.

Quantitative Analysis

After the online survey was closed, the survey data were downloaded and imported into a Microsoft Excel file in preparation for data analysis. The quantitative data analysis included data collected from questions 7 through 28 in the modified B-TILED online survey (see appendix G) to answer the first three research questions. An Anderson-Darling Normality Test was conducted and assumption for normality was met. A minimum competency for mastery on the B-TILED was established using a cut score of 57.5%, which infers that an individual has either attained competency or not (Beile O'Neil, 2005). The cut score requires correct answers to 13 of the 22 multiple-choice questions.

The first research question asked about the information literacy level of international graduate students. To answer the first research question, descriptive statistics were performed to include mean, median and standard deviation. T-tests and analysis of variance (ANOVA) were

also used to evaluate the difference in the B-TILED scores. A total of 65 international graduate students completed the survey. The mean B-TILED score for international students was 45.24% and the passing rate was 21.54, indicating a low information literacy skills level. Further analysis was conducted to investigate the B-TILED scores within the international graduate students by credit hour and content area. International graduate students scored below the B-TILED competency cutting score of 57.5 in all credit hour categories. An ANOVA was conducted to evaluate statistical differences in the B-TILED scores by credit hour and content area, and the results showed no statistically significant difference at the 95% confidence level.

The second research question asked about the difference in information literacy skills levels between the international Ph.D. and master's students. To answer the second research question, t tests and ANOVA were conducted to evaluate the performance differences between the two groups of students. The mean B-TILED score for international Ph.D. students ($M=49.30\%$) was higher than the mean score for international master's students ($M=39.16\%$). A two- sample t test was conducted to evaluate the difference in the mean B-TILED scores between international master's and Ph.D. students. The two-sample t-test indicated a statistically significant difference between the two groups, $p = 0.002$.

Further analysis between male (master's & Ph.D.) and female (master's & Ph.D.) students was conducted and indicated no statistical significance between the mean B-TILED score for international males ($M= 44.53\%, SD = 13.91\%$) and international female students ($M= 48.76\%, SD = 9.55\%$), $p = 0.34$.

More analysis was conducted by credit hour and content areas. International Ph.D. students scored higher than international master's students in all content areas. Ph.D. students also scored higher than master's students by credit hour. An ANOVA on the Ph.D. students by

credit hour was conducted and showed no statistically significant difference in the mean

B-TILED scores, $p = 0.87$. An ANOVA on master's students by credit hour was also conducted

and showed a statistically significant difference in the mean B-TILED scores, $p = 0.002$.

The third research question asked about the difference in information literacy levels

between the international graduate students and U.S. graduate students. The mean B-TILED

score for U.S. graduate students (*M=61.73%, SD=16.51%*) was higher than the mean score for

international graduate students (*M=45.24%, SD=13.31%*). A *t* test was conducted to evaluate the

statistical significance of the difference in the scores. The analysis showed a statistically

significant difference between the U.S. graduate students and international graduate students at

the 95% confidence level, $p = 0.00$.

A comparison of the B-TILED scores between U.S. and international graduate students

by student classification and gender was conducted and indicated that U.S. graduate students at

both the master's and Ph.D. levels scored higher than international graduate students. T-tests

were conducted to validate the difference between the scores of U.S. students and international

students. The *t* test results for the U.S. Ph.D. students versus international Ph.D. students showed

a statistically significant difference at the 95% confidence level, $p = 0.00$. The *t* test results for

the U.S. master's students versus international master's students also showed a statistically

significant difference at the 95% confidence level, $p = 0.00$.

Further comparison between international and U.S. graduate students by content area was

conducted and indicated that U.S. students scored higher than international students. Comparison

of each content area performance percentage by U.S. and international graduate students was

conducted using multiple *t* tests. The results showed a statistically significant difference in the

average performance percentage for each content area, $p = < 0.03$.

Qualitative Data Collection

Qualitative data were collected through audio recorded interviews with international graduate students at the College of Engineering and Computer Science. A purposeful sample of students who voluntarily agreed to participate in a follow up interview with the researcher was used, and a number of interested students were interviewed.

Description of Qualitative Sample

In this second phase of the study, qualitative, audio recorded interviews were conducted. A purposeful sample of interested international graduate students at the College of Engineering and Computer Science was taken. Initially 13 self-identified international graduate students were interested in participating in the follow up interview. Three participants were not able to participate and the final sample included 10 international graduate male students who participated in the interviews with the researcher. The researcher wanted to include some international graduate female students in the qualitative interviews, but unfortunately, no single female student signed up for the follow up interview. The international graduate student population in the study included 590 graduate students. From this group, 131 international graduate students were female students. The interviews were held during face to-face meetings in a room at the UCF Libraries. The interview questions were drawn from library literature, including the ACRL Information Literacy Competency Standards and student learning, challenges, needs, and outcomes.

Qualitative Procedures

Qualitative research interviewing can be used to listen to what participants themselves tell about their experiences, dispositions, and beliefs to have a better understanding of their feelings, attitudes, opinions and their point of view (Kvale & Brinkmann, 2015; Seidman, 2006). "We interview people to find out from them those things we cannot directly observe" (Paton, 2002, p. 340). Interviewing is a process where the interviewer and the interviewee produce knowledge, and "the quality of interviewing is judged by the strength and value of the knowledge produced" (Kvale & Brinkmann, 2015, p. 20). Interviews are a powerful data collection strategy that allows the researcher and the interviewees to have a one to one interaction. Moreover, interviews provide interviewers with the opportunity to ask for explanations of vague answers or to provide clarification if a question is not clear (Teddlie & Tashakkori, 2009).

The purpose of conducting audio recorded interviews in this study was to gather additional information and details related to the quantitative data collected and to gain insights about the experiences of the international graduate students in relation to their information literacy needs and the utilization of library services and library instruction. Interviewing international students is by far the best approach to know their background, and by actually talking with them about their experiences with libraries in their home countries, we gain the greatest insights (Hickok, 2011). Semi- structured interviews were conducted with all participants and all interviews were audio recorded. According to Ayres (2008),

> The semi-structured interview is a qualitative data collection strategy in which the
>
> researcher asks informants a series of predetermined but open-ended questions. The
>
> researcher has more control over the topics of the interview than in unstructured

interviews, but in contrast to structured interviews or questionnaires that use closed

questions, there is no fixed range of responses to each question. (Para. 1).

A guided interview approach was used in this study and open-ended questions and

prompts were also used to explore issues and to ask participants to clarify meanings. A guided-

interview approach includes a script that helps to structure the interview and allows the

researcher to outline the topics in advance and then to adapt the wording and sequence of

questions according to the responses of participants during the interviews (Kvale & Brinkmann,

2015; Patton, 2002). In each interview, participants were allowed to describe their experiences,

perceptions, and the meanings they assigned to the questions.

The following steps were used to collect qualitative data for this study:

1. At the end of the online survey that was distributed during spring 2016, international

   graduate students were invited to participate in an audio recorded interview by filling out

   a voluntary contact information form and providing their name, phone number, and

   university email address. The email address was used to contact participants who

   volunteered to schedule the audio recorded interviews.

2. Audio recorded interviews included fifteen open-ended questions and prompts for follow

   up questions (see Appendix I).

3. All interviews with graduate students were held in a room at the UCF Libraries.

   Interviews lasted approximately thirty minutes to one hour.

4. Interview dates and locations were confirmed via email, and interviews were scheduled

   based on the preferences of graduate students.

5. To protect the privacy of all participants, identifiable information was coded.

6. The author began each interview by providing an introduction and stating the purpose of

the study.

7. Due to library-related terminology used in the interview questions and the concern that terms may be unfamiliar to some participants, the terms 'information literacy' and 'library research' were explained in each interview to establish a shared meaning of the terms.

8. Following the explanation of library related terms and stating the purpose of the study to participants, the main interview questions were asked. Question prompts were also used to explore responses and issues discussed by participants in their responses, and field notes were taken during the interviews.

9. Each interview was concluded by asking participants what they think they should have been asked to provide the author with more information about the information literacy skills, challenges, and needs of international graduate students. Participants were also asked to provide their feedback about the interview, and based on feedback from some interview participants, corrections were made to the field notes to reflect accurate details.

Qualitative Analysis

For the purpose of analysis, the interviews were transcribed and transformed into a written text. Students interviewed were given numbers as alias names (S1, S2, S3, etc.) to protect their identity. In presenting and analyzing the interview data, open coding was used to interpret and categorize the raw interview data (Matthew & Price, 2010). Excerpts from the transcripts were organized into categories and search was conducted for connecting threads and patterns among the excerpts within the categories and for connections between the categories that can be

considered as themes (Seidman, 2006). Eight theme categories were initially identified from the participants' responses to the open-ended interview questions. Axial coding was used to reassemble the data based on the relationships between and within the categories to apply common themes (Wicks, 2010). The original eight categories were reduced to five themes based on threads and patterns among the excerpts and within the categories.

CHAPTER FOUR: RESULTS

Introduction

This chapter reports the results of the datasets collected in this study. It presents the data analyses of the study. During the exploration of stage in this study, a literature review was conducted in order to better understand the problem and learn about the current related issues in order to identify the causes of the problem and consider proper solutions. The author collaborated with stakeholders associated with the issue of international students' information literacy and other individuals who are knowledgeable about the issue to examine how the problem and other related problems have been addressed in the past. The researcher worked with the library administration and academic librarians at the UCF Libraries to get the study approved and get their support in conducting the study. The author also worked with the Associate Dean of Academic Affairs and the Director of Academic Support Services and faculty members at the College of Engineering and Computer science at UCF to get their support in conducting the study.

Purpose of the Study

The purpose of this mixed methods research study was to explore and investigate the information literacy skills, challenges, and needs of international graduate students at UCF. The specific objectives of the study were:

1. To assess the current information literacy skills of international graduate students and highlight the necessary skills they need to succeed in their research and academic studies.

2. To understand the unique academic needs of international graduate students and

examine the linguistic, cultural, and technological challenges they face in learning

information literacy skills and utilizing library resources to search, retrieve, and use

information properly in their academic studies.

Research Questions

The present study aimed to find answers to the following main research questions:

1. What is the information literacy skills level of international graduate students, as measured by the B-TILED assessment?

2. What is the difference in the information literacy skills levels between international graduate students at the master's degree level and international students at the doctoral degree level, as measured by the B-TILED assessment?

3. What is the difference in the information literacy skills levels between international graduate students and U.S. graduate students, as measured by the B-TILED assessment?

4. What are the self-reported challenges that international graduate students believe they face in learning information literacy skills?

5. What are the self-reported information literacy skills and library services that international graduate students believe they need?

Quantitative Results

Description of Survey Participants

The study survey was sent to all graduate students at the College of Engineering and

computer Science. Out of 1,337 graduate students, 137 students responded to the survey, which

was 10.24 % response rate. From the 137 students who responded to the survey, 96 students fully

completed the survey. Based on the sample size and response rate, the margin of error in this

study was 10% at the 90% confidence level. A test of normality was conducted and assumption

for normality was met with Anderson-Darling Normality Test, $p = 0.136$. Responses which were

not fully completed were deleted from the survey for the purpose of data analysis in this study.

Therefore, the quantitative results of the study are based on the responses of the 96 participants

who fully completed the online survey. Table 1 shows the overall number of students and the

number of participants who fully completed the online survey and the response rate by survey

categories.

Table 1: Characteristics of Survey Population and Participants by Student Classification, Academic Status, Gender, and Response Rate

Category	Number of Students	Number of Participants	Response Rate %
Student Classification			
Master's	707	44	6.22
Ph.D.	620	52	8.38
Gender			
Female	282	18	6.38
Male	1055	78	7.39
Academic Status			
US Student	747	31	4.14
International Student	590	65	11.01
Total	1337	96	7.18

Analysis of the data to examine the number of times each question was answered correctly was conducted, and the results showed that the questions that received the most and least number of correct answers spanned over different content areas discussed in B-TILED assessment. Table 2 shows the number and proportion of correct answers by question.

Table 2: Number and Proportion of Correct Answers by Question

Question #	N	% correct
20	17	17.7
11	21	21.9
14	25	26.0
8	30	31.3
26	30	31.3
13	38	39.6
23	38	39.6
24	38	39.6
19	42	43.8
28	45	46.9
16	49	51.0
10	50	52.1
7	52	54.2
25	54	56.3
22	58	60.4
9	59	61.5
18	64	66.7
21	66	68.8
27	71	74.0
12	72	75.0
15	72	75.0
17	73	76.0

Table 2 shows that the question that received the lowest number of correct answers (n=17) was question number 20, which asked students to determine the proper action when faced with a situation that involves copyright choices. This question belongs to the Content Area D: Demonstrating knowledge of legal and ethical practices.

Research Question 1

What is the information literacy skills level of international graduate students, as measured by the B-TILED assessment?

The dataset that was used to answer this research question was collected from questions 7 through 28 in the Graduate Engineering and Computer Science Online Survey (see Appendix G). To answer this research question, descriptive statistics were performed to include mean, median, and standard deviation. T-tests were also used. A total of 65 international graduate students completed the survey. A minimum competency for mastery on the B-TILED was established using a cut score of 57.5%, which infers that an individual has either attained competency or not (Beile O'Neil, 2005). The cut score requires correct answers to 13 of the 22 multiple-choice questions. Table 3 describes the results of the mean B-TILED scores and passing rate for international graduate students by student classification and gender, compared to the U.S. students' results.

Table 3: Mean B-TILED Scores and Passing Rate for International and U.S. Graduate Students by Student Classification and Gender

Categories	International Students			U.S. Students		
	N	Mean (%)	Passing Rate %	N	Mean (%)	Passing Rate %
Student Classification						
Master's Students	26	39.16	11.54	18	59.60	66.67
Ph.D. Students	39	49.30	28.20	13	64.69	76.92
Gender						
Males	54	44.53	22.22	24	62.88	70.83
Females	11	48.76	18.18	7	57.79	71.43

Table 3 indicates that the B-TILED scores for international students are relatively low with a mean B-TILED score of 45.24%. Table 3 also shows that all categories within the international students had mean B-TILED scores lower than the expected proficiency level of 57.5%. Overall, the B-TILED scores of participants ranged from a minimum score of 13.64% to a maximum score of 81.82%. Examining the pass/fail rate for this group indicates that 51 students scored below the 57.5% B-TILED proficiency threshold, and 14 students passed and achieved proficiency level, resulting in an overall pass rate of 21.54%. This clearly indicates that international graduate students have a low level of information literacy skills.

Further analysis was conducted to investigate the B-TILED scores within the international student group by credit hour. Credit hour categories in this study are divided into groups based on the number of credit hours a full-time graduate student is generally enrolled in each semester. Credit hour categories indicate the number of credit hours achieved. They count the same for master's and Ph.D. students and are not related to student academic status. Figure 2 shows the mean B-TILED scores for international graduate students by credit hour.

Mean B-TILED Scores for International Graduate Students by Credit Hour

	0-9 Credits	10-18 Credits	19-27 Credits	More than 27 Credits
Mean B-TILED Score	46.17%	38.64%	40.91%	46.36%
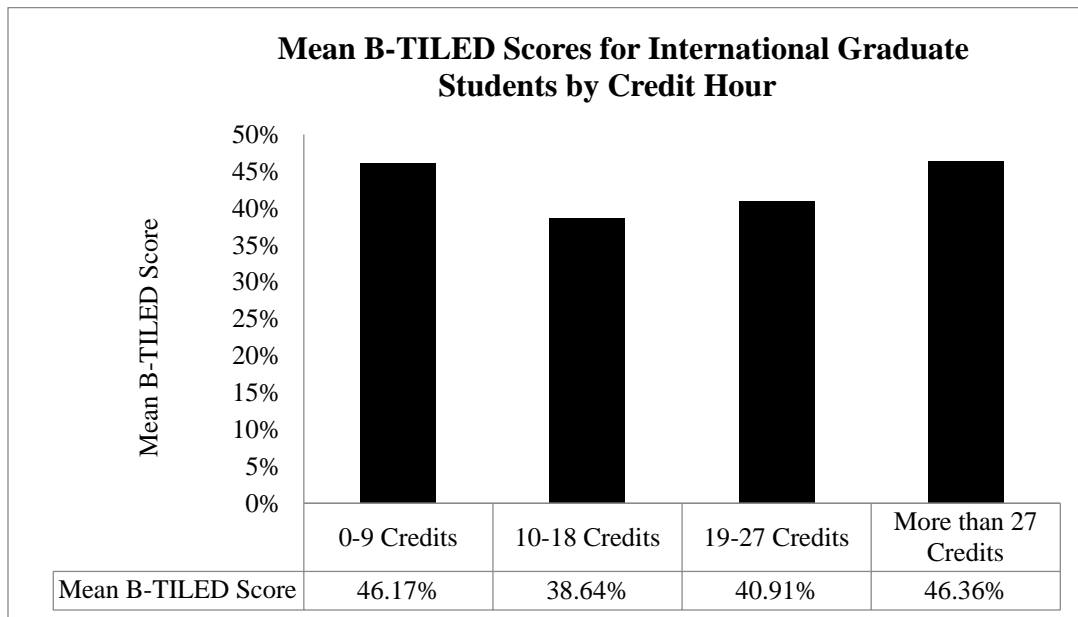
Figure 2: Mean B-TILED Scores for International Graduate Students by Credit Hour

Figure 2 shows that international graduate students scored below the B-TILED competency cutting score of 57.5 in all credit hour categories. An ANOVA was conducted to evaluate statistical differences in the B-TILED scores by credit hour. The ANOVA results showed no statistically significant difference at the 95% confidence level, $P = 0.57$. Table 4 shows a summary of ANOVA for the mean B-TILED scores for international students by credit hour.

Table 4: ANOVA Summary of the Mean B-TILED Scores for International Graduate Students by Credit Hour

Groups	Count	Sum	Average	Variance		
0-9 Credits	19	.772727273	0.461722488	0.00763617		
10-18 Credits	4	1.545454545	0.386363636	0.028236915		
19-27 Credits	7	2.863636364	0.409090909	0.018595041		
More than 27 Credits	35	16.22727273	0.463636364	0.022459893		
Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	0.036643022	3	0.012214341	0.678965029	0.568288	2.755481
Within Groups	1.097368421	61	0.017989646			
Total	1.134011443	64				

In this study, in addition to reporting graduate students' overall B-TILED scores, further analysis was conducted by content area as a formative assessment to identify any knowledge gaps that information literacy and library instruction librarians can consider for future information literacy instruction programming (Popham, 2011).

The B-TILED assesses information literacy competencies in four broad content areas (see appendix C) that are represented in questions 7 through 28 in the survey study. In developing these four content areas, Beile O'Neil (2005) aligned the ISTE NETS*T (2000) Standards (see appendix F) with learning objectives identified in the ACRL Information Literacy Competency Standards for Higher Education (see appendix D) using standards one, two, three, and five (2000). The following are the four content areas:

1. Content Area A: Identifying, evaluating, and selecting finding tools

2. Content Area B: Demonstrating knowledge of general search strategies

3. Content Area C: Evaluating and selecting sources

4. Content Area D: Demonstrating knowledge of legal and ethical practices

Data analysis of the content areas was conducted to determine the difficulty level of performance in each content area. The difficulty level was defined as the average percentage of correct answers for each content area in the group evaluated. Beile O'Neil (2005) notes that there is a wide range of difficulty levels among the four content areas. Figure 3 describes international graduate students' performance percentage scores for each of the B-TILED content areas.
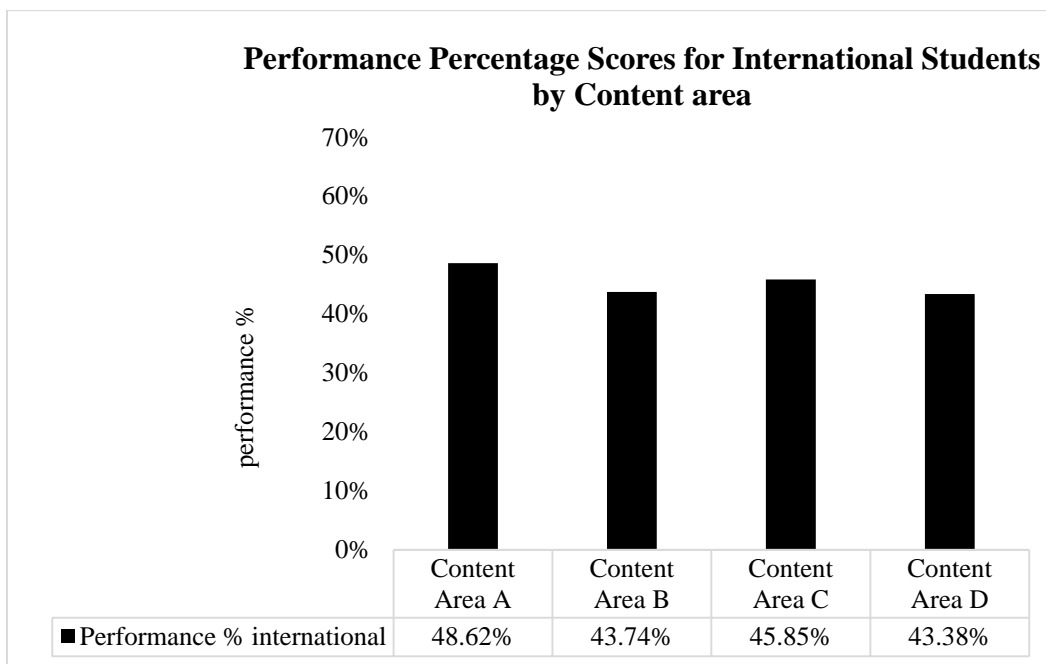
Figure 3: Performance Percentage Scores for International Graduate Students by Content Area.

Figure 3 indicates no significant difference in the performance percentage scores between the content areas. An ANOVA was conducted and the results confirmed the above conclusion, $p = 0.52$. As a result, we can say with 95% confidence that there is no significant difference in the performance percentage scores between the content areas. Table 5 shows the ANOVA summary of the performance percentage scores for international graduate students.

Table 5: ANOVA Summary of Performance Percentage Scores for International Graduate Students by Content Area

Groups	Count	Sum	Average	Variance			
Content Area A	65	3160	48.61538	574.6154			
Content Area B	65	2842.857	43.73626	298.96			
Content Area C	65	2980	45.84615	634.0385			
Content Area D	65	2820	43.38462	507.1154			
Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*	
Between Groups	1128.885	3	376.2951	0.747088	0.52492	2.639863	
Within Groups	128942.7	256	503.6823				
Total	130071.6	259					

Research Question 2

What is the difference in the information literacy skills levels between international graduate students at the master's degree level and international students at the doctoral degree level, as measured by the B-TILED assessment?

The dataset that was used to answer this research question was collected from questions 7 through 28 in the study survey (see Appendix G). The mean B-TILED score for international Ph.D. students (M=49.30%, SD=12.05%) was higher than the mean score for international master's students (M=39.16%, SD=12.99%). Table 6 and Figure 4 show the scores for each group as well as the passing rate for the whole group.

Table 6: Mean B-TILED Scores for International and U.S. Graduate Students by Student Classification and Passing Rate

	International Students			U.S. Students		
Student Classification	N	Mean (%)	Passing Rate %	N	Mean (%)	Passing Rate %
Master's Students	26	39.16	11.54	18	59.60	66.67
Ph.D. Students	39	49.30	28.20	13	64.69	76.92

Mean B-TILED Scores for International Graduate Students by Student Classification

Mean B-TILED Score	Master's Students	Ph.D. Students
Mean B-TILED Score	39.16%	49.30%
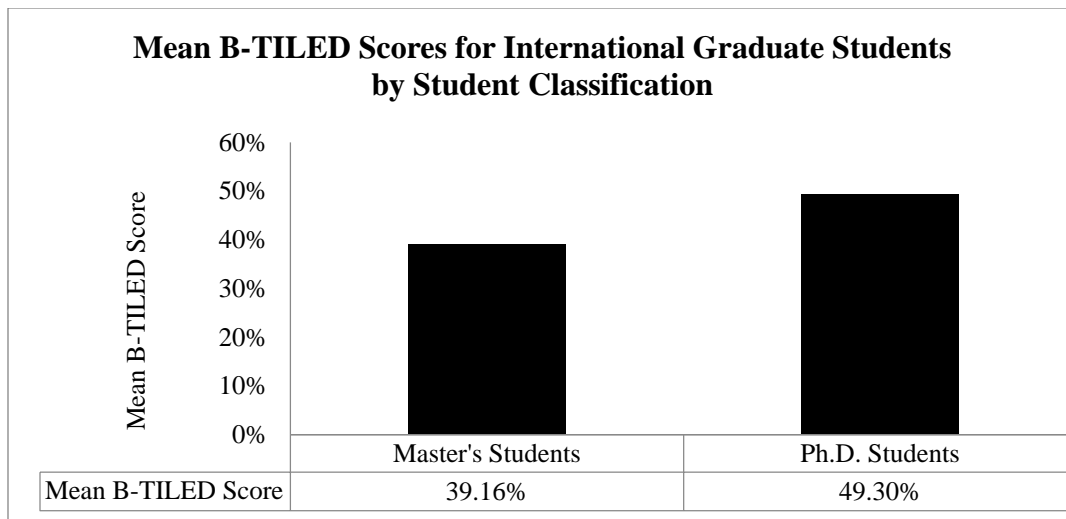
Figure 4 : Mean B-TILED Scores for International Graduate Students by Student Classification

A two- sample *t* test was conducted to evaluate the difference in the mean B-TILED scores between international master's and Ph.D. students. The two-sample *t*-test indicated a statistically significant difference between the two groups, $p = 0.002$. As a result, we can say with 95% confidence that the international Ph.D. students have a higher level of information literacy skills than the information literacy level of international master's students. Table 7

shows the *t* test summary of the mean B-TILED scores for international master's and Ph.D.

students.

*Table 7: Two-Sample T- Test of the Mean B-TILED Scores for International
Master's and Ph.D. Students*

	International Master's	*International Ph.D.*
Mean	0.391608392	0.493006993
Variance	0.016872219	0.014521364
Observations	26	39
Pooled Variance	0.015454243	
Hypothesized Mean Difference	0	
df	63	
t Stat	-3.221590971	
P(T<=t) one-tail	0.001009371	
t Critical one-tail	1.669402222	
P(T<=t) two-tail	0.002018742	
t Critical two-tail	1.998340543	

Further analysis between male (master's & Ph.D.) and female (master's & Ph.D.)

students indicated no statistically significant difference between the mean B-TILED score for

international male students (*M = 44.53%, SD = 13.91%*) and international female students

(*M = 48.76%, SD = 9.55%*), $p = 0.34$. As a result, we can say with 95% confidence that there is

no significant difference between the mean B-TILED scores for international male and female

students. Table 8 shows a summary of the Two-Sample *t* test of the mean B-TILED scores for

international graduate students by gender.

Table 8: Two-Sample T- Test of the Mean B-TILED Scores for International Graduate Students by Gender

	International Male	*International Female*
Mean	0.445286195	0.487603306
Variance	0.019365323	0.009128475
Observations	54	11
Pooled Variance	0.017740426	
Hypothesized Mean Difference	0	
df	63	
t Stat	-0.960440631	
P(T<=t) one-tail	0.170252626	
t Critical one-tail	1.669402222	
P(T<=t) two-tail	0.340505251	
t Critical two-tail	1.998340543	

Table 9 shows the Mean B-TILED scores for international graduate students in comparison to U.S. students by gender.

Table 9: Mean B-TILED Scores for International and U.S Graduate Students by Gender

	International Students			U.S. Students		
Gender	N	Mean (%)	Passing Rate %	N	Mean (%)	Passing Rate %
Males (Master's & PhD)	54	44.53	22.22	24	62.88	70.83
Females (Master's & PhD)	11	48.76	18.18	7	57.79	71.43

Figure 5 shows the Mean B-TILED scores for international students by gender
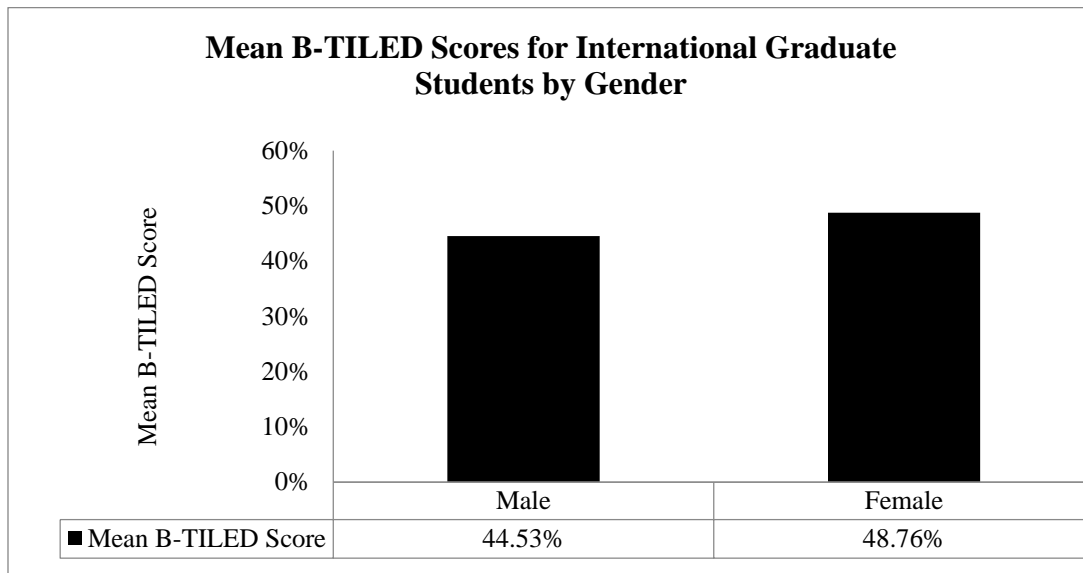
Figure 5: Mean B-TILED Scores for International Graduate Students by Gender

The data were also analyzed by credit hour. Table 10 shows the mean B-TILED scores for international students by student classification and credit hour. Figure 6 also shows the mean B-TILED scores by credit hour for international master's and Ph.D. students.

Table 10: Mean B-TILED Scores for International Graduate Students by Student Classification and Credit Hour

Credit Hour	N (Master's)	Mean B-TILED Score	N (Ph.D.)	Mean B-TILED Score
0-9 Credits	14	45.13	5	49.09
10-18 Credits	4	38.64	0	0
19-27 Credits	1	13.64	6	45.45
More than 27 Credits	7	0	28	50.16

	0-9 Credits	10-18 Credits	19-27 Credits	More than 27 Credits
■ Master's	45.13%	38.64%	13.64%	
■ Ph.D.	49.09%		45.45%	50.16%
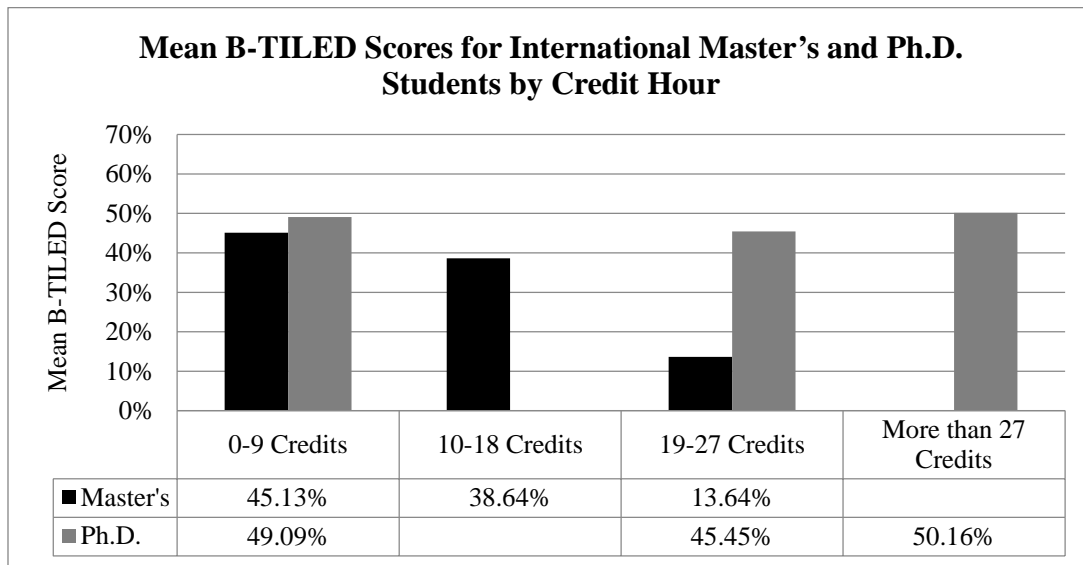
Figure 6*: Mean B-TILED Scores for International Master's and Ph.D. Students by Credit Hour.
*Blank areas indicate that no data existed in that category

Figure 6 shows that the Ph.D. students do not show significant difference in the mean B-TILED scores with varying credit hours. The ANOVA results for the Ph.D. students by credit hour showed no statistically significant difference in the mean B-TILED scores, $p = 0.87$, supporting the above conclusion. Table 11 shows the ANOVA summary of the mean B-TILED scores for international Ph.D. students by credit hour.

Figure 6 also shows that, contrary to expectations, master's students showed a decreasing trend in the mean B-TILED scores as the number of credit hours increased. This is most likely attributed to small sample size in some credit hour categories. ANOVA results (see table 12) showed a statistically significant difference in the mean B-TILED scores, $p = 0.002$. Tables 11 and 12 show the ANOVA summary for the B-TILED scores for international Ph.D. and master's students by credit hour.

Table 11: ANOVA Summary of the Mean B-TILED Scores for International Ph.D. Students by Credit Hour

Groups	Count	Sum	Average	Variance			
0-9 Credits	5	2.454545	0.490909	0.004545			
10-18 Credits	0	0					
19-27 Credits	6	2.727273	0.454545	0.004959			
More than 27 Credits	28	14.04545	0.501623	0.018439			
Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*	
Between Groups	0.010977	3	0.003659	0.236781	0.870109	2.874187	
Within Groups	0.540835	35	0.015452				
Total	0.551812	38					

Table 12: ANOVA Summary of the Mean B-TILED Scores for International Master's Students by Credit Hour

Groups	Count	Sum	Average	Variance			
0-9 Credits	14	6.318182	0.451299	0.00873			
10-18 Credits	4	1.545455	0.386364	0.028237			
19-27 Credits	1	0.014463	0.014463				
More than 27 Credits	7	2.181818	0.311688	0.010626			
Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*	
Between Groups	0.2363689	3	0.07879	6.617086	0.002357	3.049125	
Within Groups	0.261954	22	0.011907				
Total	0.4983228	25					

Further analysis was also conducted to examine content area performance differences between master's and Ph.D. students as shown in figure 7.
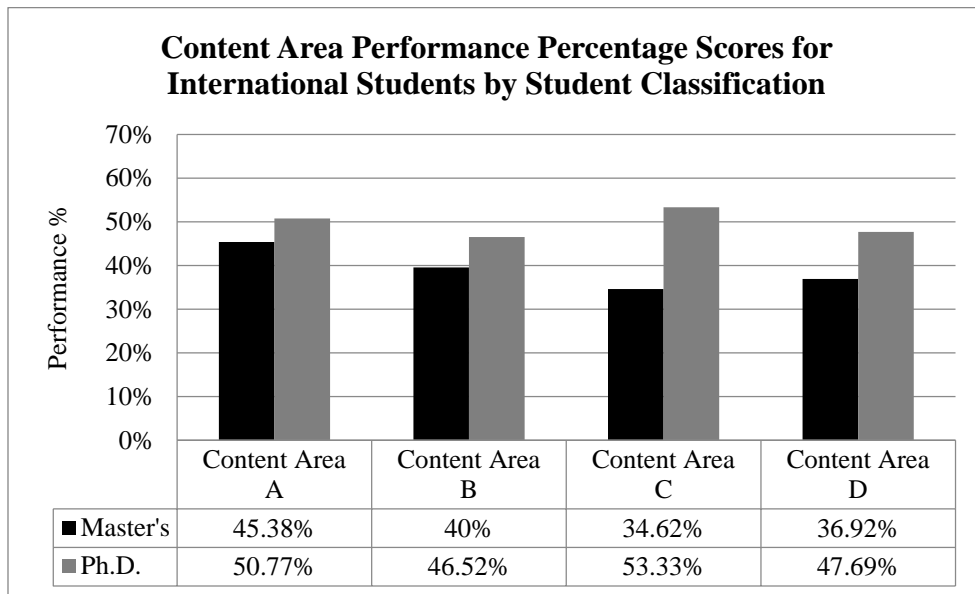
Figure 7: Content Area Performance Percentage Scores for International Graduate Students by Student Classification

Figure 7 shows that the Ph.D. students scored higher than the master's students in all content areas. Figure 7 also shows that the Ph.D. students do not show significant difference in the performance percentage score with varying content areas. The ANOVA results on the Ph.D. students by content area showed no statistical significance, $p = 0.52$, supporting the above conclusion. Table 13 shows the ANOVA summary of performance percentage scores for Ph.D. students.

Table 13: ANOVA Summary of Performance Percentage Scores for International Ph.D. Students by Content Area

Groups	Count	Sum	Average	Variance		
Content Area A	39	1980	50.76923	565.1822		
Content Area B	39	1814.286	46.52015	254.7578		
Content Area C	39	2080	53.33333	596.4912		
Content Area D	39	1860	47.69231	518.2186		
Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	1108.687	3	369.5622	0.764091	0.51586	2.664107
Within Groups	73516.69	152	483.6625			
Total	74625.38	155				

Figure 7 also shows that the master's students do not show significant difference in the performance percentage score with varying content areas. The ANOVA results showed no statistical significance, $p = 0.32$, supporting the above conclusion (see table 14).

Table 14: ANOVA Summary of Performance Percentage Scores for International Master's Students by Content Area

Groups	Count	Sum	Average	Variance		
Content Area A	26	1180	45.38462	593.8462		
Content Area B	26	1028.571	39.56044	347.8807		
Content Area C	26	900	34.61538	497.8462		
Content Area D	26	960	36.92308	438.1538		
Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	1678.493	3	559.4976	1.191862	0.316817	2.695534
Within Groups	46943.17	100	469.4317			
Total	48621.66	103				

Research Question 3

What is the difference in the information literacy skills levels between international graduate students and U.S. graduate students, as measured by the B-TILED assessment?

The dataset that was used to answer this research question was collected from questions 7 through 28 in the study survey (see Appendix G). The mean B-TILED score for U.S. graduate students (*M=61.73%, SD=16.51%*) was higher than the mean score for international graduate students (*M=45.24%, SD=13.31%*). The passing rate was 21.54% for international graduate students and 70.97% for U.S. students. Table 15 below shows the mean B-TILED scores and passing rate for each group.

Table 15: Description of B-TILED Scores and Passing Rate for U.S. and International Graduate Students

_____

Academic Status	N	Mean (%)	Passing Rate (%)
International Student	65	45.24	21.54
U. S. Student	31	61.73	70.97

_____

Figure 8 describes the mean B-TILED Scores for U.S. and International graduate students.
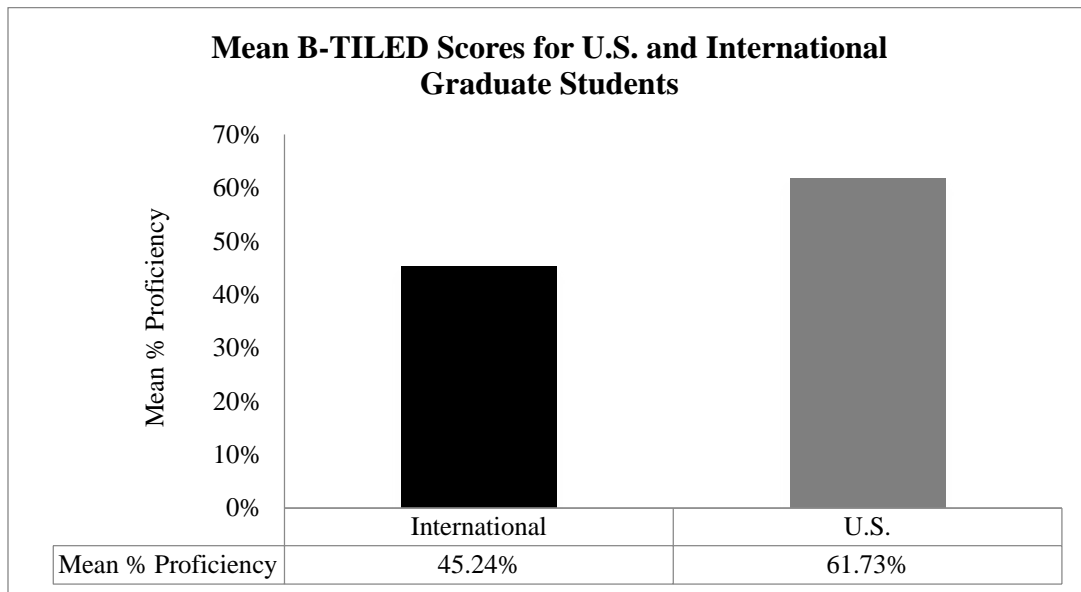
Figure 8: Mean B-TILED Scores for U.S. and International Graduate Students

A two- sample *t* test was conducted to evaluate the statistical significance of the difference in the scores. The analysis showed a statistically significant difference between the U.S. students, who had a higher score, and international students at the 95% confidence level, $p = 0.00$. As a result, we can say with 95% confidence that the level of information literacy skills of U.S. graduate students is higher than the information literacy skills level of international graduate students. Table 16 shows the *t* test summary for the mean B-TILED scores for international and U.S. graduate students.

Table 16: Two-Sample T-Test Summary of the Mean B-TILED Scores for International and U.S. Graduate Students

	International	*USA*
Mean	0.45244755	0.617302053
Variance	0.01771893	0.027241624
Observations	65	31
Pooled Variance	0.02075809	
Hypothesized Mean Difference	0	
df	94	
t Stat	-5.2421453	
P(T<=t) one-tail	4.8628E-07	
t Critical one-tail	1.66122586	
P(T<=t) two-tail	0.00000	
t Critical two-tail	1.98552344	

Figures 9 and 10 show the B-TILED scores for international and U.S. graduate students by student classification and gender.

Mean B-TILED Scores for International and U.S. Graduate Students by Student Classification

	International	US
■ Master	39.16%	59.60%
■ PhD	49.30%	64.69%
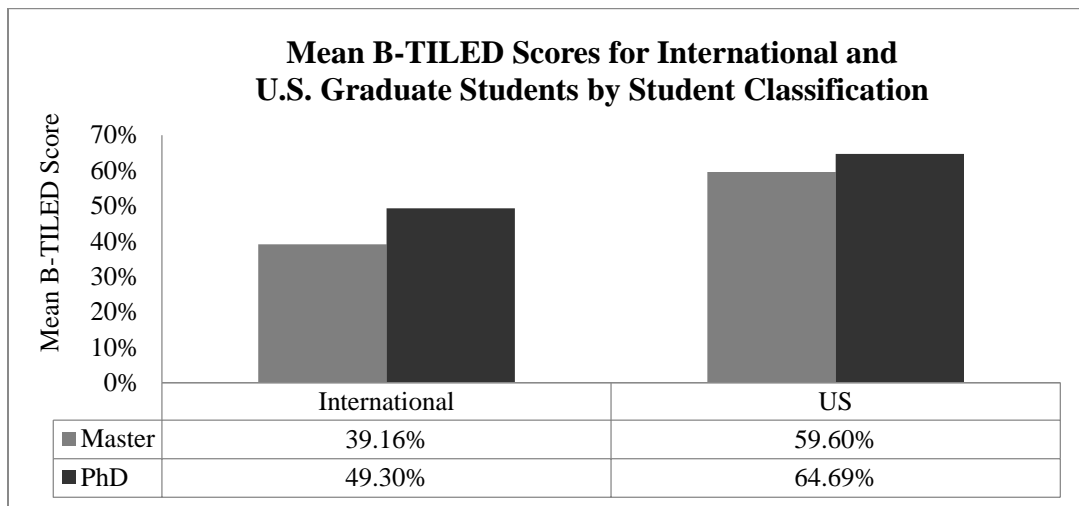
Figure 9: Mean B-TILED Scores for International and U.S. Graduate Students by Student Classification
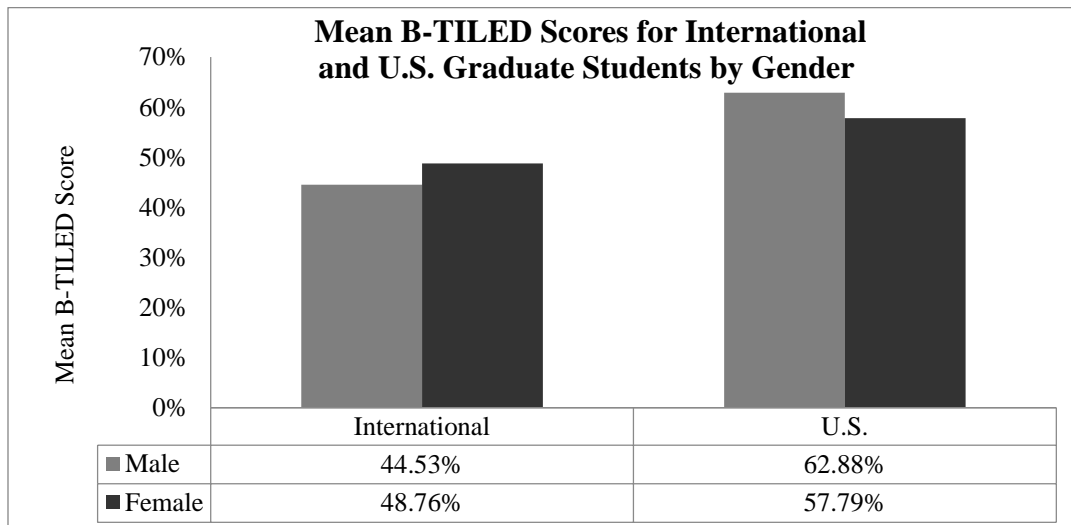
Figure 10: Mean B-TILED Scores for International and U.S. Graduate Students by
Gender

Figures 9 and 10 indicate that U.S. graduate students at both the master's and Ph.D.
levels scored higher than international graduate students. Also, both U.S. male and female
graduate students scored higher than international male and female students. A *t* test was
conducted to validate the above conclusion. The *t* test results for the U.S. Ph.D. students versus
international Ph.D. students showed a statistically significant difference at the 95% confidence
level, $p = 0.00$. As a result, we can say with 95% confidence that the level of information literacy
skills of U.S. Ph.D. students is higher than the information literacy skills level of international
Ph.D. students. Table 17 shows the *t* test summary of the B-TILED scores for international and
U.S. Ph.D. students.

Table 17: Two-Sample T-Test Summary of the Mean B-TILED Scores for International and U.S. Ph.D. Students

	U.S. Ph.D.	*International Ph.D.*
Mean	0.646853147	0.493006993
Variance	0.02932295	0.014521364
Observations	13	39
Pooled Variance	0.018073744	
Hypothesized Mean Difference	0	
df	50	
t Stat	3.573262179	
P(T<=t) one-tail	0.000395913	
t Critical one-tail	1.675905025	
P(T<=t) two-tail	0.000791826	
t Critical two-tail	2.008559112	

The *t* test results for the U.S. master's students versus international master's students also showed a statistically significant difference at the 95% confidence level, $p = 0.00$. As a result, we can say with 95% confidence that the level of information literacy skills of U.S. master's students is higher than the information literacy skills level of international master's students. Table 18 shows the *t* test summary of the B-TILED scores for the international and U.S. master's students.

Table 18: Two-Sample T-Test Summary of the Mean B-TILED Scores for International and U.S. Master's Students

	US Master's	International Master's
Mean	0.595959596	0.391608392
Variance	0.026224815	0.016872219
Observations	18	26
Pooled Variance	0.020657793	
Hypothesized Mean Difference	0	
df	42	
t Stat	4.636943725	
P(T<=t) one-tail	1.71434E-05	
t Critical one-tail	1.681952357	
P(T<=t) two-tail	0.0000	
t Critical two-tail	2.018081703	

Comparing the male and female population for the same groups shows a similar trend as with the master's and Ph.D. students. The mean B-TILED scores for both U.S. male and female students are higher than the mean B-TILED scores for international male and female students. The scores also show that the mean scores of U.S. groups are above the proficiency level while the mean scores of international groups are below the proficiency level of 57.5% B-TILED score.

The t test results for the U.S. male students versus international male students showed a statistically significant difference at the 95% confidence level, $p = 0.00$. As a result, we can say with 95% confidence that the mean B-TILED score for U.S. male students is higher than the mean B-TILED score for international male students. Table 19 shows the t test summary for the mean B-TILED scores for international and U.S. male students.

Table 19: Two-Sample T-Test Summary of the Mean B-TILED Scores for International and U.S. Male Students

	U.S. Males	*International Males*
Mean	0.628787879	0.445286195
Variance	0.024733501	0.019365323
Observations	24	54
Pooled Variance	0.020989903	
Hypothesized Mean Difference	0	
df	76	
t Stat	5.162856289	
P(T<=t) one-tail	9.45519E-07	
t Critical one-tail	1.665151353	
P(T<=t) two-tail	0.0000	
t Critical two-tail	1.99167261	

The *t* test results for the U.S. female students versus international female students also showed a statistically significant difference at the 95% confidence level, $p = 0.02$. As a result, we can say with 95% confidence that the information literacy levels of both U.S. male and female students are higher than the information literacy levels of both international male and female students. Table 20 shows the *t* test summary for the mean B-TILED scores for international and U.S. female students.

Table 20: Two-Sample T-Test Summary of the Mean B-TILED Scores for International and U.S. Female Students

	US Females	International Females
Mean	0.636363636	0.487603306
Variance	0.018181818	0.009128475
Observations	6	11
Pooled Variance	0.012146256	
Hypothesized Mean Difference	0	
df	15	
t Stat	2.659582261	
P(T<=t) one-tail	0.008923121	
t Critical one-tail	1.753050356	
P(T<=t) two-tail	0.017846242	
t Critical two-tail	2.131449546	

Further analysis was conducted by the content area to evaluate performance differences for the international group and U.S. group. Figure 11 shows the content area performance percentage for international and U.S. students.

Content Area Performance Percentage Scores for International and U.S. Students

	Area A	Area B	Area C	Area D
U.S.	59.35%	57.60%	69.03%	62.58%
International	48.62%	43.74%	45.85%	43.38%
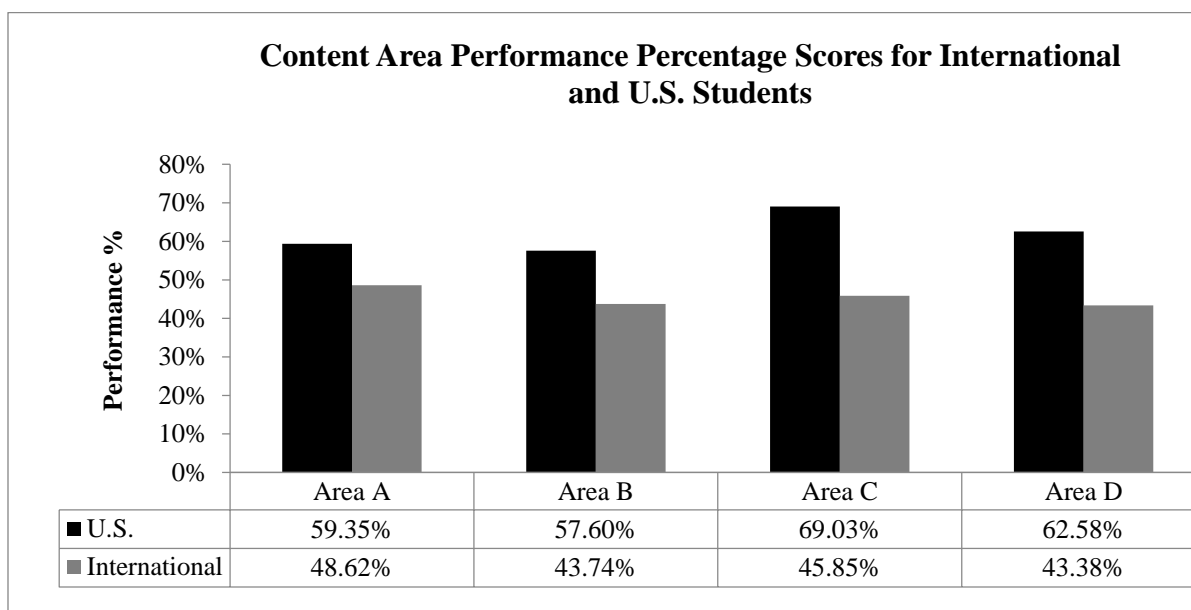
Figure 11: Content Area Performance Percentage Scores for International and U.S. Graduate Students

The ANOVA results for the content area for international students showed no statistically significant difference in the performance percentage score, $p = 0.52$. As a result, we can say with 95% confidence that the average performance percentage is not statistically different for all content areas for international students. Table 21 shows the ANOVA summary of the performance percentage scores for international students by content area.

Table 21: ANOVA Summary of the Performance Percentage Scores for International Graduate Students by Content Area

Groups	Count	Sum	Average	Variance		
Content Area A	65	3160	48.61538	574.6154		
Content Area B	65	2842.857	43.73626	298.96		
Content Area C	65	2980	45.84615	634.0385		
Content Area D	65	2820	43.38462	507.1154		
Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	1128.885	3	376.2951	0.747088	0.52492	2.639863
Within Groups	128942.7	256	503.6823			
Total	130071.6	259				

The ANOVA results for the content area for U.S. students also showed no statistically significant difference in the performance percentage score, $p = 0.22$. As a result, we can say with 95% confidence that the average performance percentage is not statistically different for all content areas for U.S. students. Table 22 shows the ANOVA summary of the performance percentage scores for U.S. students by content area.

Table 22: ANOVA Summary of Performance Percentage Scores for U.S. Graduate Students by Content Area

Groups	Count	Sum	Average	Variance			
Content Area A	31	1840	59.35484	279.5699			
Content Area B	31	1785.714	57.60369	441.9574			
Content Area C	31	2140	69.03226	849.0323			
Content Area D	31	1940	62.58065	526.4516			
Source of Variation	SS	df	MS	F	P-value	F crit	
Between Groups	2357.011	3	785.6704	1.498648	0.218433	2.680168	
Within Groups	62910.34	120	524.2528				
Total	65267.35	123					

Further comparison of each content area performance percentage by international and U.S. students was conducted using multiple t tests. The results showed a statistically significant difference in the performance percentage scores for U.S. students, $p = < 0.03$ for each content area. As a result, we can say with 95% confidence that U.S. students had a higher performance percentage score than the performance percentage score of international students in each content area. Tables 23-26 show the t-test summary of performance percentage scores between international and U.S. students for each content area.

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Table 23: T-Test Summary of Performance Percentage Scores for U.S. and International Graduate Students by Content Area A

	Content Area A	*Content Area A*
Mean	59.35483871	48.61538462
Variance	279.5698925	574.6153846
Observations	31	65
Pooled Variance	480.4519297	
Hypothesized Mean Difference	0	
df	94	
t Stat	2.244704327	
P(T<=t) one-tail	0.013566188	
t Critical one-tail	1.661225855	
P(T<=t) two-tail	0.027132376	
t Critical two-tail	1.985523442	

Table 24: T-Test Summary of Performance Percentage Scores for U.S. and International Graduate Students by Content Area B

	Content Area B	*Content Area B*
Mean	57.60368664	43.73626374
Variance	441.9574281	298.9599686
Observations	31	65
Pooled Variance	344.5974557	
Hypothesized Mean Difference	0	
df	94	
t Stat	3.422485646	
P(T<=t) one-tail	0.000460232	
t Critical one-tail	1.661225855	
P(T<=t) two-tail	0.000920464	
t Critical two-tail	1.985523442	

Table 25: T-Test Summary of Performance Percentage Scores for U.S. and International Graduate Students by Content Area C

	Content Area C	Content Area C
Mean	69.03225806	45.84615385
Variance	849.0322581	634.0384615
Observations	31	65
Pooled Variance	702.653503	
Hypothesized Mean Difference	0	
df	94	
t Stat	4.007366695	
P(T<=t) one-tail	6.14316E-05	
t Critical one-tail	1.661225855	
P(T<=t) two-tail	0.000122863	
t Critical two-tail	1.985523442	

Table 26: T-Test Summary of Performance Percentage Scores for U.S. and International Graduate Students by Content Area D

	Content Area D	Content Area D
Mean	62.58064516	43.38461538
Variance	526.4516129	507.1153846
Observations	31	65
Pooled Variance	513.2865213	
Hypothesized Mean Difference	0	
df	94	
t Stat	3.881802127	
P(T<=t) one-tail	9.62594E-05	
t Critical one-tail	1.661225855	
P(T<=t) two-tail	0.000192519	
t Critical two-tail	1.985523442	

Ninety six fully completed responses were received from a target audience of 1,337 individuals. The mean B-TILED score was 50.57% with a Standard Deviation of 16.29 %, and average Proficiency scores ranging from 42.42 to 68.90%. The overall proficiency data were tested for normality using Anderson-Darling Normality Test, and assumption for normality was met.

In this study, the B-TILED assessment was used to collect graduate students' information literacy scores. The established cut score for the B-TILED is 57.5% and represents mastery. Additionally, the B-TILED assessment can be considered as a formative assessment (Popham, 2011) to gather data about graduate students' information literacy skills and library research. Results for Research Question 1 were conclusive. The B-TILED scores indicated that international graduate students have low levels of information literacy skills. Fifty one students scored below the B-TILED cut score of 57.5 and only 14 students passed. Their mean B-TILED score was 45.24% and the overall passing rate was 21.54%.

Results for Research Question 2 were also conclusive. The B-TILED scores for international Ph.D. students (*M=49.30%, SD=12.05%*) were higher than international master's students' scores (*M=39.16%, SD =12.99%*). The passing rate was 28.20% for international Ph.D. students and 11.54% for international master's students. A two - sample *t* test was conducted to evaluate the difference between the mean B-TILED scores for proficiency percentage. The two-sample *t* test indicated a statistically significant difference between the two groups, *p* = 0.002.

Results for Research Question 3 were conclusive. The B-TILED scores for U.S. graduate students (*M=61.73%, and SD=16.51*) were higher than international graduate students' scores

(*M=45.24%, SD =13.31%*). The passing rate was 21.54% for international graduate students and 70.97% for U.S. students. A two-sample *t* test was conducted to evaluate the difference between the mean B-TILED scores for proficiency percentage. The two-sample *t* test indicated a statistically significant difference between the two groups, $p = 0.000$. The mean B-TILED scores also indicated that U.S. graduate students at both the master's and Ph.D. levels scored higher than international graduate students. Additionally, the scores indicated that both U.S. male and female graduate students scored higher than international male and female students. The scores also showed that the mean scores of U.S. groups are above the proficiency level while the mean scores of international groups are below the proficiency level of 57.5% B-TILED score.

The quantitative data analysis included further analysis of students' performance percentage in the B-TILED content areas. Data analysis of the content areas was conducted to evaluate the difficulty level of performance in each content area by different groups. The difficulty level was defined as the average percentage of correct answers for each content area in the group evaluated.

The content area performance percentage for the survey participants indicated that U.S. students had a higher performance percentage score (*Area A=59.35, Area B=57.60, Area C=69.03, and Area D=62.58*) than international students' performance percentage score (*Area A=48.62, Area B=43.74, Area C=45.85, and Area D=43.38*).

Survey data showed a good balance between master's and Ph.D. survey responses. Responses were heavily weighted toward male versus female. This can be explained by looking at the number of male and female graduate students in the population of the study. The College of Engineering and Computer Science has a total of 1,337 graduate students, of whom only 282 students are female students. Out of the 1,337 graduate students, 747 students were U.S. graduate

students and 590 were international graduate students (UCF, IKM, 2015a). Although there were more U.S. graduate students than international graduate students in the survey population, more international students than U.S. students responded and completed the survey.

Qualitative Results

Description of Interview Participants

Thirteen graduate students agreed to participate in the follow up interview with the researcher. A purposeful sample was used, and 10 students participated in the follow up interviews. Table 27 provides information about the audio recorded interviews that were completed with international graduate students.

Table 27: Description of Audio Recorded Interviews Completed with International Graduate Students

Student Classification	Interview Volunteers	Interview Participants
PhD Male Students	10	7
PhD Female Students	0	0
Masters Male Students	3	3
Masters Female Students	0	0
Total	13	10

Research Question 4

What are the self-reported challenges that international graduate students believe they face in learning information literacy skills?

The dataset used to answer this question was collected through the interviews with international graduate students. Questions used in the interviews (see Appendix I) asked participants to describe their information literacy skills and how they search for information in the library and what library resources they utilize in looking for information. Interview questions also asked students about their perceptions of library resources and services and what library instruction services they would like to see offered for international students. Participants were also asked to provide their perceptions about their information literacy needs and the challenges they face in learning information literacy skills and using the library. Overall, students described how they searched for information and how they used the information in their research papers and academic studies. Students commented positively on the role of the library in providing numerous technologies and services to students. Also, students commented positively on the B-TILED survey used in the study as a good tool to measure students' information literacy skills. Additionally, some of the graduate students commented on the value of the library instruction that they had with the subject librarian. In collecting data to answer this research question, graduate students were asked to provide their perceptions about the challenges they face in learning information literacy skills.

Results from Interviews with International Graduate Students

S1 reported that he is comfortable in using the library, and he can search the databases in the library to find the information he needs. When asked how he learned about conducting

library research, S1 stated that, "It was on my own. It was all self-learning." S1 stated that he uses the databases IEEE and ACM Library and the e-books, journals, and Google to find the information he needs. Commenting on the engineering resources he uses for his assignments, S1 stated, "It is mainly just Google, IEEE, and ACM Library." He also mentioned that he does not depend on librarians' help and he depends on online resources. As he stated, "There is enough access online, so I am very much comfortable with online searching." With respect to the assignments that need information literacy skills, S1 noted that research papers and literature reviews definitely need information literacy skills. He responded to the question about the challenges he faces in learning information literacy skills by stating that he faced some communication and cultural challenges at the beginning. He also found the difference between the educational system and technology level in his home country and the system in the U.S. challenging. He noted that at the beginning he did not know how to ask the right questions as he was confused about the system. As he stated, "In my initial stage, it was mainly communication and cultural." He elaborated stating that at the beginning he did not know the right questions to ask people in the library. He spent much time on his computer to know what he needs and where to find it. He also mentioned that language was a challenge at the beginning.

S2 described his information literacy skills and noted that he is not comfortable in searching for information and using the library. As he described his level, he stated, "From one to ten, I would say four out of ten." He also added and stated, "Even I receive some help, I feel I need more." When asked how he learned about conducting library research, S2 noted that he learned that from his friends and professors. He confirmed that he did not attend any orientation, classes, or workshops in the library. With respect to the information resources he uses and how he finds them, S2 noted that he tries to find the peer- reviewed articles in the databases and

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online. He noted that research papers need information literacy skills, and he thinks searching the Internet and the search engine Google is easier than using the library catalog. When asked about the challenges he faces in learning information literacy skills, S2 noted that the first time he used the library, he found it difficult to find the academic articles he needed. S2 usually uses keyword searching, and he believes that language is a challenge and a barrier. As he stated, "Sometimes it is hard to find the keywords, the best words to choose to find the articles or the topics I am looking for."

S3 discussed his information literacy skills and noted that most of the time he finds what he is looking for in the library. Still, he believes he needs some help to know good resources and how to use keyword searching. As he stated, "I think I might have some problems when I want to search for articles about my field." He noted that he was not aware of the classes and workshops offered by the library, and he would participate if he knew they were available. He was happy with the resources and technology available in the library and the help he receives in the library. For his assignments, he reported that he uses reference books, databases, IEEE, conference papers, online journals, search engine Google, and other online resources. When asked about the challenges he faces in learning information literacy and using library resources, he reported that the main challenge is searching for papers in the catalog and library website. Elaborating on the challenge in searching and using the library, S3 noted that some research assignments and projects definitely need information literacy. According to S3, the first year was difficult for him, but as he knew more and more, his language abilities improved. S3 believes that research papers, projects, dissertations, and literature reviews need information literacy skills.

S4 noted that his information literacy skills to search the databases and the Internet are very good. He also noted that he uses keyword searching and uses engineering materials, mainly

books and online journal articles for his assignments, especially articles from IEEE. Although he commented that the library is helpful, S4 mentioned that he does not ask librarians for help. As he stated, "I do not ask any librarian, because honestly if we do not find, may be go find the literature from Google or go to the papers because I am a researcher." S4 elaborated on the challenges he faces in learning information literacy and conducting research in the library, noting that he did not have a lot of challenges. Still, he mentioned that he sometimes gets confused or lost in the UCF Libraries and the numerous technologies and resources available, which are different from what he used to have in his home country library. He also noted that his language ability is moderate and his language fluency is not very good, but he believes that language may not be important in technical fields as it is in other fields of study.

S5 described his information literacy skills as good and noted that he is comfortable and enjoys doing research in the library. Although he commented positively about the library services and available resources, he commented that he did not know much about library services, and when asked how he learned about conducting library research and using library resources, he noted that he knew by himself. As he stated, "I just knew that there were computers in the library, and I logged in using my ID. I went to the library and used a little of empirical skills." He did not have any library workshops or classes and did not know that the library has these services. As S5 noted, he uses journal articles, online materials, and the databases IEEE and ACM Digital Library for his assignments. When asked about the challenges he faces in learning information literacy and conducting research in the library, he noted that it is mainly language. As he stated, "Mainly the language, technical language, because one thing is learning the language and the other thing is learning the technical vocabulary." Although S5 did not think that culture has a direct impact on learning information literacy skills, he noted that there are

different cultures, and it could be an issue for some students as they may not find it easy to go to the front desk and ask for help in the library.

S6 described how language is important in learning information literacy skills. As he stated, "English language is number one skill international student has to acquire." He also mentioned that students should have sufficient English language skills to be able to identify and read the articles about the area the students are researching as that will help them research more effectively in terms of keywords, paraphrasing, and other things. S6 attended some activity in the library and utilized the library consultation sessions with the subject librarian in his field. He commented positively on the help he received in learning how to use the citation software and searching the databases. When asked about how he learned conducting library research skills, S6 noted that he learned that through the high-level classes in his program, especially that these classes require research papers. For his classes and assignments, S6 uses books, journal papers, conference papers, proceedings, and the citation software, 'Endnote'. He also uses the databases Compendex (Ei Village) and ProQuest. When asked about the challenges he faces in learning information literacy skills, he noted that international students might have some difficulties in understanding the language and may get into search that they do not like. He believes that research papers, theses, and dissertations are research based, and student should have sufficient amount of knowledge and literacy to complete them. He noted that the literature review is the base for any research, and he described how he noticed that some of his friends are struggling in conducting the literature review. In describing the challenge students face in conducting the literature review, S6 stated that, "You are swimming in an ocean; you do not know what direction. If they do not have sound guidance from their research advisors, they will spend a lot of time and even maybe quit unfortunately the research experience altogether."

S7 described the challenges he faces in conducting research in the library and learning information literacy skills. Elaborating on his skills in searching the databases, S7 stated that, "I think it is not really good about the databases. I am not the best in that type of database." As he noted, professional terms used in the databases and the library that he is not familiar with present some challenge for him. He commented that even if he tries to translate the terms, that may not be helpful because, as he stated, "Translation does not give me a satisfying translation because there might be some terms used that are not how they are translated, they have different meanings when they are put in a certain content." Talking about the challenges he faces in the library, he noted that technology is sometimes challenging, because students are not used to it. S7 commented that students did not use or have certain databases before, or they were not exposed to big amount of information and a lot of databases. As he stated, "Students do not have such databases. They do not have or used this big amount of information. They will be just using limited amount, and they will not be exposed to big amount of data." S7 continued to say that he is not used to the big amount of data available in the library, and he did not know how to filter that and did not have the right methodology to find what he needs. Elaborating on the search process, he stated, "In some cases, we might get random resources or random material, but it might be inefficient." S7 did not consider language as a challenge for him, and that was because English was the language of instruction where he studied his undergraduate degree.

S8 reported that he learned library skills by himself, and he did not attend any workshop or class in the library. S8 was unaware of the library services. As he stated, "I did not know. I did not get any invitation." When asked about the challenges he faces in learning information literacy skills, S8 mentioned that in the orientation, everything should be explained to students, because some students may have libraries similar to libraries in the U.S., but in his case, things

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are different. It was different in his home country, and the library there was not as big as it is in the U.S. As he, stated, "Here, everything is computerized and at first, I found it a little hard to find a book." He also noted that technology in the library is a challenge.

S9 reported that his information literacy skills are average. As he described his skill, he stated, "I cannot say I have the necessary skills." S9 noted that he learned about conducting library research by himself. He uses mainly online resources and journal articles for his assignments, and he is happy with the library service and resources. As he commented, S9 uses keyword searching to find the information he needs in the databases. With respect to the challenges he faces in library research and learning information literacy skills, he noted that he found the way for searching to be challenging for him. As he stated, "The way for researching. When you want to search about something, but O.K. you are going to find something related to what you are trying to find, but they do not have the whole information you need."

S10 reported that his information literacy skills are improving over time and mentioned that on a scale of 1 to 10, he would give himself 8.5. He stated that at the beginning, it was very difficult for him to find the information he needed, but over time, he learned more skills and became comfortable in using the library and finding the information he needs. While he described his abilities to search the databases as above average, he gave himself a 4 or 5 on a scale of 0 to 10. When asked how he learned about conducting library research, he noted that he learned about conducting library research through a research methods class he took, in which he had to use the library and meet with the subject librarian who helped him in using the databases to search for information. S10 noted that he uses e-books, journal articles, and online resources. When asked about the challenges he faces in learning library research and information literacy skills, S10 noted that the main challenge for him is language. As he stated, "You need to spend

more time to understand the content and to go through and to read it one more time to make it clear. The language might be the only barrier." Elaborating on his ability to search the databases, S10 noted that he found searching the databases to be hard. As he stated, "It is not that easy to locate the information from the database. For me, it was a hard task."

Research Question 5

What are the self-reported information literacy skills and library services that international graduate students believe they need?

Results from Interviews with International Graduate Students

The dataset used to answer this question was collected through the qualitative interviews with international graduate students. Questions used in the interviews (see Appendix I) asked participants to describe their information literacy skills and how they search for information and what library resources they utilize in looking for information. Interview questions also asked students about their perceptions of library resources and services and what library instruction services for international students they would like to see offered in the library. In collecting data to answer this research question, international graduate students were asked to provide their perceptions about their information literacy skills and their needs in searching for information and using library resources and conducting research in the library.

S1 elaborated on his library and information literacy needs by emphasizing the importance of library orientations and workshops. He noted that workshops from the library would definitely be helpful and useful for international students, especially for students who

have just arrived at the university. He noted that students need workshops about the library resources and using them. S1 also wanted more databases and articles to be free. Moreover, S1 expressed his need to be aware of the library services available for students and noted that the library could send an e-mail to graduate students informing them about library services and resources available for them. When asked about what information literacy and instruction services he likes to see offered by the library to international students, S1 mentioned that he would like to see workshops, fliers, handouts, and posters about library services. He emphasized that these things motivate students and create bigger awareness among international graduate students. He believes that if communication is more open and clear, more directive, more specific with graduate students, it will be more useful and less intimidating to international students to come to the desk and use the resources in the library. S1 also emphasized that the library should reach out and motivate students to come to the library and benefit from the library. As he stated, "If the library reaches out and publishes itself to students, more students will be benefited. That would be more effective and the library will see more faces than the usual ones."

S2 emphasized the need for a course from the library to teach international students how to use library resources. He also noted that students need orientation in the library. As he reported, he did not know that the library provides instruction for students, and if he knew, he would attend one of these classes. He commented that students need to know about these services and classes, and the library should advertise these classes on the library website to show the classes and workshops that the library provides. S2 mentioned the library should tell students that they can receive help in the library. He mentioned that the library can publicize on the website that there are library classes that students can attend if they need help. S2 also

commented that library classes for international students would be helpful, especially that these students are not familiar with the search skills like U.S. students.

S3 discussed his information literacy skills in using the library resources and stated that he needs to be able to communicate what he needs and search what he needs in terms of search strategy. Elaborating on his information literacy needs and searching library resources, S3 stated, "I think my basic need is choosing the right keywords." He needs to be able to know what to search for, and when he finds the resources, he needs to know how to approach the resources in terms of how to read them and which ones to use. As he stated, "My basic need is when I get the resources, how to approach them, read them all or just a section. I think again the ability I need is to choose the right terms to search." S3 also noted that he did not have much knowledge about the library classes, workshops, and services, and he believed that some orientation and workshops are needed for international students. When asked about what the library should do to help international students, S3 noted that the library should provide some resources about how to search and use library resources and should increase information literacy of students in terms of research strategies. He also suggested advertising these library services. When asked about what information literacy and instruction services he would like to see offered by the library to international students, he noted that he likes to have classes about citation manuals and how to use the library catalog and interlibrary loan service. He also noted that he needs to be informed of the library services. With respect to searching skills, S3 also mentioned that he needs to learn some skills on conducting literature reviews. As he elaborated about the importance of learning how to conduct the literature review, S3 stated that, "It is definitely a need for international students and me as well."

S4 discussed his library and information literacy needs and noted that he needs a writing guide, a book to guide him to write papers in engineering. As he noted, he wanted to learn how to organize, report, and submit material for publication in engineering. S4 believes that international students need help the first time they are using the library. He mentioned that he would like to see international students invited to some library workshops on how to search and organize materials and how to present.

S5 described his information literacy needs as a graduate student by emphasizing the importance of vocabulary and reading. As he stated, "Knowing how to read and actually understanding what you are reading is really important to, let us say, master comprehensive reading." He noted that international students understand only part of what they are reading regardless of whether it is complicated or not. He believes that reading and understanding what students read in the library is important because it is important for evaluating the literature and the resources students are using. As he stated, "Part of this comprehensive reading has to do with evaluating the literature. If you are not really comprehending what you are reading, you may disregard something as not useful, but it may be actually fundamental." When asked about what library services he likes to see offered to international students, S5 noted that he would like to have a workshop on how the library works and how to use the resources. He wanted more awareness of the library resources and noted that sometimes students do not know they have these resources in the library. S5 also suggested sending an email to all UCF graduate students or using announcements or leaflets that show and inform students of the library monthly calendar of activities. He continued to say that graduate students are very busy and sometimes do not pay attention to things around them. As he stated, "If you are international student and you have not adapted, it is even more difficult, you do not know what is going on."

S6 elaborated on the information literacy needs of international graduate students and noted that the library is a must for graduate students. He believed that having a library class as a component of the graduate program would be beneficial for graduate students, and he suggested having a mandatory workshop for newly admitted students every semester. He believes that such a workshop would be helpful as it introduces students to some tips and how to search the library. S6 emphasized the importance of outreaching to students and suggested developing a guide or a manual for newly admitted international students. He also noted that the library should do more for international students. As he stated, "They need to be more exposed and approachable." Also, S6 emphasized the importance of exposing international students to the services available in the library. He noted that the library has a lot of resources and many kinds of helpful facilities, but unless international students have this as an assignment or have the initiative to do that research, they will not use the library resources. He continued to say that if students are exposed to these resources, library resources would be used much more effectively and efficiently.

S7 talked about his information literacy needs as an international graduate student and noted that manuals and workshops would be a good idea. He also suggested that the library should market and promote library resources to students. As he stated, "The library should make it or show that librarians are always approachable for any help or assistance, and they are always willing to help you out if you need anything." S7 also suggested providing a manual that shows students how to use the databases and what they can get from the databases. With respect to the information literacy and instruction services he would like to see offered by the library, S7 mentioned that he would like to see workshops for international students.

S8 expressed his information literacy needs by emphasizing his need to know the basics of research. Regarding library services and providing services to students in different languages,

S8 noted that there should be people in the library who can speak different languages to help students who might need more help. As he stated, "It is multicultural, multiracial university, and people are coming from all sorts of world at UCF. I find it like there should be people speaking multiple languages at the library." He also emphasized the importance of publicizing the library services and emailing students to inform them of the services available for them.

S9 commented on his information literacy needs, noting that he needs training to show him how to search for information and find what he needs. Also, he wanted classes to understand the literature review and how to conduct literature reviews the right way. He also wanted orientation or training to know what the library has and to learn the best way to search and find what he needs in the library.

S10 discussed his information literacy needs as an international graduate student, noting that he needs to develop skills in selecting the right database and be able to evaluate and use trusted information. He suggested that the library should increase the awareness of students about the resources and how they can use the resources. He also suggested that the library should have on the library website some videos that can give brief information on how to use the specific database and find the information in the database. In addition, he noted that the library has to increase the number of workshops and classes offered to students. When asked about the services he would like to see offered in the library, S10 wanted to see some kind of help service in the library that can be offered in the most common five languages at the university.

International Graduate Students' Themes

Based on the connecting threads and patterns among and within the original categories, five final broad themes were identified. Tables 28-32 include descriptions of the final themes that were identified from the qualitative data collected in interviews with international graduate students at the College of Engineering and Computer Science.

Table 28: International Graduate Student Theme 1

Theme	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10
Information Literacy Skills										
Students need more effective searching skills		x	x		x		x	x	x	x
Research papers/ literature reviews need information literacy skills	x	x	x		x	x	x		x	x

Examples of characteristic responses supporting the theme:

"On a scale of 1 to 10, it is 4 out of 10."

"Even I receive some help I feel I need more."

"I think I might have some problems when I want to search for articles about my field."

The above table shows that the majority of students interviewed need more effective searching skills. One student, for example, noted that on a scale of one to ten, his information literacy skills would be four out of ten. Also, the same student reported that even if he receives some help, he always feels he needs more help.

Table 29: International Graduate Student Theme 2

Theme	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10
Information Practices & Resources										
Most often use IEEE Explore & IEEE Wily eBooks	x		x	x	x					x
Most often use library online resources	x	x	x	x			x		x	x
Students depend on themselves to search for information	x	x		x	x		x	x	x	x
Most often use journal articles	x	x	x	x	x	x		x	x	
Most often use keyword searching	x	x	x	x			x		x	
Most often use search engine Google	x	x					x	x		

Examples of characteristic responses supporting the theme:

"It is mainly just Google, IEEE, and ACM Library."

"Usually professors ask for journal articles, especially per-reviewed."

The table above reflects students' responses in the area of information practices and resources. As the examples above show, a good number of students used journal articles and online resources the most.

Table 30: International Graduate Student Theme 3

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Theme	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10
Library Services & Resources										
Students are satisfied with library services	x	x	x	x	x	x		x	x	x
Students are satisfied with available resources	x		x		x	x		x	x	x
Library needs to market services to international students	x	x	x	x	x	x	x	x	x	x

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Examples of characteristic responses supporting the theme:

"The library is helpful and supportive."

"The library has been helpful."

    The table above reflects students' responses about the library services and resources. As the examples above show, students were happy with the services and resources available for them, and they noted that the library should outreach to international students and market library services to international students.

Table 31: International Graduate Student Theme 4

Theme	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10
Student Challenges										
Language/ library terminology	x	x	x	x	x	x	x	x		x
Effective database or catalog searching		x	x		x		x		x	x
Citing references			x		x		x			

Examples of characteristic responses supporting the theme:

"The first time I used the library I found it difficult to find the academic articles."

"Mainly the language, technical language, because one thing is learning the language and the other thing is learning the technical vocabulary"

"Sometimes it is hard to find the keywords to find the articles and topics I am looking for."

The table above reflects students' responses about the challenges they face in learning information literacy skills. As the examples show, students have a challenge to effectively search the databases and the library catalog. For international students, most of the time, this is related to language and library terminology, especially that most of international students are not native English speakers.

Table 32: International Graduate Student Theme 5

Theme	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10
Student Needs										
Library orientations and classes	x	x	x	x	x	x	x	x	x	x
Know about library services	x	x	x	x	x	x	x	x		x
Help in searching databases or library catalog	x	x	x		x		x	x	x	x
Graduate student workshops	x	x	x	x	x	x	x		x	x

Examples of responses supporting the theme:

"Workshops about the library resources and using them"

"Orientation sessions for international students"

"If the library reaches out, more students will benefit from the library."

"I am not familiar with library classes."

The table above reflects students' responses about their library and information literacy needs. As the examples show, the majority of the students expressed their desire to have library related orientations and workshops, and they wanted to be aware of library services available for them.

Data Interpretation

In this study, the B-TILED was used to gather and analyze scores about graduate students information literacy skills. The B-TILED was also considered as a formative assessment tool to investigate the information literacy skills level of international graduate students and to identify indicators about their information literacy and library research skills. In addition to the quantitative data collected through the online survey, qualitative data were also collected to provide a better understanding of the problem and deeper insights for the analysis of the findings of the study. The following paragraphs will compare the qualitative results with the quantitative results to determine if there is convergence or divergence between the two data sources (Creswell, 2009).

Interpretations for Research Question 1

The scores for international graduate students showed a mean B-TILED score of 45.24%, falling below the proficiency level of 57.5%. When we examine the pass/fail rate for this group, 51 students scored below the 57.5% B-TILED threshold and 14 students passed and achieved proficiency level, resulting in an overall pass rate of 21.54%. When examining the content area scores for international students, the ANOVA results indicated that there is no significant difference in the performance percentage scores between the content areas, $p = 0.52$.

The results indicated that international graduate students have a low level of information literacy skills. They scored below the competency cutting score of 57.5 and had a low performance percentage score in each of the content areas.

Qualitative interviews with international graduate students indicated that they had some challenges and difficulties in learning information literacy skills and using library resources. Results of qualitative data showed that the majority of international graduate students need more effective searching of the databases and usage of library resources. Students expressed that language is a challenging factor for them, and it negatively affects their learning of information literacy skills and using library resources. International students' performance percentage score was relatively low in all content areas. Therefore, international graduate students might benefit from general review in information literacy skills and in the different content areas to improve their information literacy skills and achieve proficiency level. Data analysis in this study showed that both quantitative and qualitative results converge. Quantitative results indicated that international students have a relatively low level of information literacy skills, and qualitative results showed that international graduate students face some challenges in searching for information and using library resources.

Interpretations for Research Question 2

The comparison between international Ph.D. and Master's students indicated a statistically significant difference between the Ph.D. students (*M= 49.30%, SD =12.05%*) and the master's students (*M= 39.16%, SD = 12.99%*), *p= 0.002*. The comparison by content area performance percentage scores indicated that Ph.D. students scored higher than the master's students in all content areas. The ANOVA results showed no significant difference in the performance percentage by content area for both the Ph.D. and master's students, $p = 0.32$ for the master's students and $p = 0.52$ for the Ph.D. students.

The comparison between the mean B-TILED scores of international students by student classification and credit hour also indicated no statistically significant difference between the master's and Ph.D. students.

Qualitative interviews with international graduate students indicated that the majority of international master's students did not have the same level of experience that international Ph.D. students showed, and they may not need to use the library often like Ph.D. students, who have to use the library due to their advanced research and coursework requirements. On the contrary, interviews with international Ph.D. students showed that they are more exposed to library resources, and they expressed that they have good skills and are comfortable searching for information and using library resources for their research. For example, when asked to name some engineering databases, S7, who is one of the international master's students, responded by stating, "I am not familiar with this." He also reported that he is not familiar with citation manuals and the engineering database 'Ei Village,' which is one of the main engineering databases. Another example that shows how master's students may not be using library resources like Ph.D. students is when S8 could not name any engineering database and noted that he has not used one before.

On the other hand, Ph.D. students showed more experience and interest in using library resources. S6, for example, commented on the library workshops he attended and how he worked with the subject librarian to help him in a literature review he was conducting. He also noted that he attended the citation software 'Endnote' workshop in the library and how helpful it was for him. When S6 was asked how he learned about conducting library research and using library resources, he stated that it was through the high-level classes in his program, especially that they require research papers. As he stated, "Thanks to my graduate program that introduced us to a

more focused approach to library resources." Another Ph.D. student, S10, also reported that he learned about conducting library research and using library resources through one of his advanced research classes, in which he was asked to come to the library. As he noted, for that class, he came to the library and met with the subject librarian and was taught how to use the databases and search for information.

Although international Ph.D. students showed that they are more experienced and may have better information literacy skills than international master's students, and although Ph.D. students' B-TILED scores and performance percentage scores in content areas were significantly higher than master's students' scores, both international Ph.D. and master's students' B-TILED scores and performance percentage scores were relatively low. Therefore, international graduate students might benefit from a general review in information literacy skills and in the different content areas to improve their information literacy skills and achieve proficiency level. The results of qualitative data support the results of the quantitative data in the study. Results of quantitative data showed that international Ph.D. students have a higher level of information literacy level than that of international master's students, and qualitative data results showed that international Ph.D. students are more experienced and comfortable in searching for information and using library resources than master's students. Therefore, international master's students might benefit from a general review in information literacy skills and in the different content areas to improve their information literacy skills and achieve proficiency level.

Interpretations for Research Question 3

The mean B-TILED score for U.S. graduate students (*M=61.73, SD=16.51*) was higher than the mean B-TILED score for international graduate students (*M=45.24, SD=13.31*). The passing rate was 21.54% for international students and 70.97% for U.S. students. A *t* test was conducted to evaluate the statistical significance of the difference in the scores. The analysis showed a statistically significant difference between the two groups at the 95% confidence level, $p = 0.00$. Comparison of the B-TILED scores between U.S. and international students by student classification and gender indicated that U.S. graduate students at both the master's and Ph.D. levels scored higher than international students. Comparison between U.S. Ph.D. students and international Ph.D. students and between U.S. master's students and international master's students indicated that U.S. Ph.D. and master's students scored higher than international Ph.D. and master's students with a statistically significant difference. The *t* test results for the U.S. Ph.D. students versus international Ph.D. students showed a statistically significant difference at the 95% confidence level, $p = 0.00$. The *t* test results for the U.S. master's students versus international master's students showed a statistically significant difference at the 95% confidence level, $p = 0.00$. Further comparison between international students and U.S. students by content area indicated that U.S. students scored higher than international students.

Qualitative interviews with international graduate students indicated that they had some challenges and difficulties in learning and using library resources. Results of qualitative data showed that the majority of international graduate students need more effective searching of the databases and usage of library resources. Students expressed that language is a challenging factor for them, and it negatively affects their learning of information literacy skills and using library resources. This may explain why U.S. graduate students scored significantly higher than

international graduate students, and their mean B-TILED score was above the competency

cutting sore of 57.5%. This can be attributed to the fact that U.S. graduate students are very

adapted to their own country and are studying in their own native language. That makes it easier

for them to learn information literacy skills, especially that they do not have to deal with the

challenge of speaking and using English language, which is important for understanding and

completing the advanced coursework required for their research and academic studies. This is

not the case with international graduate students who face culture and language related

challenges. For example, S1, who is an international graduate student, reported that he faced

some communication and cultural challenges at the beginning. He also found the difference

between the educational system and technology level in his home country and the system in the

U.S. to be challenging. As he elaborated, at the beginning he did not know the right questions to

ask people in the library, and he spent much time on his computer to know what he needs and

where to find it. He also mentioned that language was a challenge at the beginning. S2, for

example, noted that language was a barrier and a challenge for him. As he stated, "Sometimes it

is hard to find the keywords to find the articles and topics I am looking for." Another student, S3,

also commented on the language challenge and stated that the first year was a little difficult to

search and read the resources, but as he knew more and more, his language efficiency improved.

Additionally, S5 noted that the challenge he faces in using the library is mainly language. As he

stated, "Mainly the language, technical language, because one thing is learning the language and

the other thing is learning the technical vocabulary." Moreover, S6 described how language is

important in learning information and literacy skills. As he stated, "English language is the

number one skill international student has to acquire." Also, S7 noted that professional terms

used in the databases and the library that he is not familiar with present some challenge for him.

Additionally, S10 noted that the main challenge for him is language. As he stated, "You need to spend more time to understand the content and to go through and to read it one more time to make it clear. The language might be the only barrier."

Data analysis showed that both quantitative and qualitative results converge. Quantitative data results indicated that U.S. graduate students had a higher level of information literacy skills than that of international graduate students. This is most likely related to the fact that U.S. graduate students are generally native English speakers, and they do not experience any language related challenges in learning information literacy skills and using the library. On the other hand, the qualitative data results indicated that international graduate students had some culture and language related challenges in learning information literacy skills and using library resources. Therefore, international graduate students might benefit from improving their English language abilities. The library may consider their language skills and take their needs into consideration in designing information literacy classes and modules. International graduate students might also benefit from a general review in information literacy skills and the different content areas to improve their skills and achieve proficiency level.

Interpretations for Research Question 4

During the qualitative interviews international graduate students noted that they face some challenges in learning information literacy skills and using the library. Some students reported that they faced some challenges related to language and culture at the beginning, and as they learned more and received the necessary library instruction, they became more confident and comfortable in using the library and utilizing library resources. One example is S6, who

elaborated on the importance of the library workshops and how they can be helpful for graduate students and doctoral students conducting literature reviews and writing their dissertations.

In addition, some students highlighted the difference between the educational system in their home country and the system in the U.S. and how that can be challenging at the beginning. Responses from students showed that they have challenges in searching the databases and utilizing library resources effectively. Sometimes these challenges are related to language. S2, for example, noted that sometimes it is hard for him to find the keywords to find the articles and topics he is looking for, and S5 noted that the technical language and the library terminology present a challenge for him. Similarly, S7 mentioned that professional terms used in the databases are a challenge for him. Also, S10 noted that he needs more time to understand the content of what he finds, and he reads it one more time to make it clear. This indicates that language is a challenge for international students.

Not all students interviewed believed they have challenges in learning information literacy skills and using the library. Some students interviewed did not believe that language or culture presents any challenges to them. It was noticeable that students who got their undergraduate degrees from universities where the language of instruction is English and had a culture similar to the western culture did not find language and culture as challenging while using the library and conducting their research. S7, for example, stated that language is not a challenge for him because he studied his undergraduate degree in English and all his coursework assignments were in English. Therefore, the challenge for him is not just using English language, but searching for information effectively is the real challenge. He noted, for example, that the challenge he faces is narrowing down the search to get a limited number of articles that are very related to his research.

Overall, the qualitative data analysis showed that international graduate students face some challenges in learning information literacy and using library resources. The data showed that language is a challenge for international students, and searching the databases and using library resources were challenging to some international students. The analysis of the qualitative data shows that the results support the results of the quantitative data. The analysis of the quantitative data showed that international students had a relatively low information literacy skills level, and the analysis of the qualitative data showed that international students had some challenges in searching for information and using library resources.

Interpretations for Research Question 5

During the qualitative interviews, students were asked to give their perceptions about their information literacy needs and what library services they like to see offered to them. Most of the students interviewed in the study emphasized their need to be able to search for information and use the databases and library resources more effectively. Students wanted workshops on library resources and how to use them. They wanted workshops to help them in keyword searching, constructing the search strategy, and searching the databases effectively. Students expressed their need to develop skills in selecting the right database and be able to locate and use the information they find properly. They also expressed their need to understand the literature review and how to conduct literature reviews the right way and the best way to search and find what they need. Moreover, students also expressed their need to be more aware of library services. Students wanted to see library services more publicized to motivate students

to come to the library. They suggested that the library should email graduate students and inform them of the library services and resources available for international students. S6, for example, suggested that the library should have more initiatives for international students and be more approachable and active in exposing international students to the services available in the library. The answers that students gave indicated that they need help from the library to learn and improve their information literacy skills, and that the library may consider a more proactive and aggressive outreaching process to this group of library users.

Overall, the qualitative data analysis showed that international students face some challenges in learning information literacy and using library resources. The data showed that language is a challenge for international students, and searching the databases and using library resources were challenging to some international students. The analysis of the qualitative data showed that the results support the results of the quantitative data in this study. The analysis of the quantitative data showed that international students had a relatively low information literacy skills level, and the analysis of the qualitative data showed that international students had some challenges in using library resources effectively. International graduate students also had some information literacy needs. Therefore, international graduate students might benefit from a general review in information literacy skills and the different content areas to improve their skills and achieve proficiency level.

CHAPTER FIVE: DISCUSSION

Summary of Findings

This chapter presents a discussion of the findings from this study. It discusses the findings from the data gathered to investigate and examine information literacy skills of U.S. and international graduate students at the College of Engineering and Computer Science. The chapter also discusses the library information literacy and outreach services in relation to international students and in the context of organizational learning and the Bolman and Deal's Framework (2013) and provides recommendations for library instruction and academic programs.

Currently, academic libraries are expanding programming and services to meet the unique needs of specific graduate groups, including international graduate students. In line with this focus, academic librarians are expanding their roles in the area of outreach. They are becoming more involved in aligning library services and programming with academic programs, and they are playing a bigger role in promoting change in their organizations. Therefore, it is important that academic librarians gain deeper insights about the needs and perspectives of programs, program faculty, and graduate groups in order to address the challenges associated with outreach and to effectively promote change (Bishop, 2015).

In this mixed methods study, the collection and analysis of quantitative and qualitative datasets allowed the author to examine information literacy skills of graduate students enrolled in the Engineering and Computer Science programs and provided insights about how library services are provided to international graduate students. The data also helped in gaining a broader understanding of the information literacy skills, practices, challenges, and needs of international graduate students and provided valuable insights about their perspectives in relation

to library services. Based on the findings of the study, recommendations are made to inform future information literacy planning and library outreach programs in relation to international students.

Purpose of the Study

The purpose of this mixed methods research study was to explore and investigate the information literacy skills, challenges, and needs of international graduate students at the UCF. The specific objectives of the study were:

1. To assess the current information literacy skills of international graduate students and highlight the necessary skills they need to succeed in their research and academic studies.

2. To understand the unique academic needs of international graduate students and examine the linguistic, cultural, and technological challenges they face in learning information literacy skills and utilizing library resources to search, retrieve, and use information properly in their academic studies.

Findings and Implications

This study investigated the information literacy skills of international graduate students and how library services are utilized by international graduate students at the College of Engineering and Computer Science at UCF. The study included both U.S. and international graduate students, with a special focus on international graduate students. The study examined and measured the current information literacy skills of international graduate students and compared them with information literacy skills of U.S. graduate students. Additionally, the study

identified the perceptions and expectations of international graduate students about their library research and information literacy skills, challenges, and needs. Much of the research found in the library and information science literature may not address the unique and more complicated research needs of international graduate students related to library research and information literacy skills. This study offers initial insights to help in addressing this gap in the literature. In the following section, key study findings and implications are outlined in regard to research questions that are addressed in this study.

Research Question 1: What is the information literacy skills level of international graduate students, as measured by the B-TILED assessment?

Finding 1a: The information literacy skills level of international graduate students is relatively low. The overall information literacy scores of graduate students (n=65) as measured by the B-TILED assessment in this study indicated a passing rate of 21.54%. The established B-TILED cut score of 57.5% requires students to answer 13 of the 22 B-TILED content items correctly (Beile O'Neil, 2005).

Implication 1a: International graduate students may not be working on their information literacy skills and benefiting from the library services in relation to library research and information literacy instruction. Also, this may indicate that international students are not fully aware of the library instruction and services offered by the library. Additionally, misconceptions that graduate students are ready for working with the academic literature may also negatively affect their chances to develop effective research strategies. Graduate students may mistakenly believe that their information literacy skills are very good, and they do not need to ask for help to improve their information literacy skills. This finding suggests that the library may consider a

more effective role in reaching out to international students and marketing library services to inform them of the services available for them. The library should encourage international students to visit the library and attend the orientations, workshops, and library classes to improve their information literacy skills. The B-TILED scores suggest that additional learning opportunities for international graduate students in relation to library research strategies and concepts would be beneficial.

Finding 1b: International graduate students had a low performance percentage scores in all content areas, confirming the fact that they have a relatively low level of information literacy skills.

Implication 1b: International graduate students need improvement in their information literacy skills. Since they did not perform well in all content areas, they may benefit from a review in all content areas.

Research Question 2: What is the difference in the information literacy skills levels between international graduate students at the master's degree level and international students at the doctoral degree level, as measured by the B-TILED assessment?

Findings 2a: There was a statistically significant difference between the mean B-TILED score for international Ph.D. students (*M*=49.30, *SD*=12.05) and the score for international master's students (*M*=39.16, *SD*=12.99).

Implication 2a: International Ph.D. students have a better information literacy skills level than that of international master's students. This may have to do with the fact that information literacy kills and library research are highly related to graduate students due to their research and

coursework requirements and the fact that they are more exposed to research tools and library resources. This may indicate that doctoral students are more experienced in using library resources. Usually, doctoral students need the library more than master's students to conduct literature reviews and write proposals, theses, and dissertations. Attending a library orientation and attending some of the graduate workshops could be of considerable benefit in helping master's students to improve their information literacy skills.

Finding 2b: The interviews with international students indicated that the majority of Ph.D. students are more comfortable than master's students in searching for information and using library resources.

Implication 2b: This may indicate that the more students are exposed to the library resources, and the more library instruction is given to them, the better their information literacy skills will be. This is clear in some answers of the master's students during the interviews as they sometimes answered by saying, "I did not need to do that, I did not need to do a literature review or write a proposal."

Finding 2c: Although Ph.D. students had a higher mean B-TILED score than master's students, there was no statistically significant difference between the mean B-TILED score for Ph.D. students and the score for master's students based on credit hour variable.

Implication 2c: This may indicate that regardless of the number of credit hours students have finished, if students are not exposed to library resources and are not utilizing the resources for research assignments, their information literacy skills may not be at a high level. Attending library classes and workshops and using the library resources to complete coursework and research assignments seem to be more important in mastering information literacy skills than the number of credit hours achieved.

Finding 2d: The content area performance percentage score for international Ph.D. students (*Area A=50.77%, Area B=46.52%, area C 53.33%, and Area D=47.69%*) was higher than the content area performance percentage score for international master's students (*Area A=45.38%, Area B=40%, area C=34.62%, and Area D=36.92%*) in all content areas.

Implication 2d: This may indicate that a higher level of information literacy skills involves a higher level of information literacy skills in content areas too. Ph.D. students are exposed more than master's students to more advanced levels of research and coursework requirements, causing them to learn and master more information literacy skills in all four content areas. For example, Ph.D. students are expected to publish more than master's students, and that requires them to be aware of publishing and copyright law related issues.

Research Question 3: What is the difference in the information literacy skills levels between international graduate students and U.S. graduate students, as measured by the B-TILED assessment?

Finding 3a: U.S. graduate students' mean B-TILED score of 61.73 was above the 57.5 B-TILED cutting score for mastery, indicating that U.S. graduates students as a whole have achieved information literacy proficiency level.

Implication 3a: The information literacy skills level of U.S. graduate students is acceptable. Although there is no way to determine exactly why they had this score in comparison to the international graduate students, who did not perform well and their mean B-TILED score was below the competency cutting score of 57.5, one might argue that U.S. students are more adapted to the environment of their country and the university, especially that they are using their

native language as the language of learning and instruction. Moreover, they are much more adapted to the culture and the advanced technologies that international students might find challenging and negatively influencing their learning of information literacy skills.

Finding 3b: There was a statistically significant difference between the mean B-TILED score for U.S. graduate students ($M=61.73$) and the mean B-TILED score for international graduate students ($M=45.24$).

Implication 3b: This indicates that U.S. graduate students can be considered information literacy proficient, while international graduate students are not information literacy proficient based on the mean B-TILED scores for both groups.

Finding 3c: There was a statistically significant difference between the mean B-TILED score for U.S. graduate students and the mean B-TILED score for international graduate students by both student classification and gender.

Implication 3c: This clearly indicates that U.S. graduate students have higher level of information literacy skills than their international students counterparts. This may indicate again that the more students are adapted to the language, culture, and advanced technologies, the higher their information literacy skills level will be. U.S. students speak and learn in their native language and are adapted to and familiar with their culture and the numerous advanced technologies available for students. This may not be the case with international graduate students who are studying in a language other than their native language and face linguistic, cultural, and technological challenges.

Findings 3d: The question receiving the lowest overall score on the B-TILED was question 20, which received 20 correct responses out of 65 responses. Question 20 asked

students to determine the proper action when faced with a situation that involves copyright choices.

Implications 3d: Abiding by the copyright laws in relation to using information, including online information is an essential skill at the graduate level. The findings related to question 20 suggest that both U.S. and international graduate students would benefit from reviews in information literacy skills, especially those covered in B-TILED content area D: Demonstrating knowledge of legal and ethical practices.

Finding 3e: Other questions that received low overall scores by individual groups were also identified. Low-scoring questions were identified based on the lowest number of times the question was answered correctly. Ten questions were identified that spanned the four content areas assessed.

Implication 3e: Since lower scoring questions were dispersed across the four B-TILED content areas, both international and U.S. graduate students may benefit from a review of the content covered in each of the four content areas. During the qualitative interviews, some of the students stated that the test was not difficult. This finding suggests that graduate students may be overestimating their library research skills.

Research Question 4: What are the self-reported challenges that international graduate students believe they face in learning information literacy skills?

Finding 4a: International graduate students find using English language and library terminology challenging. They believe that the lack of good command of English limits their abilities to effectively search for information and utilize library resources.

Implication 4a: This indicates, as expected, that language is an important factor in learning and mastering information literacy skills. International students may not be able to use English language effectively in selecting the keywords to search the databases, and they may not understand all the library terminology they encounter in searching for information and dealing with print and online library resources. This means that students can benefit from English language classes and library classes targeting their needs and language levels and skills.

Finding 4b: International graduate students find searching the databases in the library challenging.

Implication 4b: International students have language challenges. To search the databases effectively, students should be able to understand the database commands and search terminology, and if they do not have a good command of English language, they may not be able to successfully and effectively use the database to search and find the related information they need. Another thing is that international students may not be familiar with the numerous advanced technologies available for them in the library, and they may have not had similar advanced technologies in the library in their home country.

Research Question 5: What are the self-reported information literacy skills and library services that international graduate students believe they need?

Finding 5a: The majority of international graduate students interviewed in this study may not be aware of library information literacy services.

Implication 5a: This indicates that either international graduate students are not interested in learning about the library services available for them, or the library may not be effectively

publicizing available services and outreaching to international students. During the interviews with students, they expressed their desire to attend classes and workshops held in the library. This may indicate that the library should consider a more aggressive approach in outreaching and promoting library services to international students.

Finding 5b: International graduate students need library orientations, classes, and workshops to improve their information literacy skills.

Implication 5b: This may indicate that international students are interested in learning information literacy skills and are willing to attend library orientations, classes, and workshops offered to them, especially if these classes and workshops are taking their language abilities into consideration. Some of the students interviewed in this study suggested having some research help offered in different languages to help international students and acquaint them with information literacy skills they need. This may indicate that the library should consider offering more classes and workshops targeting international students.

Bolman and Deal's Framework and Organizational Learning

The results of this study indicated that international graduate students need more effective information literacy skills. Out of the 65 international graduate students who participated in the survey, 14 students scored above the B-TILED score of 57.5 and the passing rate for the whole group was 21.54%. The coming paragraphs will discuss organizational learning and Bolman and Deal's Framework (2013) in relation to international students and information literacy.

Organizational Learning

Organizational learning is essential for organizational development and meeting the challenges and needs of the organization; moreover, it can offer insights for academic librarians who conduct library instruction and outreach activities to international students. Owens and Valesky (2011) discuss organizational learning in the context of educational settings and note that "knowledge of organizational behavior is very powerful and arguably central to the most pressing issues in educational leadership today" (p. 4). The authors also pointed out that organizational learning is important to promote organizational development so that educators can better understand the challenges and needs of their organizations. Educative organizations enhance the learning and development of their people to become more fully functioning individuals, and effective educational leaders strive for a vision of the school that is engaged in never-ending process of change and development in order to meet the collective goals of the organization (Owens & Valesky, 2011). According to Senge (1990), learning organizations are organizations where people continually expand their capacity to create the results they desire. In these organizations, new and expansive patterns of thinking are nurtured, collective aspiration is set free, and people are continuously learning.

In this sense, Jonson (1998) points out that "organizations that survive in the future will manage their organizational structures, leadership, processes, competences, and practices to allow sufficient flexibility to adapt to change" (p.142). Effective leadership is crucial for the progress, development, and overall performance of the organization. Senge (1990) also maintains that leaders in learning organizations focus on continuous learning for everybody. They have unique roles; they are designers, teachers, and stewards. They build shared vision, challenge mental models, and foster more systematic patterns of thinking.

Senge (1990) discusses the concept of creative tension in learning organizations. He argues that leaders in learning organizations embrace creative tension, which comes from the gap between where we want to be 'vision,' and where we are, 'current reality.' According to Senge (1990), creative tension can be resolved in two ways: raising current reality towards the vision or lowering the vision towards current reality. Kantabutra (2010) points out that vision has been critical to manage people to achieve goals, and that effective visions make a positive impact on performance outcomes in practice, whether directly or indirectly.

The findings from this study indicated that the current reality is that international graduate students may have a low level of information literacy skills. The library has a vision to provide all students with the most effective and outstanding library research and information literacy skills. This gap between the library vision and the current reality of the low information literacy level of international students generates natural healthy creative tension. To resolve this tension, the UCF Libraries spare no effort to raise the level of information literacy skills of international students to the library vision. Academic library administrators continue to strive to assist international students and benefit from this creative tension and learn how to use the energy it generates to move reality more reliably towards their visions. The picture in higher education institutions is that international students are a growing population and their unique academic needs should be addressed and met. One of the important traits that successful leaders have is motivation. When motivation is publically visible, it makes people excellent collaborators; their passion for work spreads to others, and they are driven to find solutions (Golman, 1988, p. 102). The academic library should continue encouraging and motivating international students to learn information literacy skills and utilize library resources. Academic librarians can play an important role in encouraging and motivating international students to

come to the library and utilize the numerous resources available for them. With the understanding and support of the administration and librarians in the academic library, international students will be more motivated to learn and master information literacy skills they need.

Bolman and Deal's Framework

Bolman and Deal's four frame model (2013) provides four different perspectives through which organizations can be understood. It outlines the structure and functions of organizations and leadership roles. Each described frame is a lens or perspective through which leaders can view and process their work, leadership, and organizations. Leaders can use these frames as useful tools to address organizational problems and consider organizational change and organizational learning (Bolman & Deal, 2013). In the following sections, the Bolman and Deal's Framework (2013) is used to discuss aspects of organizational learning in relation to the academic library outreach programs, efforts, and practices as they apply to international students and teaching information literacy skills to this group of library users.

Structural Frame

Bolman and Deal's (2013) structural frame focuses on the architecture of the organization. It explores the important role the social architecture plays in the functioning of the organization. It describes the basic issues that leaders and managers must consider in designing the right structures for the organizations to be effective in their unique environments. Leaders and managers must consider structures that fit the goals, tasks, and context of their organizations.

Properly designed, well-thought-out roles and relationships can accommodate individual differences and meet collective goals of the organization (Bolman & Deal, 2013).

Two key issues of the structural frame are differentiation and integration. Organizations divide wok by different socialized roles, functions, and units. Then, they tie these elements together by means of vertical and horizontal techniques for integration. The right organizational structure depends on the prevailing circumstances in the organization, and it considers the organization's goals, strategies, technology, and environment (Bolman & Deal, 2013). Higher education institutions typically have a decentralized organizational structure and are characterized by insulation from formal interference and slow response to change. This organizational structure influences the organization and both enhances and constrains what the organization can accomplish (Bolman & Deal, 2013). The UCF, as a higher education institution, has a decentralized, professional organizational structure and can be described as a 'professional bureaucracy.' Owens and Valesky (2011) discuss organizational structure in educational settings and maintain that "the central mechanism through which the non-bureaucratic organization exercises coordination and control is the socialization of participants about the values and goals of the organization, rather than through written rules and close supervision" (p. 17). Structurally, UCF academic departments and faculty members operate fairly autonomously. Decisions at UCF are often by consensus and issues are decided in a democratic, collegial, and collaborative fashion. For example, university administration can require academic qualifications and enforce policies on campus, but cannot force faculty members to collaborate with the library and ask their students to frequently visit the library and utilize the numerous library resources available for students. The UCF Libraries play a central role in the teaching and learning process on

campus as they support learning and teaching, research, creation of knowledge, intellectual

growth, and enrichment of the academic experience (UCF Libraries, 2016b).

Through the current coordination system, the UCF Libraries provide research and

information literacy skills to students and assists faculty member to incorporate these skills into

the curriculum of their courses. In doing so, the UCF Libraries coordinate services with

academic departments and collaborate with faculty members. The UCF Libraries coordination

system with academic departments is based mainly on subject librarians who liaise to a school or

an academic department on campus to promote and market library services including information

literacy services. In academic libraries, the librarian liaison role evolved to present the library as

an ally in instructional activities and to provide librarianship that is integrated in the curriculum

instruction (Hines, 2013). While this current coordination system is working and the UCF

Libraries are providing excellent library service and they spare no effort in providing effective

information literacy skills to all students, including international students, it seems to be that

more attention should be given to international students' information literacy skills. In order to

assist international students to learn and develop information literacy skills, the UCF Libraries

should continue emphasizing flexibility, participation, and effective collaboration with academic

departments on campus so that faculty members in academic departments can be more effective

in helping international students to master information literacy skills. This is important as

"suitable forms of coordination and control ensure that diverse efforts of individuals and units

mesh" (Bolman & Deal, 2013, p. 45). Utilizing a collaborative leadership model, leaders use a

set of principles that empower all members in the organization to act and encourage the

organization to develop support and collective action based on shared vision, ownership, and

mutual values (Hickman, 2010).

The UCF Libraries vertical coordination system should continue emphasizing that appropriate rules, policies, standards, and operating procedures are established to facilitate initiating and developing existing library services to international students. Rules and policies are essential as they govern conditions of work and specify standard ways of completing tasks and relating to customers and other key players in the environment (Bolman & Deal, 2013). The UCF Libraries should also continue emphasizing the importance of providing international students with quality library research and information literacy instruction. More programs and activities should be created and developed to provide more services to international students.

Through the lateral coordination, the UCF Libraries should focus on communication and collaboration with faculty members and staff in administrative and academic departments to better promote and market library information literacy instruction services. It is important to get faculty members involved and on board in encouraging international students to utilize library services and in helping them to learn information literacy skills. In this regard, Moor (2004) points out that instruction librarians know that the best way to teach lifelong research skills is through collaborating with teaching faculty. Therefore, it is safe to say that without positive collaboration between faculty members and librarians, information literacy efforts cannot succeed (Ellison, 2004).

Human Resource Frame

The human resource frame centers on the relationship between organizations and people and what they can do for one another. Organizations need people for their energy, effort, and talent, and people need organizations for intrinsic and extrinsic rewards they offer. The frame emphasizes the importance of a good fit between the organization and people. If the fit is poor,

one or both will suffer, but when the fit is good, both the organization and people will benefit. Individuals find their work meaningful and satisfying, and organizations find the talent and energy they need to succeed (Bolman & Deal, 2013).

Despite the outstanding library services and the sincere commitment from information literacy librarians to the students and faculty they serve, international graduate students in this study showed a relatively low level of information literacy skills. Currently, the UCF Libraries have 40 librarians, of whom only 24 librarians are involved in information literacy instruction. In addition to providing highly effective library instruction, they also have different responsibilities in the department, such as conducting research workshops, research consultations, and collection development assignments. To help international students improve their information literacy skills, the UCF Libraries may consider hiring more librarians and developing more programs targeting international students to make sure that a more effective information literacy instruction to international students is achieved.

Librarians in the academic library should be culturally competent to effectively deal with international students and successfully teach them the necessary information literacy skills they need. A highly qualified team of librarians collaborate effectively with faculty members and communicate clear library research and information literacy goals, including information literacy instruction services to international students. Building this qualified team is essential as the organization benefits from a talented, motivated, loyal, workforce, and in return, employees are more productive, innovative, and willing to go out of their way to get the job done (Bolman & Deal, 2013).

Another important related human resource issue is the low level of motivation among international students to use library resources and learn information literacy skills. One of the

primary constructs in the human resource frame is motivation. The decision to use the library

resources and learn information literacy is made by the students themselves; therefore, the

academic library should consider the motivational factors that influence international students'

decision to come to the library and utilize the various and numerous resources to improve their

information literacy skills. The interviews conducted in this study showed that students have low

level of motivation to visit the library and utilize the numerous print and online resources

available for them.

The UCF Libraries may benefit from working on increasing the faculty members'

motivation level to get involved and to encourage their students to utilize the library instruction

services to improve their information literacy skills. Motivation is a powerful catalyst for

success. "Motivation gets us going, keeps us moving, and tells us how much effort to spend on

work tasks" (Clark & Estes, 2002, p. 80). As Bandura (1997) believes, our self-efficacy exerts

powerful effects on our levels of motivation.

Political Frame

The political frame focuses on decision-making, power sources, budget, and the

competitive arena within an organization (Bolman & Deal, 2013). In the political frame,

organizations are coalitions composed of individuals and groups who endure differences and live

in a world of scarce resources. This places power and conflict at the center of the decision-

making process in the organization. From a political frame view, goals, structures, and policies

emerge from an ongoing process of bargaining and negotiation among different major groups.

The power structure in higher education institutions is best described as an under-bounded

system where power is diffuse and loosely controlled (Bolman & Deal, 2013). The UCF, as a

higher education institution, has a diffuse, loosely controlled organizational power system. In such a system, power is not direct or coercive as other more indirect forms of power may be wielded. Administration in such a system has control of budgets, agenda, incentives, committee appointments, and recognition (Bolman & Deal, 2013). In order to use power effectively and affect the change the library is looking for, strategies other than a power-coercive strategy are required. This loosely controlled power system may help to identify factors that have contributed to the problem of information literacy of international students. Politically, the students ultimately make the decision to utilize library resources and learn research and information literacy skills. As a support organization on campus, the UCF Libraries have no authoritative power. Library administrators cannot force students to come to the library and learn information literacy skills. It is really the students who make the decision to utilize the library services. The UCF Libraries may consider promoting a power system that will involve international students in selected library activities to increase the level of information literacy activities and services offered to them. Relationships should be built with faculty members in academic departments to get them interested to encourage their students to utilize the library and learn information literacy skills. These relationships are important in organizational change and effectiveness.

The other important political issue is related to the library budget. Like other institutions of higher education, the UCF has suffered from state budget cuts that may have affected the UCF Libraries budget and library services on campus, including services to international students. In such a situation, organizational resources are in short supply and the organization rarely has enough to give everyone all they want (Bolman & Deal, 2013). To better meet the increasing and unique needs of international students, the UCF Libraries may consider initiating and developing more programs and services targeting international students. As Bolman and Deal (2013) point

out, the political frame indicates competing on organizational resources. In this regard, starting or developing library services to international students entails that several roadblocks had to be negotiated, including allocating resources, innovating curriculum to fit various information literacy levels of international students.

Symbolic Frame

The symbolic frame focuses on organizational culture and how the meaning behind stories, rituals, and other symbols impacts organizational change. It interprets and illuminates the basic issues of meaning and belief that make symbols so powerful (Bolman & Deal, 2013). One of the main issues examined in this frame is the international students' culture at the UCF and how they are utilizing library services and learning information literacy skills. As the qualitative data showed, international students may not be aggressively embracing utilizing library resources and learning information literacy skills they need for their research and academic studies. Aspects in the symbolic frame to information literacy services environment include the culture of higher education institutions and the perceptions and attitudes of international students toward the utilization of library research and information literacy services. Bolman and Deal (2013) describe the organizational culture as a pattern of basic assumptions shared among members of a group. They argue that "culture forms the superglue that bonds an organization, unites people, and helps an enterprise accomplish desired ends" (p. 248). Owens and Valesky (2007) also found that culture has the most impact on organizational change. The UCF has an overarching learning culture. The UCF Libraries should continue developing a library culture that motivates international students and effectively promotes information literacy skills and values of teaching information literacy skills to international students. In this regard, the UCF Libraries may

consider having a more positive faculty role in embracing the values of teaching information literacy skills to international students. To accomplish this, the UCF Libraries should continue collaborating with faculty members and positively influence their culture, their beliefs, and how they view the library and the services offered, including information literacy services to international students. In this regard, librarians should continue to be proactive and should always try to promote and market services to international students and faculty members and make them aware of the values and benefits of this library service. Ceremonial events marketing and advocating the service should be held whenever possible. Such ceremonies can be used to achieve four major library roles: they socialize, stabilize, reassure, and convey messages to constituencies (Bolman & Deal, 2013). The UCF Libraries should try to involve international students and faculty members in library activities related to information literacy instruction services and may consider being more involved in activities happening in academic departments like participating in academic activities to enhance a culture of productive collaboration. As more students and faculty experience success with learning and teaching information literacy skills and they start telling stories to their peers about the benefits and values of information literacy instruction services, more international students will start utilizing information literacy services and more faculty members will be interested in collaborating with librarians to promote and teach information literacy skills to all students, including international students. Unless faculty members value information literacy skills, they are less likely to encourage their students to utilize this library service. This lasting organizational change will come from influencing both the student culture and the faculty culture, which are central to the symbolic frame.

Conclusions and Recommendations

Graduate students need library research and information literacy skills to fulfill the research requirements associated with their coursework and assignments. Graduate students need to have some research skills to deal with the academic literature and be able to effectively search for information and properly use it to conduct comprehensive literature reviews and write quality research papers, proposals, theses, and dissertations. International graduate students have some complicated and unique research needs, and they face some challenges in using the library for research and academic purposes. This problem affects different groups of people on campus. It affects international students themselves, faculty members who deal with international students, and academic librarians who deal with these students and are supposed to provide them with effective library services. Therefore, finding the right solutions to this problem will positively impact and reflect on different constituents at the university.

The UCF Libraries and academic programs at the College of Engineering and Computer Sciences and other academic colleges on campus could work collaboratively to explore ways to address the needs identified in this study related to international graduate students and library research. The UCF Libraries and academic programs could identify flexible options that could expand on the existing library services and integrated approaches to utilize library instructional options and library resources to address the needs of international graduate students. Library outreach could also pay more attention to the concerns of international students in general and international graduate students in particular. Potential topics could be identified and added to the existing library services provided to graduate students and international graduate students. An example of this is the workshop series that is offered to graduate student by UCF librarians. Workshops for international graduate students could be offered at various times during the

semester to meet the needs of international graduate students. As the majority of the students interviewed in this study noted, workshops can be very helpful and useful for them. Additionally, such workshops, along with related library classes and orientation activities, can provide a practical solution for academic librarians to support international graduate students and teach them the necessary information literacy and research skills they need to succeed in their academic studies.

Some of the students interviewed in this study noted that they have very good information literacy skills and they are comfortable in using the library to find the information they need and use it properly. The majority of graduate students interviewed in this study reported that they rely heavily on online resources.

The results of the B-TILED assessment used in this study indicated clearly that the information literacy levels of international graduate student are relatively low. This supports the idea that graduate students may be entering into their coursework without the prerequisite library research skills needed to effectively work with the literature in their field. This is another area where the perceptions and expectations of international graduate students are needed to identify practical solutions. One potential solution could involve offering a series of orientations and graduate workshops geared toward international graduate students. Through collaboration between program faculty and academic librarians, findings identified in this study could be addressed to develop practical solutions. This study provides initial insights and recommendations about additional areas of support for international graduate students enrolled in UCF graduate programs. The research questions investigated in this study focused on understanding the needs of international graduate students in relation to library research and information literacy.

Based on the findings from the quantitative and qualitative data collected about the information literacy of international graduate students, the following paragraphs will discuss what the UCF Libraries and academic libraries should and could do to support the information literacy of both undergraduate and graduate international students.

Staff Training and Development

The UCF Libraries believe that training staff and providing professional development for librarians are key factors in supporting a culturally competent environment where librarians are capable of understanding international students, motivating them, and providing them with the most effective library services. The library should give more attention to international students and provide training to library staff and librarians to be more culturally competent. Cultural competence here means having a set of highly developed abilities and understanding and knowledge of culturally diverse groups and creating equitable environment for them (Overall, 2009). This is important to better understand this group of students. International students may have a different understanding of the library system and source use from the expectations held at American universities, which may cause unintentional improper use of library sources and can lead to accusations of plagiarism (Amsberry, 2009). Therefore, "library professionals who are attuned to the strengths and challenges of international students can play an important part in enabling them to become successful library users and learners" (Hughes, 2010, p. 77).

In developing highly qualified librarians academically and culturally, the library should collaborate and partner with faculty and staff in other administrative and academic departments, such as Student Affairs Office, International Student Center, Multicultural and Multilingual

Center, Inclusion and Diversity Office, English Department, and English Language Center. Training activities may include workshops on inclusion, cultural competence, and teaching methodology. Teaching methodology is important, especially that librarians need to use proper and effective instruction methods in teaching information literacy to international students. As Mayer (2011) argues about the science of instruction, he points out that educators should be able to specify "which instructional methods work for teaching which kinds of knowledge to which kinds of learners under which kinds of circumstances" (p. 13). Also, the library may consider arranging for a number of public services librarians to visit foreign academic libraries from time to time. This is helpful for librarians to see the difference, especially that resources and services of libraries in other countries can vary dramatically from U.S. libraries.

Outreach Initiatives and Activities

The library should adopt a proactive outreach program to assist international students and facilitate their access to the library's services, programs, resources, and research assistance. Outreach activities and initiatives may include the following:

1. Student orientations: The library should communicate and collaborate with Student Affairs, International Student Center, and the Multicultural and Multilingual Center and encourage them to hold orientation activities for international students and inform them of the library services and programs. The library should also have some orientation activities for international students at the start of every fall and spring semesters in order to encourage them to come to the library and use the library resources available for them.

2. Marketing and promoting strategies: The library should promote and market library collections, services and programs by going to places where international students gather, such as student cultural clubs, international office activities, ESL classes, and departments with large international enrollments (Hickok, 2011). The library should also publicize library services and programs through the library website, the faculty and staff distribution lists campus-wide and by distributing flyers, brochures, and posters in different places on campus, including International Student Center, Multicultural and Multilingual Student Center, and other important locations.

Instruction Programs and Initiatives

Research indicates that international students face challenges in using the U.S. academic library, including language barriers, familiarity with library systems, general cultural adjustments as well as research and writing skills (Natawitz, 1995; Baron & Strut- Dapaz, 2001). The library should collaborate with other academic departments to develop some instruction classes and workshops that are designed specifically for international students. The library may also partner with faculty in different departments and encourage them to refer their students to the library and inform them of the library services and programs available for them. These initiatives and activities may include the following:

1. Course-integrated instruction: The library should collaborate with faculty members and class instructors to arrange for course-integrated instruction, which allows librarians to incorporate and integrate library concepts and terminology in the curriculum of their

courses. Students should be required to go to the library to complete specific assignments.

2. Embedded librarian services**:** The library should collaborate with interested faculty members to have a librarian embedded in their classes, especially English and writing classes and classes that have a majority of international students. According to this service, students can ask the librarian to assist them in issues related to searching, retrieving, and proper use of library resources.

3. Library classes and workshops: The library should offer a number of basic and specialized information literacy classes and workshops to encourage international students to come to the library and assist them in learning and mastering information literacy skills. In addition to these basic classes and workshops, the library should offer more graduate workshops targeting international graduate students. Such workshops can focus on effective searching for information and using the databases, conducting literature reviews, and writing quality research papers. Almost all graduate students interviewed in this study expressed their desire to see more workshops offered about research and effective searching and utilization of library resources. Workshops should also address copyright related issues, especially that not all international students are aware of the copyright law in the United States, and they may have had a totally different situation in their home country. These classes and workshops could be taught in different languages such as Chinese, Spanish, and other important languages.

Student Needs

The library should strive to provide students with assistance beyond the basic research needs. The library should incorporate a socially and culturally competent environment where library personnel can effectively help international students and make them feel comfortable in the library. To do that, the library should do the following:

1. Reference services: Reference librarians should provide effective research and library services to international students. They should be understanding and aware of language and cultural barriers. Librarians should engage international students and offer them quality research services and encourage them to enhance their self-efficacy and improve their motivation level in learning and using library resources. As Bandura (1997) believes, our self-efficacy exerts powerful effects on our levels of motivation. When students believe they are good at tasks, they work on them vigorously.

2. Multicultural Library Resources: The library should build a collection of books, serials, online resources, and other library resources that are of international nature. In this regard, information professionals and providers must adapt their marketing skills, workforce, print and online collections, and services in order to meet the information needs of international students (Maud & LaVerne, 2008).

3. Library Guides for International Students: The library should develop a number of print and online guides for international students. These guides could include information about how to use the library, how to access library resources, and how to get research help. The library can create more research guides that are targeting international students, and some of them could be translated into different languages. The library could also create some handouts and brochures about the important services in the library and

translate them into different languages, such as Chinese, Spanish, and other important languages.

Future Research

Based on the findings from this study and the review of literature, the following suggestions are proposed for future research:

1. Future research should include a larger sample from different programs at the university or from engineering programs outside the university to potentially generalize results.

2. Future research should be conducted with program faculty to obtain their perceptions about graduate engineering and computer science students' needs related to library research and information literacy skills.

3. Future research should be conducted through collaborations between librarians and program faculty at the College of Engineering and Computer Science and other academic departments to review graduate level course syllabi and identify potential areas where library research and information literacy resources and services for international graduate students could be further integrated.

4. Future research should be conducted to compare the information literacy skills of international graduate students with the information literacy skills of international under graduate students.

APPENDIX A: IRB APPROVAL LETTER

IRB Approval Letter

University of Central Florida Institutional Review Board
Office of Research & Commercialization
12201 Research Parkway, Suite 501
Orlando, Florida 32826-3246
Telephone: 407-823-2901 or 407-882-2276
www.research.ucf.edu/compliance/irb.html

Approval of Exempt Human Research

From: **UCF Institutional Review Board #1**
             FWA00000351, IRB00001138

To: **Yousef I. Ayoub**

Date: **April 07, 2016**

Dear Researcher:

On 04/07/2016, the IRB approved the following minor modification as human participant research that is exempt from regulation:

Type of Review:	Exempt Determination
Modification Type:	The study title has been changed to: An Investigation of Information Literacy of International Graduate Students: Skills, Challenges, and Needs. The original study title was: Information Literacy of International Graduate Students at University of Central Florida: An Investigation of Their Skills, Challenges, and Needs.
Project Title:	An Investigation of Information Literacy of International Graduate Students: Skills, Challenges, and Needs
Investigator:	Yousef I Ayoub
IRB Number:	SBE-15-11844
Funding Agency:	
Grant Title:	
Research ID:	N/A

This determination applies only to the activities described in the IRB submission and does not apply should any changes be made. If changes are made and there are questions about whether these changes affect the exempt status of the human research, please contact the IRB. When you have completed your research, please submit a Study Closure request in iRIS so that IRB records will be accurate.

In the conduct of this research, you are responsible to follow the requirements of the Investigator Manual.

On behalf of Sophia Dziegielewski, Ph.D., L.C.S.W., UCF IRB Chair, this letter is signed by:

Joanne Muratori

Signature applied by Joanne Muratori on 04/07/2016 02:00:18 PM EDT

IRB Manager

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APPENDIX B: B-TILED COPYRIGHT PERMISSION

B - TILED COPYRIGHT PERMISSION

Penny Beile, Ph.D.
Associate Director
Information Services & Scholarly Communication
University of Central Floirda Libraries
PBeile@ucf.edu
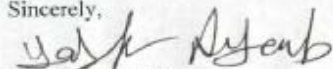
Date: 4/14/2016

Dear Dr. Beile

As you know I am completing my dissertation at the University of Central Florida, "An Investigation of Information Literacy of International Graduate Stuentds:Skills, Challenges, and Needs." I would like your permission to reprint in my dissertation the Beile Test of Information for Education Students (B-TILED), which is enclosed as a copy with this letter.

> Beile Test of Information for Education (B-TILED)
> Beile O'Neil, P. M. (2005). *Development and validation of the Beile test of information literacy for Education (B-TILED)* (Doctoral dissertation). Retrieved from ProQuest Dissertations & Theses Global. (UMI No. 3193465).

The requested permission extends to any future revisions and editions of my dissertation, including non-exclusive world rights in all languages. These rights will in no way restrict republication of the material in any other form by you or by others authorized by you. Your signing of this letter will also confirm you own or your company owns the copyright to the above-described material.
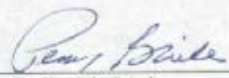
If these arrangements meet with your approval, please sign this letter where indicated below and return it to me in the enclosed envelope. Thank you for your attention in this matter.

Sincerely,

Yousef Ayoub/Signature
Doctoral Candidate, Univesity of Central Florida Ed.D Program
Yousef.ayoub@ucf.edu

PERMISSION GRANTED FOR THE USE DESCRIBED ABOVE

By _____   Date: 4/18/16
Penny Beile, Ph.D/ signature
Univesity of Central Florida Libraries

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APPENDIX C: B-TILED TEST OF INFORMATION LITERACY FOR EDUCATION

B-TILED Test of Information Literacy for Education (B-TILED)

The library is gathering information to evaluate the effectiveness of its instruction program. This questionnaire consists of demographic questions and a library and information skills quiz. Please fill in the most correct choice on your answer sheet. Fill in the most correct choice on your Scantron form.

1. Overall, how would you rate your ability to search library databases to find information?
a. excellent
b. good
c. average
d. poor

2. Overall, how would you rate your ability to search the Internet to find information?
a. excellent
b. good
c. average
d. poor

Please indicate whether you have attended any of the following since you began your studies at UCF.

3. Have you attended a tour or physical orientation of the library?
a. yes
b. no
c. don't know

4. Have you attended a library instruction session held in your classroom?
a. yes
b. no
c. don't know

5. Have you attended a library instruction session held in the library?
a. yes
b. no
c. don't know

6. Have you had one on one intensive instruction with a librarian?
a. yes
b. no
c. don't know

7. Which of the following characteristics best indicates scholarly research?
a. available in an academic library
b. indexed by ERIC
c. reviewed by experts for publication
d. written by university faculty

8. Your professor has assigned a paper on the whole language movement. You are not familiar with the topic, so you decide to read a brief history and summary about it. Which of the following sources would be best?
a. a book on the topic, such as Perspectives on whole language learning: A case study
b. a general encyclopedia, such as *Encyclopedia Britannica*
c. an article on the topic, such as "Whole language in the classroom: A student teacher's perspective."
d. an education encyclopedia, such as *Encyclopedia of Education*

9. Research or periodical databases are designed to include items based on which of the following criteria?
a. found on the Internet
b. not found on the Internet
c. owned by your library
d. relevant subject matter

10. ERIC is the most appropriate database to search to locate:
a. education article citations and documents
b. education publications from 1877 to current
c. full-text education articles
d. US Department of Education statistics

11. Most research and periodical databases have basic and advanced searching interfaces. Which of the following can you do ONLY in advanced searching?
a. add Boolean or search connectors between terms
b. enter multiple search terms
c. search by keyword
d. search multiple terms by field

12. Research studies in education are generally first communicated through:
a. books published by education associations
b. education encyclopedia entries
c. newsletters of education associations
d. professional conferences and journal articles

13. You have been assigned to write a short class paper on effective instruction techniques for teaching English as a Second Language (ESL) students. Your professor indicated three recent scholarly sources would be sufficient. Which

strategy is best to locate items?
a. search a general academic and an education database for journal articles
b. search an education database for journal articles
c. search the library catalog for books
d. search the library catalog for encyclopedias

14. Select the set of search terms that best represent the main concepts in the following:
What are the health risks associated with the use of drug therapy for hyperactive students?
a. drug therapy, health risks, hyperactivity
b. drug therapy, health risks, students
c. drug therapy, hyperactivity, students
d. drugs, hyperactivity, therapy

15. Select the set that best represents synonyms and related terms for the concept "college students."
a. colleges, universities, community colleges…
b. Gen X, students, undergraduates…
c. graduate students, freshmen, sophomores...
d. university, adult learners, educational attendees...

16. While researching a paper on character education, you find that it is also sometimes called *values education* or *moral education*. You decide to look for information on the subject in a research database, and to save time you write a search statement that includes all three terms. Which of the following is the best example to use when you have fairly synonymous terms and it does not matter which of the terms is found in the record?
a. character and values and moral
b. character or values or moral
c. character, values and moral
d. character, values or moral

17. You are using a research database that uses an asterisk (*) as its truncation symbol. When you type in *read** you would retrieve records that contained which of the following words?
a. examine, peruse, reader, reading
b. peruse, read, reader, reading
c. read, reader, reads, readmit
d. read, reader, reading, reapply

18. You have a class assignment to investigate how group work impacts student learning. A keyword search in ERIC on "group work" has returned over 600 items. To narrow your search, which of the following steps would you next perform?

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a. add "impacts" as a keyword
b. add "student learning" as a keyword
c. limit search results by date
d. limit search results by publication type

19. The following citation is for:
Massaro, D. (1991). Broadening the domain of the fuzzy logical model of perception. In H. L. Pick, Jr., P. van den Broek, & D. C. Knill (Eds.), *Cognition: Conceptual and methodological issues* (pp. 51-84). Washington, DC: American Psychological Association.
a. a book
b. a chapter in a book
c. a journal article
d. an ERIC document

20. Your professor suggested you read a particular article and gave you the following citation:
Shayer, M. (2003). Not just Piaget, not just Vygotsky. *Learning and Instruction, 13*(5), 465-485.
Which of the following would you type into the library's catalog to locate the actual article?
a. author search: Shayer
b. journal title search: Learning and Instruction
c. journal title search: Not just Piaget, not just Vygotsky
d. subject search: Piaget and Vygotsky

21. The following item was retrieved from an ERIC database search. What kind of source is it?
Title: Pre-service Elementary Teachers' Self-Efficacy Beliefs
Author(s): Cakiroglu, Jale; Boone, William J.
Publication Year: 2001
Abstract: The purpose of this study was to examine pre-service elementary teachers' self-efficacy beliefs in teaching science.
Notes: Presented at the Annual Meeting of the American Educational Research Association (Seattle, WA, April 10-14, 2001).
Number of Pages: 24
ERIC Number: ED453084
a. a book
b. a book chapter
c. a conference paper
d. a journal article

22. Using this result from an Internet search engine, who is the "owner" of this Web site?
State policies on planning, funding, and standards. Does the state have

technology requirements for students?
http://www.edweek.org/reports/tc98/states/fl.htm
a. business or commercial entity
b. college or university
c. other organization
d. state government agency

23. While developing a lesson plan on the U.S. legislative system, you find the
following story on the Internet:
Congress Launches National Congress-Awareness Week
WASHINGTON, DC—Hoping to counter ignorance of the national legislative
body among U.S. citizens, congressional leaders named the first week in August
National Congress Awareness Week. "This special week is designed to call
attention to America's very important federal lawmaking body," Speaker of the
House Dennis Hastert said. The festivities will kick off with a 10-mile Walk for
Congress Awareness.
The item is from a newspaper Web site, which states it is "America's Finest News
Source." Given this, the following action is in order:
a. you can use the story as it's obviously from a reputable news source
b. you decide to investigate the reputation of the publisher by looking at their Web site
c. you decide to investigate the reputation of the publisher by looking at other Web sites
d. you should not use the story because Web information is not always trustworthy

24. Based on the following paragraph, which sentence should be cited?
(1)Technology use in the schools is often characterized as a potentially dehumanizing
force. (2)Perhaps the fear that the virtual world may lead to passivity and isolation, at the
expense of literal social interaction, is valid. (3)Certainly, educators must ask *which* uses
of technology result in increased learning and a better quality of life. (4)To address these
issues, Hunter has
proposed that students work in groups with the computer peripheral to the group
and the teacher acting as facilitator.
a. 1
b. 2
c. 3
d. 4

25. When is it ethical to use the ideas of another person in a research paper?
a. it is never ethical to use someone else's ideas
b. only if you do not use their exact words
c. only when you give them credit
d. only when you receive their permission

26. You are planning an open house for your students' parents. Browsing the
Internet, you find the report *Child Safety on the Internet*, which is a US
Department of Education publication. If you distribute 30 copies of the report to

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parents at the open house, which of the following copyright choices is the proper action?

a. permission is not needed as the report is from a government agency.

b. permission is not needed as the report was found on the Internet.

c. permission is not needed as you are only distributing 30 copies.

d. permission to distribute 30 copies of the report must be acquired.

27. You have an assignment that requires you to use course management software to practice setting up a class grade book. Your school has purchased the software and loaded it in the computer lab, but you have a difficult time getting to the lab due to work conflicts. A friend loans you the software and you load it on your computer. Is this legal?

a. no, because this action constitutes a violation of copyright.

b. yes, because it is already freely available in the lab.

c. yes, because it is education software and therefore able to be shared.

d. yes, because your friend owns it and can share as he wants.

28. Browsing a weekly news magazine, you come across an article that discusses the future of space exploration. As you are teaching this topic you decide to make copies of the article and share it with your class.

Which of the following concepts makes it legally permissible to reproduce portions of works for educational purposes without permission?

a. copyright

b. fair use

c. freedom of information

d. intellectual freedom

29. Which of the following most closely describes the level you want to teach?

a. early childhood

b. elementary

c. middle school

d. high school

30. What is your student classification?

a. freshman

b. sophomore

c. junior

d. senior

31. How long have you been continuously enrolled at UCF?

a. less than 1 year

b. 1 to 2 years

c. 3 to 4 years

d. more than 4 years

32. Have you ever attended another university or college?
a. yes (go to question 33)
b. no (skip to question 34)

33. How long ago did you attend another university or college?
a. 0-1 year
b. 2-3 years
c. 4-5 years
d. more than 5 years

34. What is your gender?
a. male
b. female

35. Please indicate those racial or ethnic groups that apply to you.
(Select all that apply.)
a. White or European American
b. Hispanic or Latino
c. Black or African American
d. Asian or Asian American
e. Other (write in on Scantron)

Thank you!

APPENDIX D: INFORMATION LITERACY COMPETENCY STANDARDS FOR HIGHER EDUCATION 2000

ACRL Information Literacy Competency Standards for Higher Education

Standards, Performance Indicators, and Outcomes

Standard One
The information literate student determines the nature and extent of the information needed.
　　Performance Indicators:
　　1. The information literate student defines and articulates the need for information.

Outcomes Include:
a. Confers with instructors and participates in class discussions, peer workgroups, and electronic discussions to identify a research topic, or other information need
b. Develops a thesis statement and formulates questions based on the information need
c. Explores general information sources to increase familiarity with the topic
d. Defines or modifies the information need to achieve a manageable focus
e. Identifies key concepts and terms that describe the information need
f. Recognizes that existing information can be combined with original thought, experimentation, and/or analysis to produce new information

2. The information literate student identifies a variety of types and formats of potential sources for information.

Outcomes Include:
a. Knows how information is formally and informally produced, organized, and disseminated
b. Recognizes that knowledge can be organized into disciplines that influence the way information is accessed
c. Identifies the value and differences of potential resources in a variety of formats (e.g., multimedia, database, website, data set, audio/visual, book)
d. Identifies the purpose and audience of potential resources (e.g., popular vs. scholarly, current vs. historical)
e. Differentiates between primary and secondary sources, recognizing how their use and importance vary with each discipline
f. Realizes that information may need to be constructed with raw data from primary sources

3. The information literate student considers the costs and benefits of acquiring the needed information.

Outcomes Include:
a. Determines the availability of needed information and makes decisions on broadening the information seeking process beyond local resources (e.g., interlibrary loan; using resources at other locations; obtaining images, videos, text, or sound)
b. Considers the feasibility of acquiring a new language or skill (e.g., foreign or discipline-based) in order to gather needed information and to understand its context
c. Defines a realistic overall plan and timeline to acquire the needed information

4. The information literate student reevaluates the nature and extent of the information need.

Outcomes Include:
a. Reviews the initial information need to clarify, revise, or refine the question
b. Describes criteria used to make information decisions and choices

Standard Two
The information literate student accesses needed information effectively and efficiently.
Performance Indicators:
1. The information literate student selects the most appropriate investigative methods or information retrieval systems for accessing the needed information.

Outcomes Include:
a. Identifies appropriate investigative methods (e.g., laboratory experiment, simulation, fieldwork)
b. Investigates benefits and applicability of various investigative methods
c. Investigates the scope, content, and organization of information retrieval systems
d. Selects efficient and effective approaches for accessing the information needed from the investigative method or information retrieval system

2. The information literate student constructs and implements effectively-designed search strategies.

Outcomes Include:
a. Develops a research plan appropriate to the investigative method
b. Identifies keywords, synonyms and related terms for the information needed
c. Selects controlled vocabulary specific to the discipline or information retrieval source
d. Constructs a search strategy using appropriate commands for the information retrieval system selected (e.g., Boolean operators, truncation, and proximity for search engines; internal organizers such as indexes for books)
e. Implements the search strategy in various information retrieval systems using different user interfaces and search engines, with different command languages, protocols, and search parameters
f. Implements the search using investigative protocols appropriate to the discipline

3. The information literate student retrieves information online or in person using a variety of methods.

Outcomes Include:
a. Uses various search systems to retrieve information in a variety of formats
b. Uses various classification schemes and other systems (e.g., call number systems or indexes) to locate information resources within the library or to identify specific sites for physical exploration

c. Uses specialized online or in person services available at the institution to retrieve information needed (e.g., interlibrary loan/document delivery, professional associations, institutional research offices, community resources, experts and practitioners)
d. Uses surveys, letters, interviews, and other forms of inquiry to retrieve primary information

4. The information literate student refines the search strategy if necessary.

Outcomes Include:
a. Assesses the quantity, quality, and relevance of the search results to determine whether alternative information retrieval systems or investigative methods should be utilized
b. Identifies gaps in the information retrieved and determines if the search strategy should be revised
c. Repeats the search using the revised strategy as necessary

5. The information literate student extracts, records, and manages the information and its sources.

Outcomes Include:
a. Selects among various technologies the most appropriate one for the task of extracting the needed information (e.g., copy/paste software functions, photocopier, scanner, audio/visual equipment, or exploratory instruments)
b. Creates a system for organizing the information
c. Differentiates between the types of sources cited and understands the elements and correct syntax of a citation for a wide range of resources
d. Records all pertinent citation information for future reference
e. Uses various technologies to manage the information selected and organized

Standard Three
The information literate student evaluates information and its sources critically and incorporates selected information into his or her knowledge base and value system.
Performance Indicators:
1. The information literate student summarizes the main ideas to be extracted from the information gathered.

Outcomes Include:
a. Reads the text and selects main ideas
b. Restates textual concepts in his/her own words and selects data accurately
c. Identifies verbatim material that can be then appropriately quoted

2. The information literate student articulates and applies initial criteria for evaluating both the information and its sources.

Outcomes Include:
a. Examines and compares information from various sources in order to evaluate reliability, validity, accuracy, authority, timeliness, and point of view or bias
b. Analyzes the structure and logic of supporting arguments or methods
c. Recognizes prejudice, deception, or manipulation
d. Recognizes the cultural, physical, or other context within which the information was created and understands the impact of context on interpreting the information

3. The information literate student synthesizes main ideas to construct new concepts.

Outcomes Include:
a. Recognizes interrelationships among concepts and combines them into potentially useful primary statements with supporting evidence
b. Extends initial synthesis, when possible, at a higher level of abstraction to construct new hypotheses that may require additional information
c. Utilizes computer and other technologies (e.g. spreadsheets, databases, multimedia, and audio or visual equipment) for studying the interaction of ideas and other phenomena

4. The information literate student compares new knowledge with prior knowledge to determine the value added, contradictions, or other unique characteristics of the information.

Outcomes Include:
a. Determines whether information satisfies the research or other information need
b. Uses consciously selected criteria to determine whether the information contradicts or verifies information used from other sources
c. Draws conclusions based upon information gathered
d. Tests theories with discipline-appropriate techniques (e.g., simulators, experiments)
e. Determines probable accuracy by questioning the source of the data, the limitations of the information gathering tools or strategies, and the reasonableness of the conclusions
f. Integrates new information with previous information or knowledge
g. Selects information that provides evidence for the topic

5. The information literate student determines whether the new knowledge has an impact on the individual's value system and takes steps to reconcile differences.

Outcomes Include:
a. Investigates differing viewpoints encountered in the literature
b. Determines whether to incorporate or reject viewpoints encountered

6. The information literate student validates understanding and interpretation of the information through discourse with other individuals, subject-area experts, and/or practitioners.

Outcomes Include:
a. Participates in classroom and other discussions
b. Participates in class-sponsored electronic communication forums designed to encourage discourse on the topic (e.g., email, bulletin boards, chat rooms)
c. Seeks expert opinion through a variety of mechanisms (e.g., interviews, email, listservs)

7. The information literate student determines whether the initial query should be revised.

Outcomes Include:
a. Determines if original information need has been satisfied or if additional information is needed
b. Reviews search strategy and incorporates additional concepts as necessary
c. Reviews information retrieval sources used and expands to include others as needed

Standard Four
The information literate student, individually or as a member of a group, uses information effectively to accomplish a specific purpose.
Performance Indicators:
1. The information literate student applies new and prior information to the planning and creation of a particular product or performance.

Outcomes Include:
a. Organizes the content in a manner that supports the purposes and format of the product or performance (e.g. outlines, drafts, storyboards)
b. Articulates knowledge and skills transferred from prior experiences to planning and creating the product or performance
c. Integrates the new and prior information, including quotations and paraphrasing, in a manner that supports the purposes of the product or performance
d. Manipulates digital text, images, and data, as needed, transferring them from their original locations and formats to a new context

2. The information literate student revises the development process for the product or performance.

Outcomes Include:
a. Maintains a journal or log of activities related to the information seeking, evaluating, and communicating process
b. Reflects on past successes, failures, and alternative strategies

3. The information literate student communicates the product or performance effectively to others.

Outcomes Include:
a. Chooses a communication medium and format that best supports the purposes of the product or performance and the intended audience

b. Uses a range of information technology applications in creating the product or performance
c. Incorporates principles of design and communication
d. Communicates clearly and with a style that supports the purposes of the intended audience

Standard Five
The information literate student understands many of the economic, legal, and social issues surrounding the use of information and accesses and uses information ethically and legally.
Performance Indicators:
1. The information literate student understands many of the ethical, legal and socio-economic issues surrounding information and information technology.

Outcomes Include:
a. Identifies and discusses issues related to privacy and security in both the print and electronic environments
b. Identifies and discusses issues related to free vs. fee-based access to information
c. Identifies and discusses issues related to censorship and freedom of speech
d. Demonstrates an understanding of intellectual property, copyright, and fair use of copyrighted material

2. The information literate student follows laws, regulations, institutional policies, and etiquette related to the access and use of information resources.

Outcomes Include:
a. Participates in electronic discussions following accepted practices (e.g. "Netiquette")
b. Uses approved passwords and other forms of ID for access to information resources
c. Complies with institutional policies on access to information resources
d. Preserves the integrity of information resources, equipment, systems and facilities
e. Legally obtains, stores, and disseminates text, data, images, or sounds
f. Demonstrates an understanding of what constitutes plagiarism and does not represent work attributable to others as his/her own
g. Demonstrates an understanding of institutional policies related to human subjects research

3. The information literate student acknowledges the use of information sources in communicating the product or performance.

Outcomes Include:
a. Selects an appropriate documentation style and uses it consistently to cite sources
b. Posts permission granted notices, as needed, for copyrighted material

Retrieved from http://www.ala.org/acrl/standards/informationliteracycompetency

APPENDIX E: FRAMEWORK OF INFORMATION LITERACY FOR HIGHER EDUCATION

The six frames are presented alphabetically and do not suggest a particular sequence in which they must be learned.

Authority Is Constructed and Contextual

Information resources reflect their creators' expertise and credibility, and are evaluated based on the information need and the context in which the information will be used. Authority is constructed in that various communities may recognize different types of authority. It is contextual in that the information need may help to determine the level of authority required.

Experts understand that authority is a type of influence recognized or exerted within a community. Experts view authority with an attitude of informed skepticism and an openness to new perspectives, additional voices, and changes in schools of thought. Experts understand the need to determine the validity of the information created by different authorities and to acknowledge biases that privilege some sources of authority over others, especially in terms of others' worldviews, gender, sexual orientation, and cultural orientations. An understanding of this concept enables novice learners to critically examine all evidence—be it a short blog post or a peer-reviewed conference proceeding—and to ask relevant questions about origins, context, and suitability for the current information need. Thus, novice learners come to respect the expertise that authority represents while remaining skeptical of the systems that have elevated that authority and the information created by it. Experts know how to seek authoritative voices but also recognize that unlikely voices can be authoritative, depending on need. Novice learners may need to rely on basic indicators of authority, such as type of publication or author credentials, where experts recognize schools of thought or discipline-specific paradigms.

Knowledge Practices

Learners who are developing their information literate abilities do the following:

- Define different types of authority, such as subject expertise (e.g., scholarship), societal position (e.g., public office or title), or special experience (e.g., participating in a historic event).
- Use research tools and indicators of authority to determine the credibility of sources, understanding the elements that might temper this credibility.
- Understand that many disciplines have acknowledged authorities in the sense of well-known scholars and publications that are widely considered "standard". Even in those situations, some scholars would challenge the authority of those sources.

- Recognize that authoritative content may be packaged formally or informally and may include sources of all media types.
- Acknowledge they are developing their own authoritative voices in a particular area and recognize the responsibilities this entails, including seeking accuracy and reliability, respecting intellectual property, and participating in communities of practice.
- Understand the increasingly social nature of the information ecosystem where authorities actively connect with one another and sources develop over time.

Dispositions

Learners who are developing their information literate abilities do the following:

- Develop and maintain an open mind when encountering varied and sometimes conflicting perspectives
- Motivate themselves to find authoritative sources, recognizing that authority may be conferred or manifested in unexpected ways
- Develop awareness of the importance of assessing content with a skeptical stance and with a self-awareness of their own biases and worldview
- Question traditional notions of granting authority and recognize the value of diverse ideas and worldviews
- Are conscious that maintaining these attitudes and actions requires frequent self-evaluation

Information Creation as a Process

Information in any format is produced to convey a message and is shared via a selected delivery method. The iterative processes of researching, creating, revising, and disseminating information vary, and the resulting product reflects these differences.

The information creation process could result in a range of information formats and modes of delivery, so experts look beyond format when selecting resources to use. The unique capabilities and constraints of each creation process as well as the specific information need determine how the product is used. Experts recognize that information creations are valued differently in different contexts, such as academia or the workplace. Elements that affect or reflect on the creation, such as a pre- or post-publication editing or reviewing process, may be indicators of quality. The dynamic nature of information creation and dissemination requires ongoing attention to understand evolving creation processes. Recognizing the nature of information creation, experts look to the underlying processes of creation as well as the final product to critically evaluate the usefulness of the information. Novice learners begin to recognize the significance of the creation process, leading them to increasingly sophisticated choices when matching information products with their information needs.

Knowledge Practices

Learners who are developing their information literate abilities do the following:

- Articulate the capabilities and constraints of information developed through various creation processes
- Assess the fit between an information product's creation process and a particular information need
- Articulate the traditional and emerging processes of information creation and dissemination in a particular discipline
- Recognize that information may be perceived differently based on the format in which it is packaged
- Recognize the implications of information formats that contain static or dynamic information
- Monitor the value that is placed upon different types of information products in varying contexts
- Transfer knowledge of capabilities and constraints to new types of information products
- Develop, in their own creation processes, an understanding that their choices impact the purposes for which the information product will be used and the message it conveys

Dispositions

Learners who are developing their information literate abilities do the following:

- Are inclined to seek out characteristics of information products that indicate the underlying creation process
- Value the process of matching an information need with an appropriate product
- Accept that the creation of information may begin initially through communicating in a range of formats or modes
- Accept the ambiguity surrounding the potential value of information creation expressed in emerging formats or modes
- Resist the tendency to equate format with the underlying creation process
- Understand that different methods of information dissemination with different purposes are available for their use

Information Has Value

Information possesses several dimensions of value, including as a commodity, as a means of education, as a means to influence, and as a means of negotiating and understanding the world. Legal and socioeconomic interests influence information production and dissemination.

The value of information is manifested in various contexts, including publishing practices, information access, the commodification of personal information, and intellectual property laws. The novice learner may struggle to understand the diverse values of information in an environment where "free" information and related services are plentiful and the concept of intellectual property is first encountered through rules of citation or warnings about plagiarism and copyright law. As creators and users of information, experts understand their rights and responsibilities when participating in a community of scholarship. Experts understand that value may be wielded by powerful interests in ways that marginalize certain voices. However, value may be leveraged by individuals and organizations to effect change and may be leveraged for civic, economic, social, or personal gains. Experts also understand the individual is responsible for making deliberate and informed choices about when to comply with and when to contest current legal and socioeconomic practices concerning the value of information.

Knowledge Practices

Learners who are developing their information literate abilities do the following:

- Give credit to the original ideas of others through proper attribution and citation
- Understand that intellectual property is a legal and social construct that varies by culture
- Articulate the purpose and distinguishing characteristics of copyright, fair use, open access, and the public domain
- Understand how and why some individuals or groups of individuals may be underrepresented or systematically marginalized within the systems that produce and disseminate information
- Recognize issues of access or lack of access to information sources
- Decide where and how their information is published
- Understand how the commodification of their personal information and online interactions affects the information they receive and the information they produce or disseminate online
- Make informed choices regarding their online actions in full awareness of issues related to privacy and the commodification of personal information

Dispositions

Learners who are developing their information literate abilities do the following:

- Respect the original ideas of others
- Value the skills, time, and effort needed to produce knowledge
- See themselves as contributors to the information marketplace rather than only consumers of it
- Are inclined to examine their own information privilege

Research as Inquiry

Research is iterative and depends upon asking increasingly complex or new questions whose answers in turn develop additional questions or lines of inquiry in any field.

Experts see inquiry as a process that focuses on problems or questions in a discipline or between open or unresolved disciplines. Experts recognize the collaborative effort within a discipline to extend the knowledge in that field. Many times, this process includes points of disagreement where debate and dialogue work to deepen the conversations around knowledge. This process of inquiry extends beyond the academic world to the community at large, and the process of inquiry may focus upon personal, professional, or societal needs. The spectrum of inquiry ranges from asking simple questions that depend upon basic recapitulation of knowledge to increasingly sophisticated abilities to refine research questions, use more advanced research methods, and explore more diverse disciplinary perspectives. Novice learners acquire strategic perspectives on inquiry and a greater repertoire of investigative methods.

Knowledge Practices

Learners who are developing their information literate abilities do the following:

- Formulate questions for research based on information gaps or on reexamination of existing, possibly conflicting, information
- Determine an appropriate scope of investigation
- Deal with complex research by breaking complex questions into simple ones, limiting the scope of investigations
- Use various research methods, based on need, circumstance, and type of inquiry
- Monitor gathered information and assess for gaps or weaknesses
- Organize information in meaningful ways
- Synthesize ideas gathered from multiple sources
- Draw reasonable conclusions based on the analysis and interpretation of information

Dispositions

Learners who are developing their information literate abilities do the following:

- Consider research as open-ended exploration and engagement with information
- Appreciate that a question may appear to be simple but still disruptive and important to research
- Value intellectual curiosity in developing questions and learning new investigative methods
- Maintain an open mind and a critical stance
- Value persistence, adaptability, and flexibility and recognize that ambiguity can benefit the research process

- Seek multiple perspectives during information gathering and assessment
- Seek appropriate help when needed
- Follow ethical and legal guidelines in gathering and using information
- Demonstrate intellectual humility (i.e., recognize their own intellectual or experiential limitations)

Scholarship as Conversation

Communities of scholars, researchers, or professionals engage in sustained discourse with new insights and discoveries occurring over time as a result of varied perspectives and interpretations.

Research in scholarly and professional fields is a discursive practice in which ideas are formulated, debated, and weighed against one another over an extended time. Instead of seeking discrete answers to complex problems, experts understand that a given issue may be characterized by several competing perspectives as part of an ongoing conversation in which information users and creators come together and negotiate meaning. Experts understand that, though some topics have established answers through this process, a query may have more than one uncontested answer. Experts are, therefore, inclined to seek out many perspectives, not merely the ones with which they are familiar. These perspectives might be in their own discipline or profession or may be in other fields. Even though novice learners and experts at all levels can take part in the conversation, established power and authority structures may influence their ability to participate and can privilege certain voices and information. Developing familiarity with the sources of evidence, methods, and modes of discourse in the field assists novice learners to enter the conversation. New forms of scholarly and research conversations provide more avenues in which a wide variety of individuals may have a voice in the conversation. Providing attribution to relevant previous research is also an obligation of participation in the conversation. It enables the conversation to move forward and strengthens one's voice in the conversation.

Knowledge Practices

Learners who are developing their information literate abilities do the following:

- Cite the contributing work of others in their own information production
- Contribute to scholarly conversation at an appropriate level, such as local online community, guided discussion, undergraduate research journal, conference presentation/poster session
- Identify barriers to entering scholarly conversation via various venues
- Critically evaluate contributions made by others in participatory information environments
- Identify the contribution particular articles, books, and other scholarly pieces make to disciplinary knowledge
- Summarize the changes in scholarly perspective over time on a particular topic within a specific discipline

- Recognize that a given scholarly work may not represent the only or even the majority perspective on the issue

Dispositions

Learners who are developing their information literate abilities do the following:

- Recognize they are often entering into an ongoing scholarly conversation and not a finished conversation
- Seek out conversations taking place in their research area
- See themselves as contributors to scholarship rather than only consumers of it
- Recognize that scholarly conversations take place in various venues
- Suspend judgment on the value of a particular piece of scholarship until the larger context for the scholarly conversation is better understood
- Understand the responsibility that comes with entering the conversation through participatory channels
- Value user-generated content and evaluate contributions made by others
- Recognize that systems **privilege** authorities and that not having a fluency in the language and process of a discipline disempowers their ability to participate and engage

Searching as Strategic Exploration

Searching for information is often nonlinear and iterative, requiring the evaluation of a range of information sources and the mental flexibility to pursue alternate avenues as new understanding develops.

The act of searching often begins with a question that directs the act of finding needed information. Encompassing inquiry, discovery, and serendipity, searching identifies possible relevant sources and the means to access those sources. Experts realize that information searching is a contextualized, complex experience that affects, and is affected by, the searcher's cognitive, affective, and social dimensions. Novice learners may search a limited set of resources, and experts may search more broadly and deeply to determine the most appropriate information within the project scope. Likewise, novice learners tend to use few search strategies; experts select from various search strategies, depending on the sources, scope, and context of the information need.

Knowledge Practices

Learners who are developing their information literate abilities do the following:

- Determine the initial scope of the task required to meet their information needs

- Identify interested parties, such as scholars, organizations, governments, and industries, which might produce information about a topic and determine how to access that information
- Utilize divergent (e.g., brainstorming) and convergent (e.g., selecting the best source) thinking when searching
- Match information needs and search strategies to search tools
- Design and refine needs and search strategies, based on search results
- Understand how information systems (i.e., collections of recorded information) are organized to access relevant information
- Use different searching language types (e.g., controlled vocabulary, keywords, natural language)
- Manage searching processes and results

Dispositions

Learners who are developing their information literate abilities do the following:

- Exhibit mental flexibility and creativity
- Understand that first attempts at searching do not always produce adequate results
- Realize that information sources vary greatly in content and format and have varying relevance and value, depending on the needs and nature of the search
- Seek guidance from experts, such as librarians, researchers, and professionals
- Recognize the value of browsing and other serendipitous methods of information gathering
- Persist in the face of search challenges, and know when enough information completes the information task

Retrieved from http://www.ala.org/acrl/standards/ilframework

APPENDIX F: ISTE NATIONAL EDUCATIONAL TECHNOLOGY STANDARDS FOR TEACHERS (NETS•T, 2000)

ISTE National Educational Technology Standards for Teachers (NETS•T, 2000)

All classroom teachers should be prepared to meet the following standards and performance

indicators

I. TECHNOLOGY OPERATIONS AND CONCEPTS Teachers demonstrate a sound understanding of technology operations and concepts. Teachers: A. demonstrate introductory knowledge, skills, and understanding of concepts related to technology (as described in the ISTE National Educational Technology Standards for Students). B. demonstrate continual growth in technology knowledge and skills to stay abreast of current and emerging technologies.

II. II. PLANNING AND DESIGNING LEARNING ENVIRONMENTS AND EXPERIENCES Teachers plan and design effective learning environments and experiences supported by technology. Teachers: A. design developmentally appropriate learning opportunities that apply technology-enhanced instructional strategies to support the diverse needs of learners. B. apply current research on teaching and learning with technology when planning learning environments and experiences. C. identify and locate technology resources and evaluate them for accuracy and suitability. D. plan for the management of technology resources within the context of learning activities. E. plan strategies to manage student learning in a technology-enhanced environment.

III. III. TEACHING, LEARNING, AND THE CURRICULUM Teachers implement curriculum plans that include methods and strategies for applying technology to maximize student learning. Teachers: A. facilitate technology-enhanced experiences that address content standards and student technology standards. B. use technology to support learner-centered strategies that address the diverse needs of students. C. apply technology to develop students' higher order skills and creativity. D. manage student learning activities in a technology-enhanced environment.

IV. IV. ASSESSMENT AND EVALUATION Teachers apply technology to facilitate a variety of effective assessment and evaluation strategies. Teachers: A. apply technology in assessing student learning of subject matter using a variety of assessment techniques. B. use technology resources to collect and analyze data, interpret results, and communicate findings to improve instructional practice and maximize student learning. C. apply multiple methods of evaluation to determine students' appropriate use of technology resources for learning, communication, and productivity.

V. V. PRODUCTIVITY AND PROFESSIONAL PRACTICE Teachers use technology to enhance their productivity and professional practice. Teachers: A. use technology

resources to engage in ongoing professional development and lifelong learning. B. continually evaluate and reflect on professional practice to make informed decisions regarding the use of technology in support of student learning. C. apply technology to increase productivity. D. use technology to communicate and collaborate with peers, parents, and the larger community in order to nurture student learning.

VI.   VI. SOCIAL, ETHICAL, LEGAL, AND HUMAN ISSUES Teachers understand the social, ethical, legal, and human issues surrounding the use of technology in PK–12 schools and apply that understanding in practice. Teachers: A. model and teach legal and ethical practice related to technology use. B. apply technology resources to enable and empower learners with diverse backgrounds, characteristics, and abilities. C. identify and use technology resources that affirm diversity. D. promote safe and healthy use of technology resources. E. facilitate equitable access to technology resources for all students

Retrieved from http://www.iste.org/docs/pdfs/nets_for_teachers_2000.pdf

APPENDIX G: GRADUATE ENGINEERING AND COMPUTER SCIENCE ONLINE SURVEY

Graduate Engineering and Computer Science Online Survey

The library is gathering information to evaluate the effectiveness of its instruction program. This questionnaire consists of demographic questions and a library and information literacy skills quiz. Select the best answer for the following questions.

1. What is your student classification?
a. Master's degree student
b. Doctoral degree student
c. Other (please note status _____)

2. Which of the following best describes your academic status as a student?
a. I am a U.S. native speaker of English student
b. I am a U.S. non-native speaker of English student
c. I am an international native speaker of English student
d. I am an international non-native speaker of English student

3. How many credit hours have you finished in your graduate program?
a. 0 - 9
b. 10 - 18
c. 19 - 27
d. More than 27

4. Which of the following is closest to your overall GPA?
A (3.75 - 4.0)
B (2.75 - 3.25)
C (1.75 - 2.25)
D (.75 - 1.25)

5. What is your country of origin?

6. What is your gender?
a. male
b. female
c. prefer not to answer

7. Which of the following characteristics best indicates scholarly research?
a. available in an academic library
b. indexed by Compendex (EI Engineering Village)
c. reviewed by experts for publication
d. written by university faculty

8. Your professor has assigned a paper on the origin of optical engineering. You are not familiar with the topic, so you decide to read a brief history and summary about it. Which of the following sources would be best?

a. a book on the topic, such as Modern optical engineering: The design of optical systems
b. a general encyclopedia, such as Encyclopedia Britannica
c. an article on the topic, such as "Teaching Optical Engineering"
d. an engineering encyclopedia, such as Encyclopedia of Optical Engineering

9. Research or periodical databases are designed to include items based on which of the following criteria?
a. found on the Internet
b. not found on the Internet
c. owned by your library
d. relevant subject matter

10. Compendex (EI Engineering Village) is the most appropriate database to search to locate:
a. Engineering and computer science articles and proceedings
b. engineering publications from 1877 to current
c. full-text engineering articles only
d. United States Army Corps of Engineers statistics

11. Most research and periodical databases have basic and advanced searching interfaces. Which of the following can you do ONLY in advanced searching?
a. add Boolean or search connectors between terms
b. enter multiple search terms
c. search by keyword
d. search multiple terms by field

12. Research studies in engineering and computer science are generally first communicated through:
a. books published by engineering associations
b. engineering encyclopedia entries
c. newsletters of engineering associations
d. professional conferences and journal articles

13. You have been assigned to write a short class paper on innovative design plans for building cars. Your professor indicated three recent scholarly sources would be sufficient. Which strategy is best to locate items?
a. search a general academic and an engineering database for journal articles
b. search an engineering database for journal articles
c. search the library catalog for books
d. search the library catalog for encyclopedias

14. Select the set of search terms that best represent the main concepts in the following: What are the structural benefits associated with the use of steel reinforcement in building concrete skyscrapers?

a. steel reinforcement, structural benefits, concrete
b. steel reinforcement, structural benefits, skyscrapers
c. steel reinforcement, concrete, skyscrapers
d. steel, concrete, reinforcement

15. Select the set that best represents synonyms and related terms for the concept "computer software."
a. devices, hardware, monitors...
b. programers, designers, builders...
c. software, software program, software package…
d. computer development, computer building, computer design…

16. While researching a paper on high-rise buildings, you find that they are also sometimes called towers or skyscrapers. You decide to look for information on the subject in a research database, and to save time you write a search statement that includes all three terms. Which of the following is the best example to use when you have fairly synonymous terms and it does not matter which of the terms is found in the record?
a. high-rise buildings and towers and skyscrapers
b. high-rise buildings or towers or skyscrapers
c. high-rise buildings, towers and skyscrapers
d. high-rise buildings and towers or skyscrapers

17. You are using a research database that uses an asterisk (*) as its truncation symbol. When you type in engine* you would retrieve records that contained which of the following words?
a. examine, construct, engineer, engineering
b. design, engine, engineer, engineering
c. engine, engineer, engineers, engineering
d. engine, engineer, engineers, regenerate

18. You have a class assignment to investigate how computer modeling impacts student learning. A keyword search in Compendex (EI Engineering Village) on "computer modeling" has returned over 16,000 items. To narrow your search, which of the following steps would you next perform?
a. add "impacts" as a keyword
b. add "student learning" as a keyword
c. limit search results by date
d. limit search results by publication type

19. The following citation is for:
Schachterle, L., Demetry, C, & Orr, J.A. (2009). Quality assurance in engineering education in the United States. In A. S. Patil, & P. Gray (Eds.) Engineering education quality assurance: A global perspective (pp.163-180). New York, NY: Springer.
a. a book
b. a chapter in a book

c. a journal article

d. a conference proceeding

20. Your professor suggested you read a particular article and gave you the following citation:

Curran, W. S. (2003). Teaching software engineering in the computer science curriculum. *SIGCSE Bulletin*, 35(4), 2-75. Which of the following would you type into the library's catalog to locate the actual article?

a. author search: Curran

b. journal title search: SIGCSE Bulletin

c. journal title search: Teaching software engineering in the computer science curriculum

d. subject search: software engineering and computer science curriculum

21. The following item was retrieved from a Compendex (EI Engineering Village) database search. What kind of source is it?

Title: Cloud Computing in Computer Science and Engineering Education

Author(s): Rajaei, Hassan, Aldakhel, Eman.

Publication Year: 2012

Abstract: This item discusses the potentials of Cloud Based Education (CBE) in STEM areas to better stimulate and engage students in their pursuit of knowledge and learning.

Notes: Presented at the 119th ASEE Annual Conference and Exposition (San Antonio, TX, June 10 - June 13, 2012).

Number of Pages: 15.

a. a book

b. a book chapter

c. a conference paper

d. a journal article

22. Using this result from an Internet search engine, who is the "owner" of this Web site?

Surmounting the Barriers Ethnic Diversity in Engineering Education

https://www.asee.org/Surmounting_the_Barriers.pdf

a. business or commercial entity

b. college or university

c. other organization

d. state government agency

23. While searching for information on driverless cars, you find the following story on the Internet: GM Announces Plans To Recall Driverless Car By 2021. Always looking ahead to the future, top executives from the automaker General Motors announced plans to recall a fully autonomous car by 2021. By early next decade, GM plans to put over 500,000 self-driving vehicles on the nation's roads, and then later take them off the roads amidst serious public safety concerns. General Motors would be the first major car manufacturer in the world to roll out a large - scale recall of a driverless automobile. CEO Marry Barra said. The company have already begun to test several autonomous prototypes with -life threatening mechanical flaws.

The item is from a newspaper Web site, which states it is "America's Finest News Source." Given this, the following action is in order:
a. you can use the article as it's obviously from a reputable news source
b. you decide to investigate the reputation of the publisher by looking at their Web site
c. you decide to investigate the reputation of the publisher by looking at other Web sites
d. you should not use the article because Web information is not always trustworthy

24. Based on the following paragraph, which sentence should be cited?
(1)Vibration control of flexible structures is a very important issue that engineers take into consideration in designing tall buildings. To reduce vibration in flexible structures, engineers use dynamic vibration absorbers. (2) Perhaps the fear that strong winds and earthquakes may lead to the collapse of uncontrolled, vibrating tall buildings is valid. (3) Certainly, engineers must ask which types of vibration absorbers result in producing sufficient protection against both the natural frequency of ultra-tall structures and large earthquake movements. (4)To address these issues, Set, the author, has proposed a control system that places actuators between a pair of flexible buildings. By placing actuators between a pair of flexible buildings the vibrational force to which both buildings are subject can be offset by the reaction force which each building produces.
a. 1
b. 2
c. 3
d. 4

25. When is it ethical to use the ideas of another person in a research paper?
a. it is never ethical to use someone else's ideas
b. only if you do not use their exact words
c. only when you give them credit
d. only when you receive their permission

26. You are planning to give a class presentation on science, technology, engineering, and math education (STEM). Browsing the Internet, you find the *report STEM Attrition: College Students' Paths into and out of STEM Fields,* which is a publication of The National Center for Education Statistics (NCES). If you distribute 30 copies of the report to class at the presentation, which of the following copyright choices is the proper action?
a. permission is not needed as the report is from a government agency
b. permission is not needed as the report was found on the Internet
c. permission is not needed as you are only distributing 30 copies
d. permission to distribute 30 copies of the report must be acquired

 27. You have an assignment that requires you to use an engineering software to design a 3D model of a robot. The school has purchased the software and loaded it in the computer lab, but you have a difficult time getting to the lab due to work conflicts. A friend loans you the software and you load it on your computer. Is this legal?

a. no, because this action constitutes a violation of copyright
b. yes, because it is already freely available in the lab
c. yes, because it is education software and therefore able to be shared
d. yes, because your friend owns it and can share as he wants

28. Browsing a science news magazine, you come across an article that discusses the future of robot-assisted surgery. As you are preparing for a presentation on this topic you decide to make copies of the article and share it with the class. Which of the following concepts makes it legally permissible to reproduce portions of works for educational purposes without permission?
a. copyright
b. fair use
c. freedom of information
d. intellectual freedom

APPENDIX H: GRADUATE ENGINEERING AND COMPUTER SCIENCE ONLINE SURVEY INVITATION AND REMINDERS

Graduate Engineering and Computer Science Online Survey Invitation and Reminders

Survey Invitation

Study Title: Information literacy of International Graduate Students: An Investigation of their Skills, Challenges, and Needs.

Dear graduate Engineering and Computer Science students:

I am Yousef Ayoub, a UCF Libraries employee and a doctoral candidate for the Education E.d.D. degree in the College of Education and Human Performance at UCF and I am asking for your participation in this important study. You are being recruited to participate in this research study based on your status as an actively enrolled Engineering OR Computer Science graduate student at UCF. The study is important for graduate students and was approved by the College of Engineering and Computer Science at UCF.

Purpose of the research study: The purpose of the study is to better understand and explore the library research and information literacy skills levels of national and international graduate students. The study has a special focus on international students and will investigate their information literacy skills, challenges, and needs (Information literacy refers to concepts related to locating, evaluating, and using information). Your participation is needed to provide important insights about library services for both national and international students and will yield very useful data to support the library information literacy program decisions, modifications, and improvements.

What you will be asked to do in the study: Participation in this study will require approximately 30 minutes of your time. You will be asked to take an electronic survey that includes 28 items, six of which are of demographic nature. Survey items contain items related to information literacy skills in locating, evaluating, and using information and library resources.

At the end of the survey, international students will also be asked to volunteer to participate in an audiotaped interview. Interview participants will be contacted to schedule an interview date and time through their Knight's email account. Interviews will take approximately 30 minutes to complete and will be held at the John C. Hitt Library on the main campus or at a location of your choice.

There are no risks associated with your participation in this study. Every precaution will be made to keep all study information confidential and secure. Participation is voluntary and will have no impact on your grades. You will not be individually identified. You may withdraw at any time.

Study contact for questions about the study or to report a problem: If you have questions about this information or to report a problem, please contact: Yousef Ayoub, doctoral candidate at Yousef.ayoub@ucf.edu or Thomas Cox, Ed.D, faculty supervisor, College of Education & Human Performance at Thomas.Cox@ucf.edu

IRB contact about your rights in the study or to report a complaint: Research at the University of Central Florida involving human participants is carried out under the oversight of the Institutional Review Board (UCF IRB). This research has been reviewed and approved by the IRB. For information about the rights of people who take part in research, please contact: Institutional Review Board, University of Central Florida, Office of Research & Commercialization, 12201 Research Parkway, Suite 501, Orlando, FL 32826-3246 or by telephone at (407) 823-2901.

I thank you in advance for your consideration!

Please follow this link to the Survey or copy and paste the URL below into your internet browser:

   Survey Link

Survey Invitation Reminder

Study Title: Information literacy of International Graduate Students: An Investigation of their

Skills, Challenges, and Needs.

Dear graduate Engineering and Computer Science students:

You were recently invited to participate in the library study about the information literacy of graduate students at UCF. The purpose of the study is to better understand and explore the information literacy skills levels of both national and international graduate students and was approved by the college of engineering and Computer Science. The study includes both national and international students. The study has a special focus on international students and will investigate their information literacy skills, challenges, and needs (Information literacy refers to concepts related to locating, evaluating, and using information). Your participation is needed to provide important insights about library services for both national and international students and will yield very useful data to support the library information literacy program decisions, modifications, and improvements.

If you have already completed the survey, thank you for your participation!

If you have not completed the survey, please consider taking a few minutes to complete it now.

Participants are being asked to complete the online information literacy skills survey that includes demographic questions and information literacy related questions.

The survey includes 28 questions and will take approximately 30 minutes to complete.

At the end of the survey, international students will also be asked to volunteer to participate in an audiotaped interview. Interview participants will be contacted to schedule an interview date and time through their phone or Knight's email account.

Interviews include questions related to information literacy of international graduate students and will take approximately 30 minutes to complete. Interviews will be held at the John C. Hitt Library on the main campus or at a location of your choice.

There are no risks associated with your participation in this study. Every precaution will be made to keep all study information confidential and secure. Participation is voluntary and will have no impact on your grades. You will not be individually identified. You may withdraw at any time. You must be 18 years old to participate in all study materials.

If you have questions about this information or to report a problem, please contact: Yousef Ayoub, doctoral candidate at Yousef.ayoub@ucf.edu or Thomas Cox, Ed.D, faculty supervisor, College of Education & Human Performance at Thomas.Cox@ucf.edu

IRB contact about your rights in the study or to report a complaint: Research at the University of Central Florida involving human participants is carried out under the oversight of the Institutional Review Board (UCF IRB). This research has been reviewed and approved by the IRB. For information about the rights of people who take part in research, please contact: Institutional Review Board, University of Central Florida, Office of Research & Commercialization, 12201 Research Parkway, Suite 501, Orlando, FL 32826-3246 or by telephone at (407) 823-2901.

Please follow this link to the Survey or copy and paste the URL into your internet browser:

      Survey Link

APPENDIX I: GRADUATE ENGINEERING AND COMPUTER SCIENCE AUDIO RECORDED INTERVIEW QUESTIONS

Graduate Engineering and Computer Science Audio Recorded Interview Questions

1. How do you describe your information literacy or library research skills in general?

2. How would you describe your ability to search library databases and the Internet to find information?

3. How did you learn about conducting library research or using library resources?

4. What types of information do you usually use for your assignments? What research tools do you usually use for these assignments?

5. What research strategies do you usually use for your assignments?

6. How well do you think the B-TILED survey measured your skills related to conducting library research?

7. What are some of the challenges you face in learning information literacy or library research skills?

8. How do you describe the library role in helping students to handle these challenges?

9. What are some assignments that you think will need information literacy or research skills?

10. What are some of your information literacy and research needs as a graduate students?

11. How do you describe the role of the library in meeting the information literacy and research needs of international students?

12. What types of assistance have you received at the library or from librarians related to conducting library research or using library resources?

13. How do you describe the library information literacy services and instruction offered to international students?

14. What are some information literacy and instruction services you would like to see offered by the library to international students?

15. What else should I have asked in this interview to learn more about international graduate students' information literacy challenges, needs and services?

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