Assessing and Improving the Information Literacy Skills of WPI Students in the Humanities and Arts Project Seminar

An Interactive Qualifying Project Report submitted to the Faculty of WORCESTER POLYTECHNIC INSTITUTE in partial fulfillment of the requirements for the Degree of Bachelor of Science

By:
Lindsey Gallagher
Meghan Lutz
Anthony Ward

Advisor:
Professor Joseph Cullon

Project Sponsor:
Laura Hanlan
Gordon C. Library

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Abstract

This project took a mixed methods approach to assessing the information literacy of Humanities and Arts Inquiry Seminar students. Through the collection of surveys, an ethnographic study, and a final bibliographical assessment, we gathered evidence in support of incorporating library instruction into HU3900 courses. Library sessions were shown to have an immediate positive impact on the way students carried out searches. Students were also more likely to correctly cite the sources they used following library instruction. Based on our results, we further encourage faculty to consistently reinforce information literacy concepts to students throughout the course of their seminar. Future projects should focus on utilizing and improving upon our methodology to further assess and improve information literacy among HU3900 students.

Executive Summary

Today many universities, including WPI, teach information literacy as an integrated aspect of course curriculum, involving the search for accurate and credible information for use in reports and projects. The purpose of this study was to better understand how effectively students conduct research throughout their Humanities and Arts (HU3900) inquiry seminar.

We utilized a mixed method technique to assess information literacy of HU3900 student through the use of survey data, an ethnographic study and a final bibliography evaluation. These methods allowed us to see if and to what extent library instruction would have on student research practices and their final work. To collect information about students' past research experience and demographics, we distributed a pre-observation questionnaire. For the ethnographic study, we observed two HU3900 seminars: one acting as an experimental group after participating in a library session (DDT seminar), and one acting as a control with no library session (Franklin seminar). Students in each group were given a set amount of time to perform searches as they normally would. Their search histories were then collected and analyzed by the team. Immediately following the study, the students completed self-evaluation rubrics. This helped us gage student self-perceptions about their research abilities. A quarter of the way through the term, we electronically distributed process surveys to evaluate student progress and response to library instruction. Lastly, we collected the final bibliographies of each student at the end of the term.

Overall, our results have shown the advantages of adding library sessions into HU3900 coursework. Based on our findings, we recommend that faculty build library

instruction into their course syllabi so that information literacy concepts are consistently reinforced to students. Information literacy objectives should be explicitly defined in the student outcomes section of HU3900 syllabi. Gordon C. Library should continue to encourage HU3900 faculty to promote information literacy skills. It would be helpful to interview faculty about whether or not they use library instruction in their seminars and why. The Gordon Library should also continue to assess the range of current practices among faculty for incorporation of information literacy concepts into seminars.
We also suggest that future projects utilize our mixed method technique because of the strength of the results gathered. Our methodology can be applied to assessment of other HU3900 courses focused on varying disciplines.

For future ethnographic studies, project teams should focus on eliminating the bias associated with the history evaluation. Future iterations of our project should design methodology that gets the students to start searching where they naturally would on their own, rather than at Summon. The goal of our study was to evaluate our results based on the differences seen between seminars. Other projects could focus on the progress of individuals by analyzing the three different methodologies simultaneously. Finally, future projects should distribute a post-self-evaluation rubric to compare the differences in student confidence level as the term progressed. We hope that faculty and the library can use our findings and recommendations to help students become more effective and efficient researchers.

Acknowledgments

We would like to thank all of the individuals that have dedicated their time, assistance and effort for this project. We would like to thank Professor Joseph Cullon for being our advisor and for all of his assistance he provided throughout the course of the project. We also would like to thank Laura Hanlan for being our sponsor for the duration of the project and for all of the insight and guidance she provided throughout the project.

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Chapter 1: Introduction

1.1 Problem Statement

Research is a valued skill that is used throughout our everyday lives. Over the past two decades the way research is conducted has changed dramatically. One of the biggest changes involves the availability of information. As a result of advancing digital technologies, books have become more widely and easily available, and vast amounts of information sources can be found over the Internet (articles, newspapers, journals, range of un-reviewed sources, etc.). A large number of sources are created exclusively for the internet which enables a broad availability to the public, but these sources are not necessarily subjected to the same scrutiny of peer review like those printed in books and journals. Some sources could be crowd-sourced, highly partisan, or simply plagiarized. Because of both the amount of information that can be accessed and how easily it is retrieved, students need to develop essential skills in effectively and efficiently obtaining and assessing the value and quality of information available.

Worcester Polytechnic Institute (WPI) has a Humanities and Arts requirement, including a culminating one-term inquiry seminar (HU3900) that is heavily research oriented. Through its Humanities and Arts requirement, WPI hopes to bridge the gap between technical and humanistic learning. After taking a series of depth and breadth courses, students must complete an inquiry seminar in their chosen depth discipline to fulfill the requirement. The seminar project enables the development of a focused approach to a humanistic theme specific to the student's disciplinary focus. Students have the option of choosing among a wide range of themes for their seminars within their discipline.

Every seminar calls for well-attuned information literacy skills since each student must possess the proper research skills to ensure effective performance. This requires students to do extensive research over the course of just seven weeks and, therefore, it is crucial that students utilize efficient and effective practices with the research methods.

Using ethnographic methods, survey instruments and bibliographical analysis, our goal is to better understand how effectively students conduct research throughout their inquiry seminar. We will also examine any discrepancies between student perceptions of their own research abilities in coordination with the actual results of the work in two C-Term inquiry seminars. This information will be essential in determining how WPI librarians can better understand student needs and subsequently adapt their research instruction to improve student information literacy. Such observations may also emphasize the added value to HUA faculty of research instruction in advanced classes such as the inquiry seminars.

1.2 Project Aims

Through an ethnographic study of two seminars, we plan to assess information literacy tendencies of HU3900 students. In addition to the ethnographic study, pre- and post-observation questionnaires will provide insight into the self-perceptions of student confidence in finding and evaluating sources. In addition, we intended to carry out a final bibliography assessment. From the results of our study, we hope to provide the Gordon Library of WPI with a set of recommendations for improving information literacy skill through instruction in HU3900 courses. Our conclusions may also be evidence for faculty to increase the amount of library involvement they allow within their seminars. We plan to achieve the following objectives during the course of our project:

- Assist the Gordon Library at WPI in evaluating baseline information literacy skills of HU3900 students as defined by the Framework for Information Literacy for Higher Education from the ACRL.
- Conduct and analyze an ethnographic study to assess information literacy skills of HU3900 students with and without library instruction
- Conduct and analyze a post-study process survey to assess students' ongoing research progress and response to the library instruction session (if applicable) throughout the course of the term.
- Conduct a bibliographic evaluation to assess student's final bibliographies that will be submitted along with their final report at the end of the term.
- Create a set of recommendations for the Gordon Library as well as HUA 3900 faculty to improve information literacy education within HU3900 seminars

Chapter 2: Background Information

2.1 History of Information Literacy

Information literacy is a concept first dating back to Paul Zurkowski's 1974 paper, "The Information Service Environment: Relationships and Priorities." Initially if referred to the skills to utilize information tools and primary sources to form solutions to problems. This initial definition pertained mainly to information being used in an industry setting before the expansion of the internet and digital distribution of information. Up through the 1980s, aided greatly by the advent of accessible computer technology for students, the concept was reworked so the scope included academic information pursuits as well as industrial research. In 1985, a new general definition developed by Martin Tessmer defined information literacy as "the ability to effectively access and evaluate information for a given source." The proliferation of digital resources allowed for a much wider selection of available sources, but this was not without drawback; as locating information was no longer confined to libraries, there was new emphasis on the evaluation of the quality of information and sources, especially those found on the internet [3]. By the end of the decade, the shift from library literacy to information literacy as a whole focused on the learning process of librarians. These processes included: how to find, obtain, evaluate, and properly use information. They focused on educating users for lifelong learning and the definition of information literacy developed into what we are currently familiar with today.

2.2 Information Literacy Standards & Assessment

The majority of higher education institutions in the United States including WPI endorse the standards outlined within the Association of College and Research Liberians

(ACRL)'s Information Literacy Competency Standards for Higher Education. Since its initial drafting in 2000, this document has also been key in guiding institutions in the evaluation of student learning outcomes. However, as of 2014, this document has been extensively edited, with the addition of new focus areas in information literacy. The new Framework for Information Literacy for Higher Education reframes information literacy as metaliteracy, in which students act as "both consumers and creators of information in multiple formats [9]." In order for students to do so they must understand and utilize a variety of abilities and tools, to properly access the information ecosystem. These changes are highlighted in the ACRL's updated definition of information literacy as a "repertoire of understandings, practices, and dispositions focused on flexible engagement with the information ecosystem, underpinned by critical self-reflection," [9]. The discovery, evaluation, and interpretation of source information fall under the realm of this information literacy definition. The ACRL's document calls on institutional librarians and campus faculty to partner in a collaborative effort to aid student information literacy. The new framework is organized into the following six frames or threshold concepts, with corresponding knowledge practices and dispositions [9].

2.2.1 Scholarship is a Conversation

> "The idea of sustained discourse within a community of scholars or thinkers, with new insights and discoveries occurring over time as a result of competing perspectives and interpretations."

2.2.2 Research as Inquiry

"The understanding that research is iterative and depends upon asking increasingly complex questions whose answers develops new questions or lines of inquiry in any field."

2.2.3 Authority is Contextual and Constructed

"Authority of information resources depends upon the resources' origins, the information need, and the context in which the information will be sued. This authority is viewed with an attitude of informed skepticism and an openness to new perspectives, additional voices, and changes in schools of thought."

2.2.4 Format as a Process

"The way tangible knowledge is disseminated. The essential characteristic of format is the underlying process of information creation, production, and dissemination, rather than how the content is delivered or experienced."

2.2.5 Searching as Exploration

"Locating information requires a combination of inquiry, discovery, and serendipity. There is no one size fits all source to find the needed information. Information discovery is nonlinear and iterative, requiring the use of a broad range of information sources and flexibility to pursuit alternate avenues as new understanding is developed."

2.2.6 Information has Value

"The acknowledgement that the creation of information and products derived from information requires a commitment of time, original thought, and resources that need to be respected by those seeking to use these products, or create their own based on the work of others. In addition, information may be

valued more or less highly based on its creator, its audience/consumer, or its message."

2.3 Gordon C. Library Current Practices

WPI's Gordon Library is known for its significant presence in much of the university's project-centered curriculum, including the many courses requiring work in small groups. Classes requiring research-intensive group work, including engineering design, the Great Problems Seminars and ID2050, have almost full participation in library research initiatives. However, the participation of Gordon C. Library staff in the HU3900 seminars is much less uniform. Because there is a more independent, "grassroots" effort by librarians to implement programs, students in these seminars have varying experiences when it comes to different research skills. The library staff has demonstrated that their presence in the seminars is effective in expanding the student research bases yet full involvement in the HU3900 seminars akin to that in the Great Problems Seminars or ID2050 is difficult to sustain [12]. The faculty is relatively independent in setting up their respective seminar courses. HUA department is a multidisciplinary field represented through the variety of courses offered. Because students complete an individual project in their respective seminar, it is key that research is focused on their specific seminar topic. This requires librarians to tailor their programs to each individual student, in turn diminishing sustainability. To improve library practices in the future, it is important to evaluate the needs of both faculty and students across the different disciplines of the HU3900 seminars.

Minimal research has been conducted into the information literacy of students within the HU3900 seminars. However one study has examined research tendencies of a

history seminar and observed the effects after the addition of library sessions and gaming elements [12]. Students in the HU3900 seminar worked to develop a classroom-based role-playing game based on solving engineering problems in the year 1899. Researchers assessed the quality and legitimacy of citations provided by students researching the time period. They also reviewed self-reflective essays of the students to get an accurate portrayal of any skills that were developed over the course of the term. The results showed that although students were not asked to evaluate their own information seeking abilities, many stated that they noticed improved information literacy skills. They also highlighted how valuable the game process was in bettering their capability to gather credible sources. The study indicated that librarian engagement in this HU3900 seminar, resulted in more successful information literacy skills and learning outcomes for students involved. Students themselves also affirmed that what they learned through these sessions could be transferred to other disciplines and classes that required such research proficiencies.

2.4 Information Literacy Assessment at Other Universities

Today many universities, such as WPI, teach information literacy as an integrated aspect of course work, involving the search for accurate and credible information for use in reports and projects. University libraries often have tutorials or guides on how to evaluate the credibility and legitimacy of a source. Alongside classes that feature library integration for aid in research, students are also able to make appointments with one-on-one or group instruction with research librarians. More proactive initiatives such as Purdue University Libraries' Instruction Matters: Purdue Academic Course Transformation (IMPACT) use multifaceted solutions to teaching and promoting

information literacy. IMPACT tackles this issue by redesigning courses, introducing students to evidence-based learning and active construction of knowledge [14]. Combined with learning spaces that enable students and their instructors to access information and tools within a class setting, students are required to engage and critically evaluate the information that they encounter.

Other institutions have also pioneered evaluation tools and procedures to gauge the effectiveness of their information literacy curricula and outreach. At the University of Rochester, a group of the university's librarians and an anthropologist undertook an ethnographic study that explored how students conducted their research. The main goals of the study were to learn about the research habits of undergraduate students as well as what resources students were using to obtain information. Their initial aim was to be able to describe in detail how students actually write their research papers. Many different ethnographic methods were used including interviews, observation sessions, and photo surveys [19]. The study dug deeply into the student environment. It was broken down into sub teams, each team observing a different "student spot," both academically and non-academically oriented. Paying attention to everyday details in all areas of the community and formulating a sense of not just who the members are, but also context and meaning, are critical. The community analysis "is as basic to library management as the physician's diagnosis is to the practice of medicine," [7]. The information that was gathered throughout these observations was then used to help the University librarians improve the library and its resources. The results of the Rochester study helped shape the library's current instructional approaches because it enabled the library staff to develop new ways to help students meet faculty expectations for research papers and become

more adept researchers. The results were also meaningful because they reflected on the way students do research in today's technological world.

The study found that students tend to have a very narrow view of what librarians can do to help them, and viewed the only help they could offer was assisting them find a book off the shelf or locate items. One of the biggest surprises was that many students feel enchained by personal technologies and struggle to break free, especially of instant messaging and similar distractions [8].

Through these findings the Rochester University Library had made many changes to help students become more efficient researches. Since the study, University of Rochester has changed their reference services, enlarged their partnership with their college writing center and altered their library instruction.

2.5 Ethnography in the Library

There is a recent trend seen throughout multiple libraries among various universities using ethnographic research methods to focus on how students obtain and use information that can then be used to enhance and improve upon current library resources and instruction. For example, the University of Rochester study employed ethnographic methods, adopting a qualitative orientation that emphasizes the detailed observation of people in naturally occurring, everyday settings.

Ethnographic methods are very beneficial because they involve obtaining an "insider's" view and, therefore, allow the ethnographer to collect large and detailed amounts of information in a short amount of time. Because ethnography yields qualitative empirical data, our team will perform an ethnographic observation as the basis of our study. We believe this type of data will be of most use to the Gordon Library in seeing

the practices of student researchers and the benefits of information literacy education in the classroom.

An ethnographic assessment to assist the Gordon Library at Worcester Polytechnic Institute in evaluating baseline information literacy skills of students as defined by the 2014 framework from the ACRL will provide librarians with more in-depth information on the practices of students in HU3900. These qualitative approaches in comparison with quantitative ones, are often far more engaging, stimulating, and yield much richer data than qualitative survey answers or quantitative figures alone. Additionally, it will provide librarians information on student research skills independent from what they think they know about student research skills in order to help librarians make the appropriate changes necessary to improve upon their current resources and instruction.

Based on our research, we believe using ethnographic methods to study students taking the HUA inquiry seminar would be an effective way to observe and analyze how efficiently students find information relevant to their respective seminars.

Our goal is to better understand and evaluate how efficiently students gather information when conducting research for their inquiry seminar through qualitative analysis. Additionally, we will evaluate student's sources and resources used to retrieve information, their perceived confidence level as researchers, as well as their past research experience and exposure to research through quantitative and quantitative analysis. With these observations of research efficiency and evaluations of sources that we gather, we hope to give WPI librarians a better sense on how they can improve upon their research instruction, and help better prepare students for the Interactive Qualifying Project (IQP)

and/or the Major Qualifying Project (MQP), both of which are large-scale research projects, and traditionally come after students complete the HUA requirement. We also hope to provide recommendations to the Gordon Library and to HUA faculty, about how the librarians could help students become more effective and efficient researchers.

Chapter 3: Structure of Information Literacy Assessment

We observed two groups of students from separate History HU3900 seminars, both taught by Prof. Joseph Cullon. One group, acting as our experimental group, had a sample of thirteen and was registered for the "DDT, Silent Spring and American Environment" seminar. The group acting as our control group had a sample size of nine and was registered for the "Benjamin Franklin's Science" seminar. The students who were registered for "DDT, Silent Spring and American Environment" had a library instruction session prior to the independent research session while the students who were registered for "Benjamin Franklin's Science" did not have a library instruction session. Performing a controlled study allowed us to see if and to what extent library instruction had on student research practices and their final work.

Since this research required observation, analysis and surveying of students we sought approval from the WPI Institutional Review Board (IRB) prior to any work with human subjects. The purpose of the IRB approval was to ensure the study followed regulatory requirements and ethical guidelines while working with human subjects. Within the application we included a detailed description of our methodology as well as any potential risks to the participants. Additionally, we created an informed consent form that outlined the purpose, procedure, and rights of the participant concerning the study. Participants prior to their involvement in the research study signed this. A copy of the informed consent form can be found in Appendix B.

Along with ethnography observation while students undertook research in Gordon Library, Andersons Lab A, we developed five tools to direct and standardize the information literacy assessment of each student participant's approach to research. These

tools included both, qualitative and quantitative analysis. We will explain each tool and its purpose below.

3.1 Pre-Observation Questionnaire

A pre-observation questionnaire was administered to gather general demographic information about our subjects. This demographic information included the participants' age, major, whether they live on-campus or off-campus, and whether or not they have completed a Great Problems Seminar (GPS), the IQP, and/or the MQP. We also included questions about their involvement in previous library research instruction in order to observe their research experience to library instruction and exposure prior to enrollment in the HUA seminar. We used this information when comparing the results to observe if there was any correlation between the skills of students who had more involvement with library instruction versus students who did not have as much involvement with library instruction. The pre-observation survey was given out for student participants to complete prior to ethnographic observation session. A copy of the pre-observation questionnaire can be found in Appendix C.

3.2 Ethnographic Study

We reserved Gordon Library's Anderson Labs to administer our pre-observation and self-evaluation rubrics and perform our observation. We gave both groups of students the same pre-observation questionnaire and self-evaluation rubric to complete prior to observation. We then instructed each student to log in to a lab computer using his or her own WPI account, open Firfox browser, and clear the internet browser history. We then instructed each student to visit the WPI website homepage so we know exactly where

each student began their fifteen minutes of research. This allowed us to see just the links visited by each student during the observation. To maintain anonymity we assigned each student a number as an identifier. Students then began researching the topic of their choice and gathering citations for sources they deem credible enough to use in their independent research projects.

During observation, each student was given fifteen minutes to gather credible research about his or her research topic. In addition to viewing the websites and sources that students found during the fifteen minute research test, we also observed their actions while the observation session was going on and took note of any behavior that stood out during the fifteen minute research session. This allowed us to see how often students got distracted while researching either by checking their phones, texting, starting conversation with other participants or visiting social media websites.

Once the fifteen minutes of research ended, we went around to every computer and saved the history into a word document and put it on a flash drive. Once all of the links were recorded into a single word document, we transferred them into a data sheet. This computer history data was later analyzed using the Ethnographic Assessment Checklist to evaluate the quality of the sources and the paths they took to find them. The raw data can be found in Appendix D

3.3 Student Self-Evaluation

In addition to administering a pre-observation questionnaire, we also administered an evaluation rubric for students to fill out immediately after the ethnographic observation session took place. The evaluation rubric included questions that aimed to grasp an idea on the students' own perceptions of where they stand in terms of

researching habits and efficiency. Questions evaluated the student's confidence in his or her current research abilities. From this, our team was able to compare the students' perceptions on their own research skills to the actual skills we observed through our ethnographic study and analysis of final project bibliographies. Their responses were used to evaluate individual past research experience as well as to examine any resulting trends from the students. The evaluation rubric was given to student participants immediately following the observation session. A copy of our evaluation rubric can be found in Appendix E.

3.4 Post-study Process Surveying

Towards the end of the term, students were asked a variety of questions. These questions pertained to their ongoing research and to the library session they attended (if applicable) and were based off of the new ACRL information literacy framework. For more information, see Appendix F.

3.5 Final Bibliography Assessment

We designed a bibliography assessment that we used to analyze the students final bibliographies. Prof. Cullon provided the bibliographies. To maintain the privacy of the participants the names of the students were not included on the bibliographies. The assessment was broken down into specific aspects of the citation itself and of its source. Given the quantitative nature of these aspects, the results were tabulated and evaluated accordingly. A copy of the Final Bibliography Assessment can be found in Appendix G.

Chapter 4: Data Results & Discussion

4.1 Pre-Observation Questionnaire Results

During the ethnographic study, a questionnaire was administrated to gather general demographic information about our subjects as well as analyze their previous research experience and exposure to research-intensive oriented projects. The data we gathered to evaluate prior research experience was whether or not they completed an IQP, and whether or not they took a GPS. The data we gathered to evaluate prior research exposure was whether or not they have had individual librarian help and whether or not they have participated in a group librarian research session. The percentages of each category per seminar were taken. The results are displayed in the following charts:

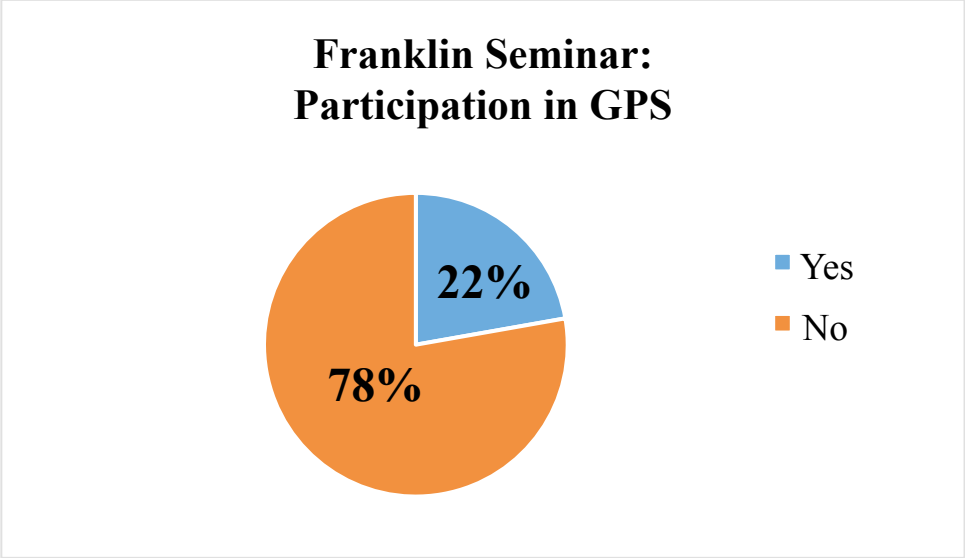


Figure 1: Percent of Franklin seminar students who had previously participated in GPS

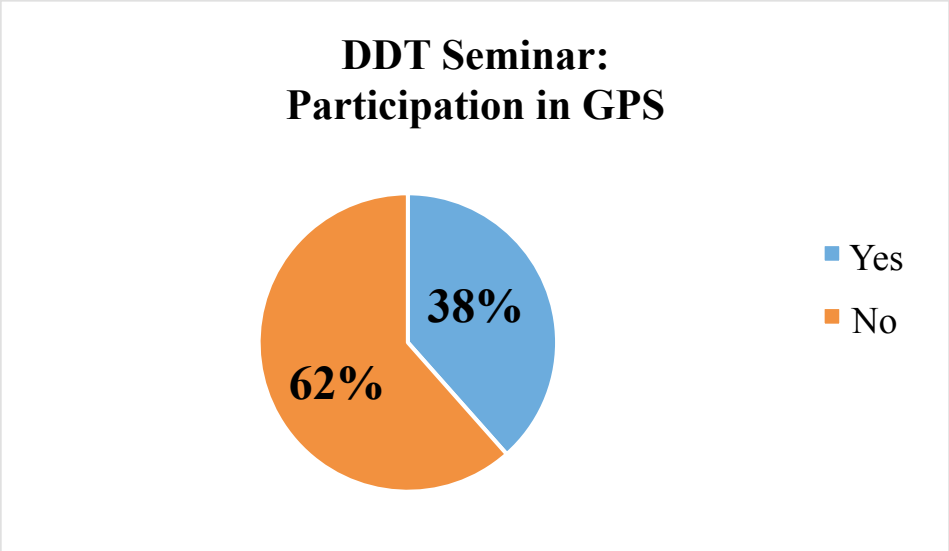


Figure 2: Percent of DDT seminar students who had previously participated in GPS

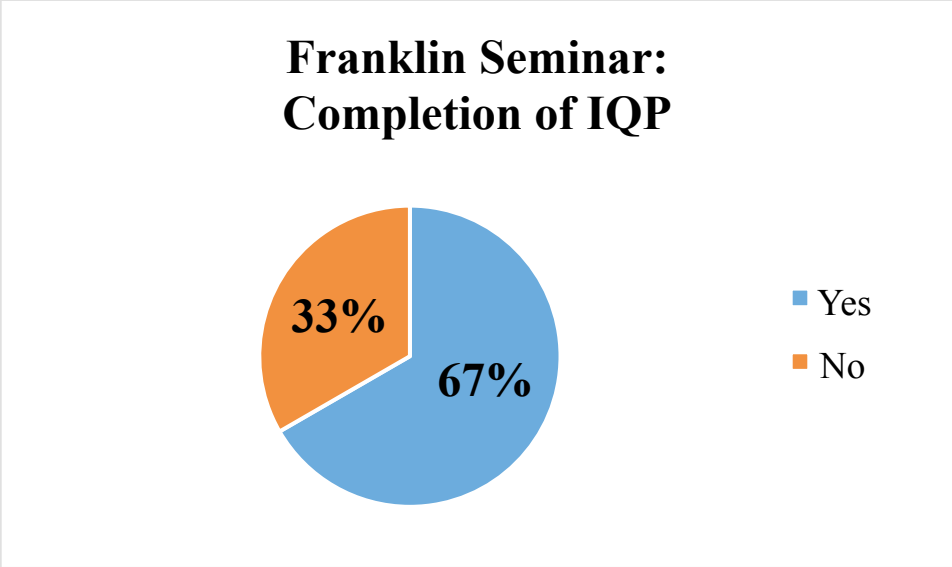


Figure 3: Percent of Franklin seminar students who had completed IQP

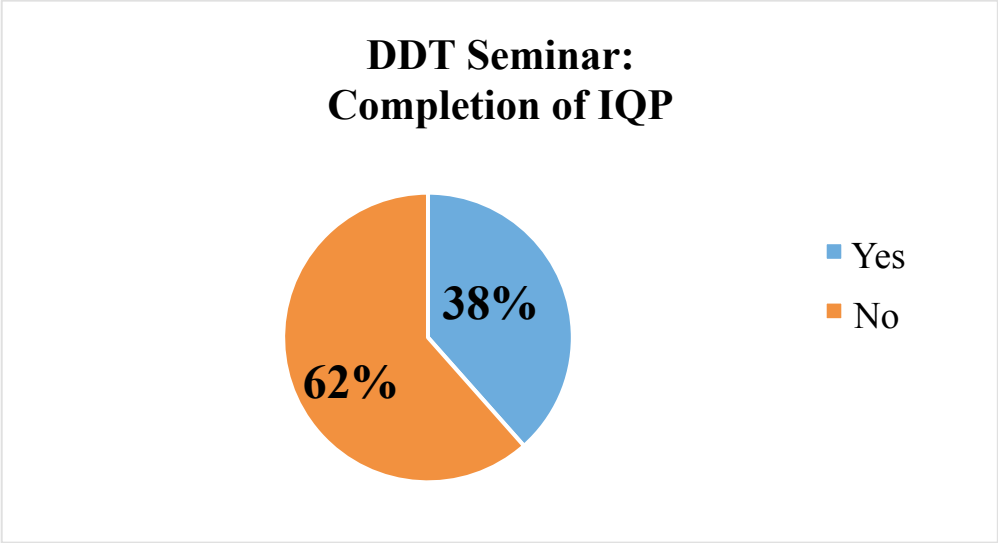


Figure 4: Percent of DDT seminar students who had completed IQP

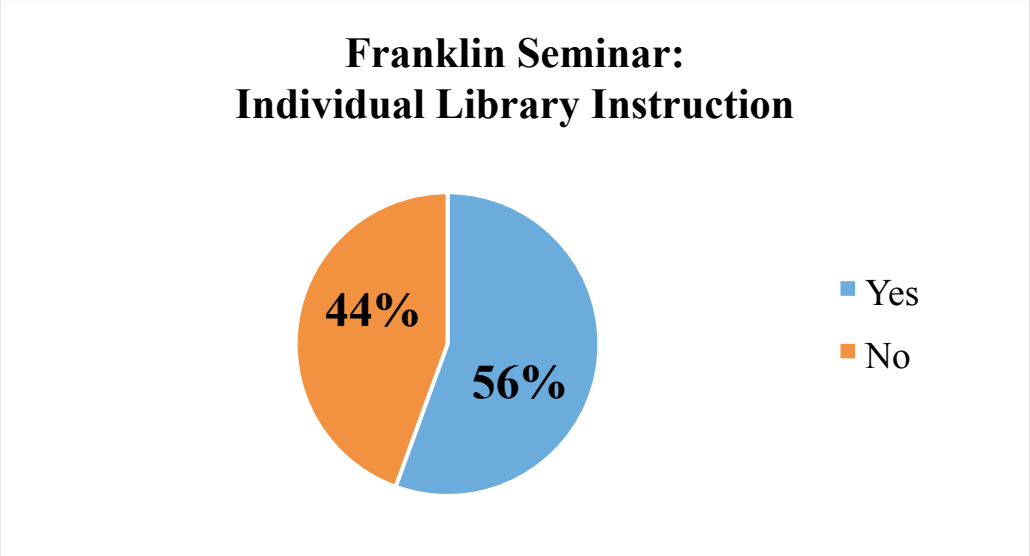


Figure 5: Percent of Franklin seminar students who have had individual library instruction

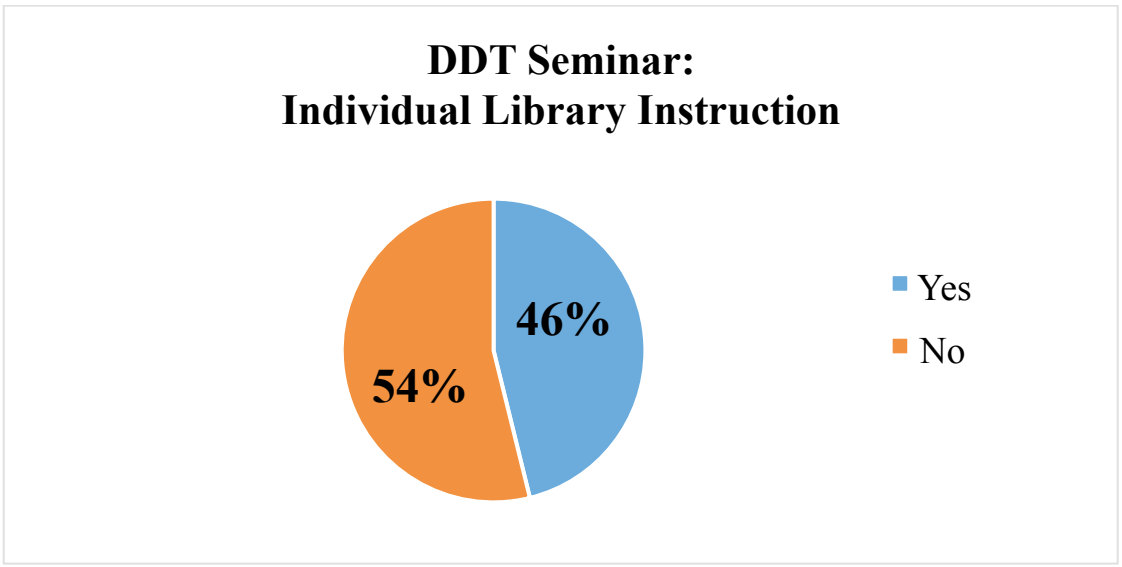


Figure 6: Percent of DDT seminar students who have had individual library instruction

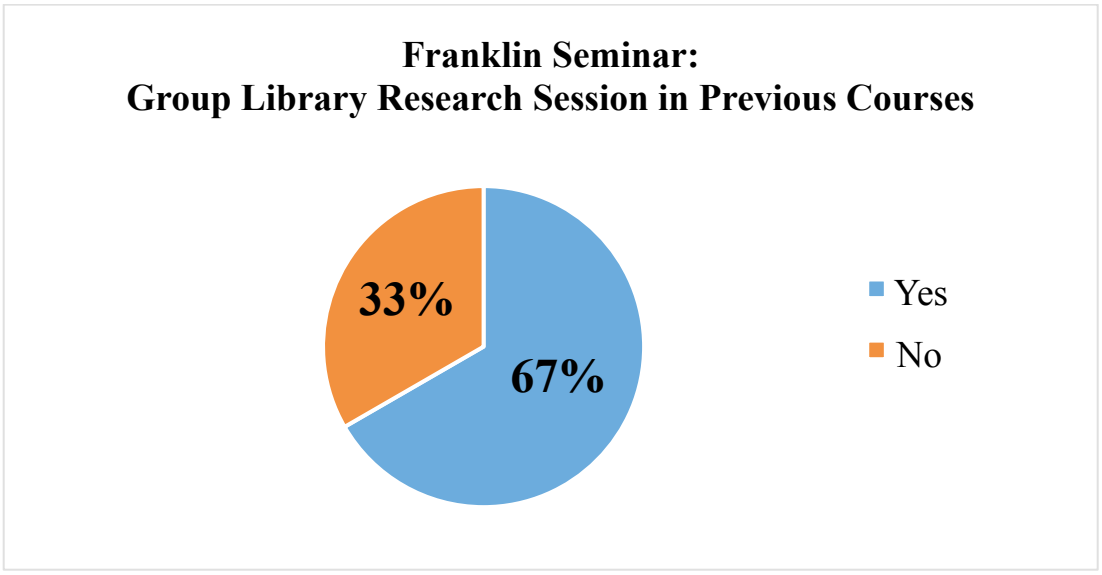


Figure 7: Percent of Franklin seminar students who have participated in a group library research session in previous courses

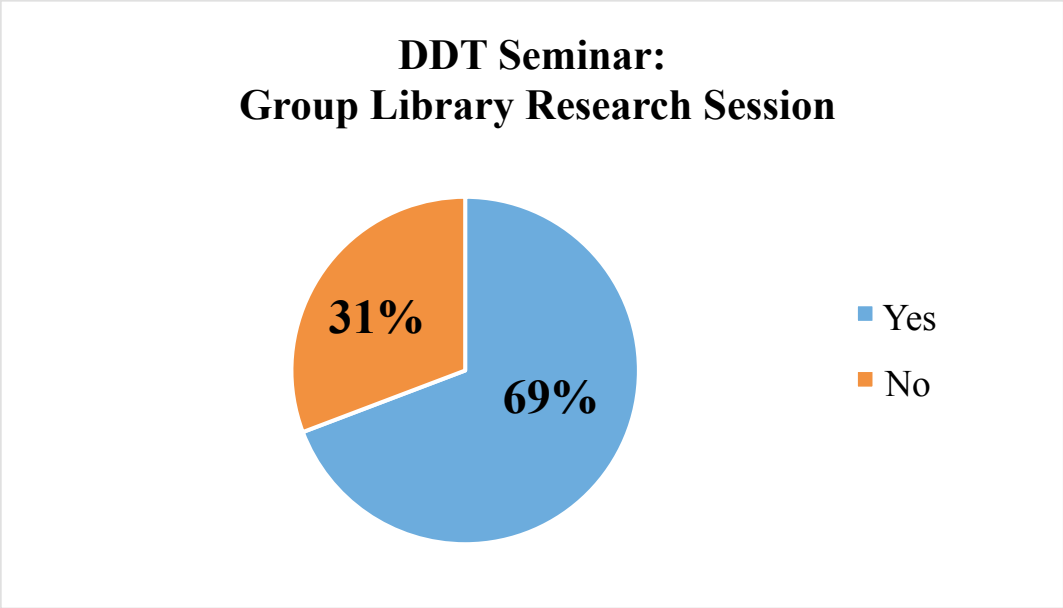


Figure 8: Percent of DDT seminar students who have participated in a group library research session in previous courses

Based on the percentages listed above, it was clear that there was a similar ratio of students who had individual library instruction, with the Franklin Seminar having a slightly higher ratio, and students who have participated in a group library research session before taking the seminar. This allows us to infer that students in both seminars had a similar amount of exposure to research prior to taking the seminar.

The data above also shows that more students in the DDT Seminar have participated in a GPS. However, the data also revealed that more students in the Franklin Seminar have taken the IQP.

In order to analyze and evaluate which class had more research experience, we looked at the percent differences. The percentage of students who have already taken the IQP in the Franklin Seminar is almost double the percentage of students who have already taken the IQP in the DDT Seminar. That being said, the percent difference from the students in the DDT Seminar who have taken a GPS is a lot smaller than the percent

difference from the students in the Franklin Seminar who have taken IQP. The chart below shows this analysis.

Table 1: Pre-observation questionnaire research experience results

Percentage of Students in DDT Seminar who have taken GPS	**38%**
Percentage of Students in Franklin Seminar who have taken GPS	22%
Percent Difference	**16%**
Percentage of Students in Franklin Seminar who have taken IQP	67%
Percentage of Students in DDT Seminar who have taken IQP	38%
Percent Difference	**29%**
Total Percent Difference	**13%**

Therefore, 13% of students have more research experience in the Franklin Seminar than students in the DDT Seminar, which shows that students in the Franklin Seminar had slightly more research experience then students in the DDT Seminar prior to taking the seminar.

4.1.1 Possible Result Limitations

There is uncertainty with the analysis of this data because the questionnaire was limited to only four categories: whether or not they have taken IQP, whether or not they have taken a Great Problem Seminar, whether or not they have had individual library instruction, and whether or not they have participated in a group research session. By basing our analysis on only four components in determining students library research

exposure and experience leaves out a lot of other potential factors that could have an effect on student's previous level of library research experience and exposure. To add onto that, the percentages for the Franklin Seminar are more sensitive because they are based on a smaller sample size of nine students, compared to the sample size of the DDT Seminar of thirteen students. As a result, these limitations produce uncertainties in our data. Results have shown that there are students who have had individual librarian instruction and have also participated in a group library session but still yield the same results as students who have neither had individual library instruction nor participated in a group library research session. This indicates that there is no clear correlation between levels of research exposure and experience and results.

Producing high results is all about reinforcement and repetition. Students do not necessarily draw connections from past research experiences, or previous library instruction. A group library research session may enhance results right after or for the discipline the session focused on, however it will not necessarily enhance future results in another discipline or in future research projects. In other words, having participated in a previous GPS focused on biology research, will not enhance the research experience when researching a topic from an entirely different discipline, such as history or philosophy. That being said, in order to enhance research experience and exposure across all disciplines, reinforcement is necessary across disciplines, projects, and time.

As a result of these findings, we recommend that students consistently attend group library research sessions and individual library help, and recognize that they can never have enough library research instruction. For faculty, we would note that library sessions are never redundant and should be regularly incorporated into a broad range of courses.

4.2 Search History Evaluation Results

Following the ethnographic study, the search histories were collected and analyzed. The average number of links accessed, keywords used, total searches of each class, per student were taken. These results are displayed below in Table 2.

Table 2: History evaluation averages

	# Of links accessed	# Of keywords searches	# Of database searches	# Of advanced searches
Franklin Seminar (control)	25.1	10.3	10.8	0.9
DDT Seminar (w/library instruction)	22	5.1	15.5	2.4

As evident through the averages listed above, there was little difference in the number of links accessed between seminars, with the Franklin Seminar having a slightly higher volume of links. The students in the Franklin Seminar also used more keywords as compared to students within the DDT seminar. Because the Franklin seminar did not receive any instruction about how to choose and properly utilize keywords, it is possible that students were more likely to haphazardly search without any particular technique. This could explain why they used double the amount of keyword searches than the seminar with librarian instruction. On the other hand, students of the DDT seminar performed an average of roughly five more database searches than those in the Franklin seminar. In addition, they carried out significantly more searches with advanced criteria, including source type, author, source title, and subject/field. This was a major principle taught in the library session, which most likely explains the significant difference between seminars. In the Franklin seminar), 75% of students performed advanced

searches whereas 92% of students in the DDT seminar did the same. However, the students of the DDT seminar carried out a higher frequency of such searches.

Another interesting difference in trends between seminars had to do with the nature of sources. Only 1 student in the Franklin seminar (~11%) was noted to have utilized a peer-reviewed/scholarly work. In contrast, 46% of students (6 out of 13) in the DDT seminar that received librarian instruction found peer-reviewed sources.

As evident through the databases accessed column (marked as "Other"), students of the DDT seminar had more variation and diversity in the sources or databases accessed. The library session stressed the importance of these other databases such as EBSCOhost. It is interesting to note that the Franklin course only used Franklin Papers and JSTOR, without attempting to expand into other databases as did DDT students. The seminar professor had previously suggested using Franklin Papers, which may explain this. However he did not explain JSTOR, which means that as a database it has great name recognition. We are unable to clarify why students used this database specifically but it can be assumed that they may have had previous experience with it.

4.2.1 Possible Result Limitations

Interpretation of certain aspects of the data may be ambiguous. Because each database is independent and operates differently, the full-text data must be taken cautiously. It is important to note that this data may not be entirely valid. Issue may also arise from the number of links accessed. The numbers as listed in the raw data sheet may be higher than the actual numbers because of the nature of databases like JSTOR and Franklin Papers. For instance, different pages of the same sources may be presented as separate links. These factors cause uncertainties in our data.

4.3 Student Self-Evaluations

The self-evaluation rubrics administered after the observation sessions were analyzed to see how students reported their efficiency in researching, their experiences with library instruction, and how helpful students believe these library sessions are. The survey asks for the participant to rate their perceived research efficiency level on a scale from 1 to 5, the number of times they have approached librarians for instruction and aid in their research, the number of classes they have taken with library instruction built into the course curriculum, and to rate the helpfulness of their library sessions on a scale from 1 to 5. For both questions that use rating scales, 1 corresponds to inefficient or not helpful at all and 5 corresponds with extremely efficient or helpful. The results of these surveys were averaged and can be seen in Table 3 below.

Table 3: Student self-evaluation averages

	Perceived Efficiency Level	**# of Times Approached Librarians for Instruction**	**# of Classes with Library Instruction**	**Helpfulness of Previous Library Sessions**
Franklin Seminar (control)	3.22 (out of 5)	1.33	2.44	3.56 (out of 5)
DDT Seminar (w/library instruction)	3.67 (out of 5)	1.50	2.42	3.55 (out of 5)

The results from this section of the survey show similar values for each question across the two seminars. The DDT Seminar average perceived efficiency level and the number of times participants approached librarians for instruction independent of a course were reported to be approximately 12% and 11% higher than those of the Franklin seminar, respectively. The reported average number of classes taken with library

instruction featured as part of the course and the rated helpfulness of WPI library instruction sessions are both reported are extremely similar with less than 1% difference favoring the Franklin Seminar. From these results we infer that the students of both seminars are statistically identical in their perceived level of efficiency, their experience with library instruction, and their perception of the helpfulness of library information sessions.

The self-evaluation rubric also asked the participants about the different types of media they use to obtain sources while conducting research. The listed media were general websites, books both in print and digitized, online journal articles, print articles such as those in newspapers and digitized printed journals, and textbooks. The percentages seen in Figure 9 are the average percentages of students in each seminar that report using the listed media.

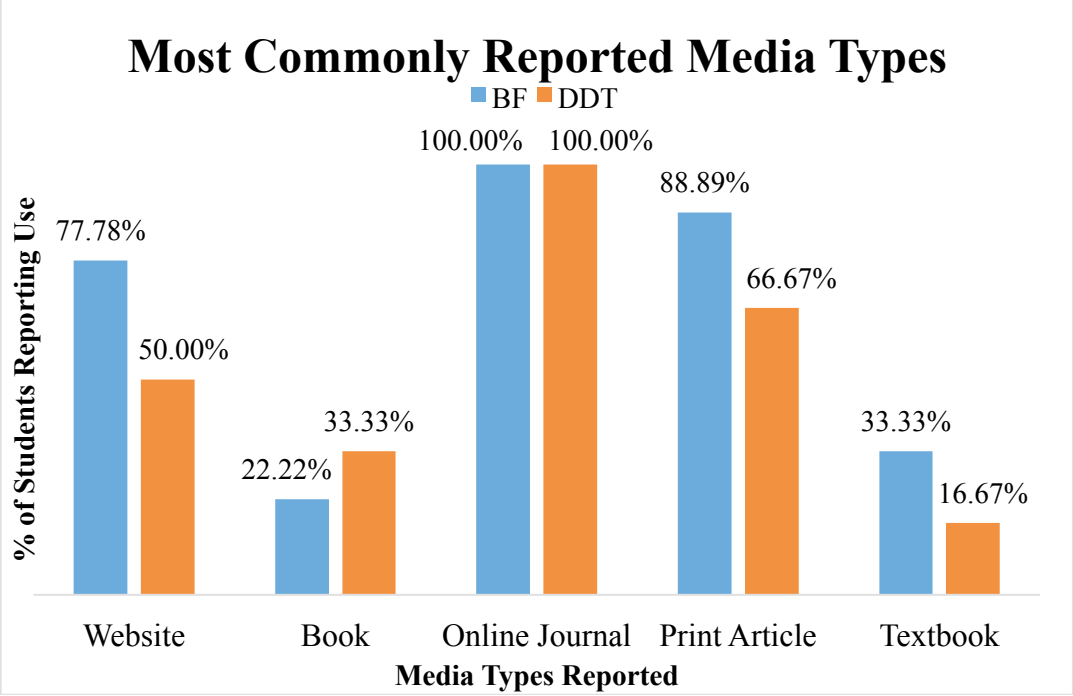


Figure 9: Most commonly reported media types participating students use

The results show that the Franklin Seminar reported using a wider variety of media when conducting research compared to the DDT seminar. The results also show that students heavily rely on digitally available sources for their research. 100% of participants across both seminars report using online journal articles. Furthermore, the majority of both seminars report using print articles and websites, the former of which are more readily accessible online through scanning and digitization. It should be noted that while these are not the only types of popular media used in research, no participant completed the "other" option of this section.

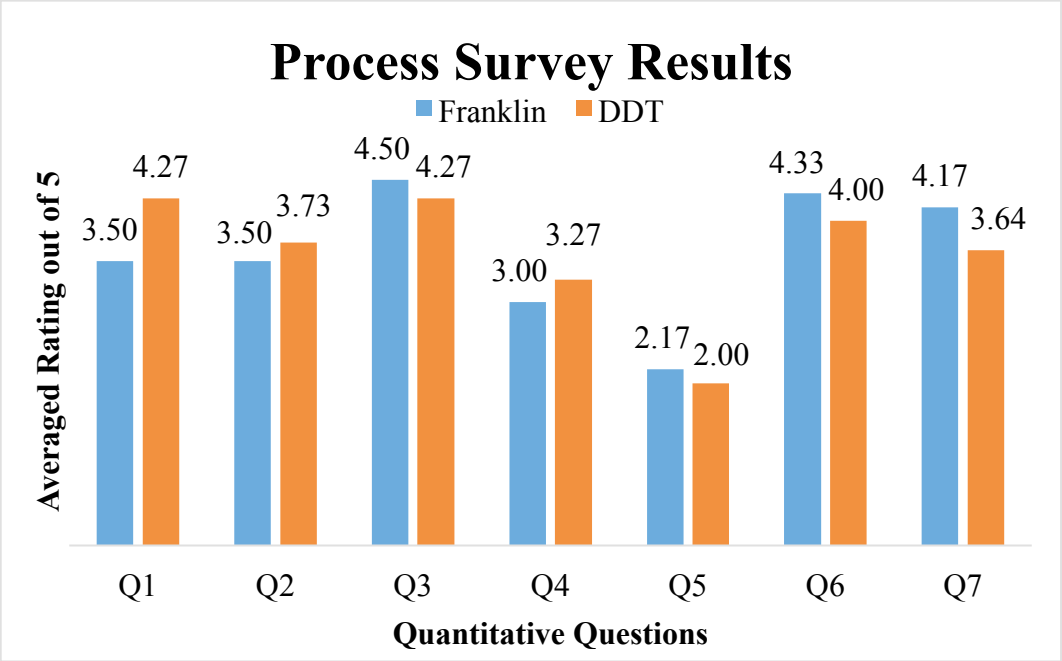
4.3.1 Possible Result Limitations

The values we analyzed for this aspect of our study are all self-reported. This may generate results that are inaccurate due to various human errors, such as any possible unaddressed confusion on the part of the participant, an exaggerated response, etc. While we addressed any possibly confusing aspects of our study and our questions to the participants, exaggeration is a possible source of false reporting concerning the questions in which they are asked to rate their own efficiency in conducting research and to rate how helpful they believe WPI library instruction sessions are.

Our commonly used media section of the survey is limited by the generality of our media options. We chose media that we perceive as the most commonly used media based on our own research experience as students. The survey did not feature differentiation between exclusively digital or print media unless explicitly stated.

4.4 Post-Study Process Surveying

Roughly three quarters through the term, we electronically administered the process survey with the aid of Prof. Cullon. Of the nine participants in the Franklin seminar and 13 participants in the DDT seminar, six and eleven participants responded to the process survey, respectively. The survey included seven quantitative questions and two or three open-ended questions depending on the seminar; the DDT seminar process survey included a question to gain feedback on the library instruction session they received at the beginning of the term. These questions are based upon the six frames of the ACRL's New Framework and ask the participants to rate aspects of their research in regards to several qualities (i.e. how apparent, how difficult, and how difficult). Responses were recorded as ratings from 1 to 5. Figure 10 shows the averaged ratings they reported for each question.



Note: For the purposes of clarity the quantitative questions are the following:
Q1: How apparent was it that multiple sources addressed difference viewpoints of your topic?
Q2: How apparent was it that there are gaps in the research literature about your topic
Q3: How apparent was it that there were many different experts on your topic?
Q4: How difficult was it to guide your research pertaining to your topic?
Q5: How difficult was it to use your sources to find other useful sources?
Q6: How confident did you feel in your ability to properly cite the sources you found?
Q7: How confident did you feel in your ability to distinguish between credible and non-credible authors?

Figure 10: Process survey results as reported by participants

The results of the process survey show differences in average reported values between the two seminars. While each seminar reported higher ratings for some questions compared to the other, the small margins between the majorities of questions show that there is no clear seminar with higher reported ratings for these questions. The questions most relevant for comparison to other aspects of our study are Q5, Q6, and Q7. The Franklin seminar reported average ratings for each of these three questions higher than the average ratings reported by the DDT seminar.

The open-ended questions yielded written in responses that cannot be tabulated, but can express useful feedback from their research experience over the course of the term as well as topics that they would like to learn more about with respect to the library research and information literacy. Participants from the Franklin Seminar responded by mentioning they learned about other resources available to them beyond the resources available directly through the Gordon Library, such as those offered by the Boston Public Library. Responses from the DDT seminar participants were more abundant. The majority of these responses mention the amount of databases available to them through the Gordon Library's services. One DDT participant responded to our request for any additional feedback on the library session at the beginning of the term by stating they "thought the library session was extremely helpful and guided [them] in the right direction in [their] research."

4.4.1 Possible Result Limitations

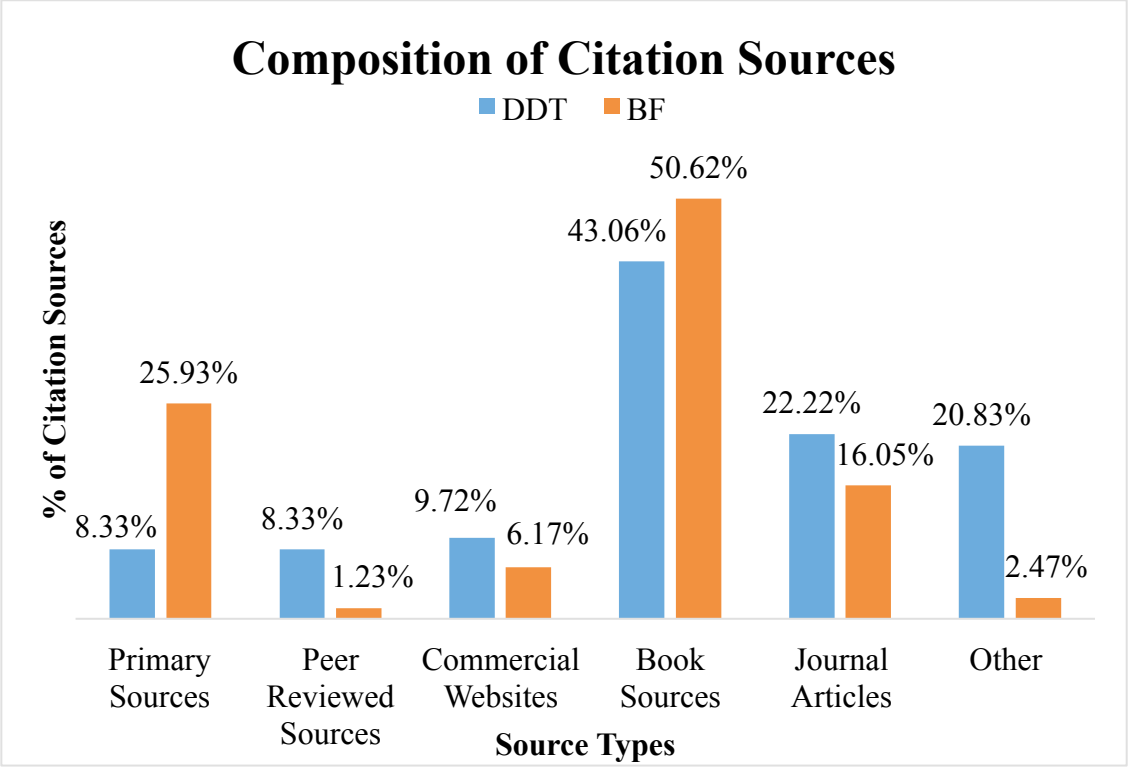
One of the most difficult limitations in gathering our process survey results was not receiving results from all participants. Both versions of the survey received less responses than the number of participating students in the seminars. We also did not know which participant did or did not complete the survey, so we could not ask those who participated whether or not they opted to take the process survey. We also did not receive written responses from each survey participant, which limits the amount of verbal feedback we received regarding their research experience.

As with the results of the self-evaluation rubric, the fact that these values are self-reported opens the results to inaccurate reporting. Though these numbers give us a better

view of how participants perceive their own abilities we must recognize this possibility and account for it. Students may also have had difficulty understanding the questions.

4.5 Final Bibliography Assessment

The final analysis we conducted was on the bibliographies of each participating student's final report. We received these bibliographies at the beginning of the term following the inquiry seminars. In our analysis, we examined the total number of citations in each bibliography, the number of different type of sources in each bibliography such as journal articles, book sources, primary sources, etc., and whether or not each citation was in proper Chicago citation format, the citation has enough information to find the source, and the source is freely available without a subscription or other type of payment. We computed averages of these data across their respective seminar and percentages based on the average number of citations. Results of these analyses are shown in the following charts.



Note: For the purposes of this bar graph, the evaluators defined the following as such:
Primary Sources: Original works such as letters, diaries, etc.
Peer Reviewed Sources: Sources that have been reviewed by members of the established field before publishing
Commercial Websites: Websites run by a company or organization that offers a product or information for sale
Book Sources: Books, both physical and digitized
Journal Articles: Article in compilation text, such as journal, magazine, etc.
Other: Any source that does not fit within the other source types

Figure 11: Composition of final bibliography citations across inquiry seminars

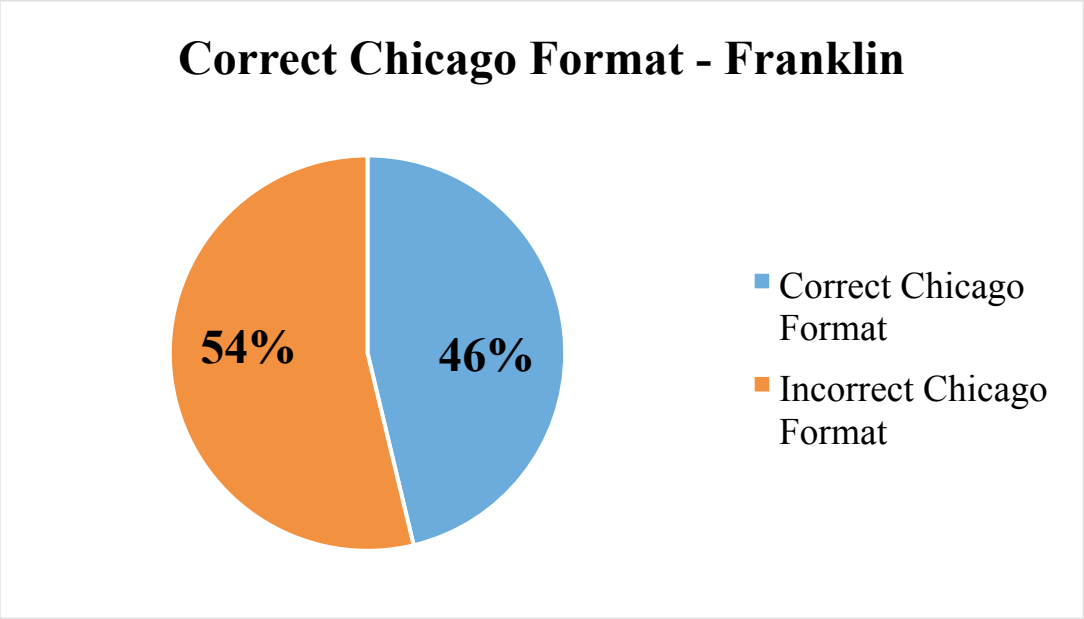


Figure 12: Correct Chicago format usage for citations from Franklin seminar

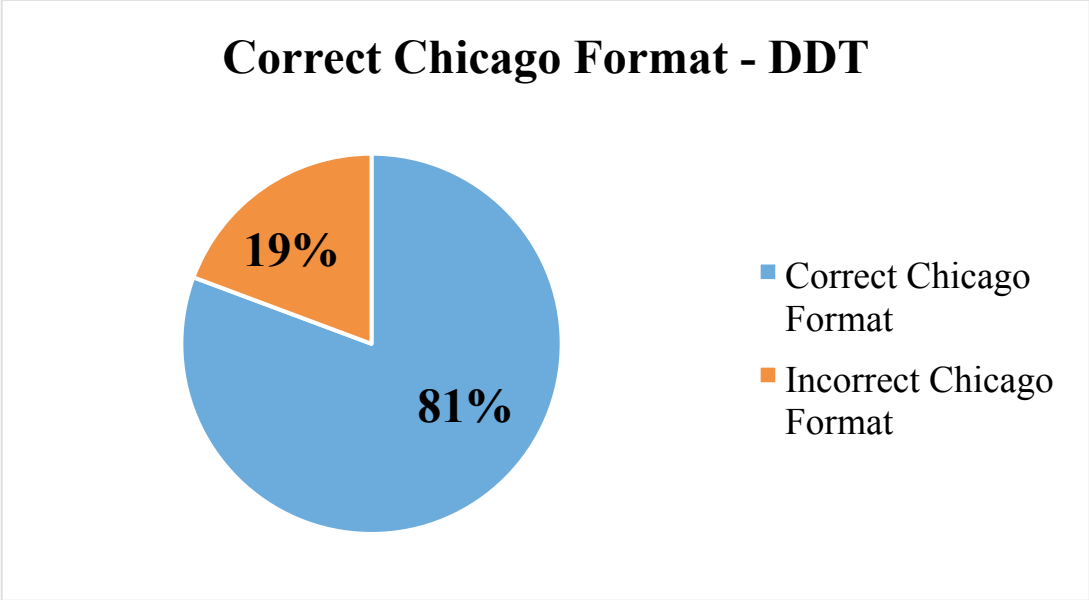


Figure 13: Correct Chicago format usage for citations from DDT seminar

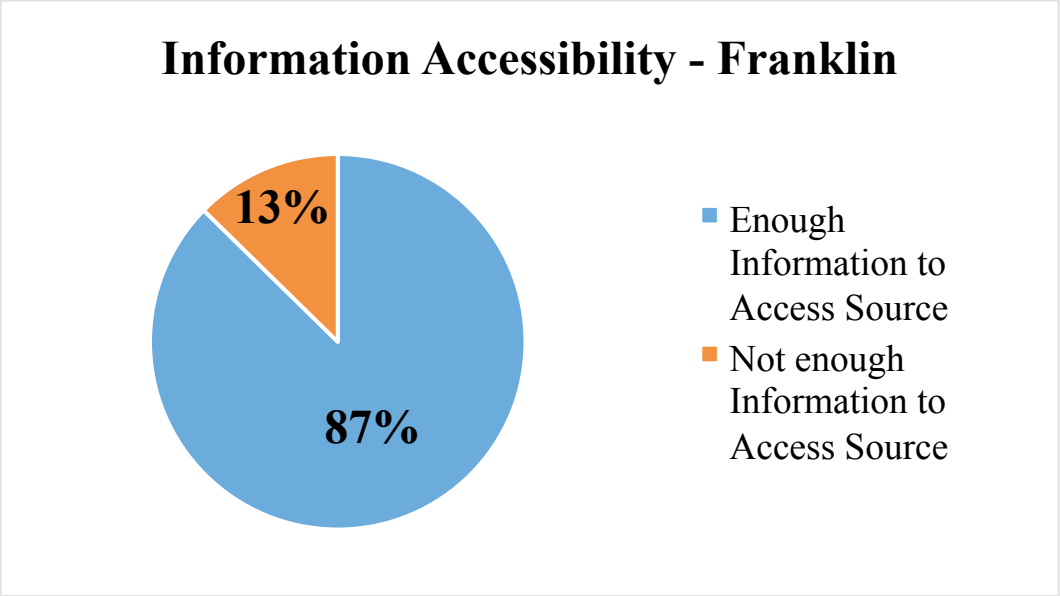


Figure 14: Information accessibility based on citations from Franklin seminar

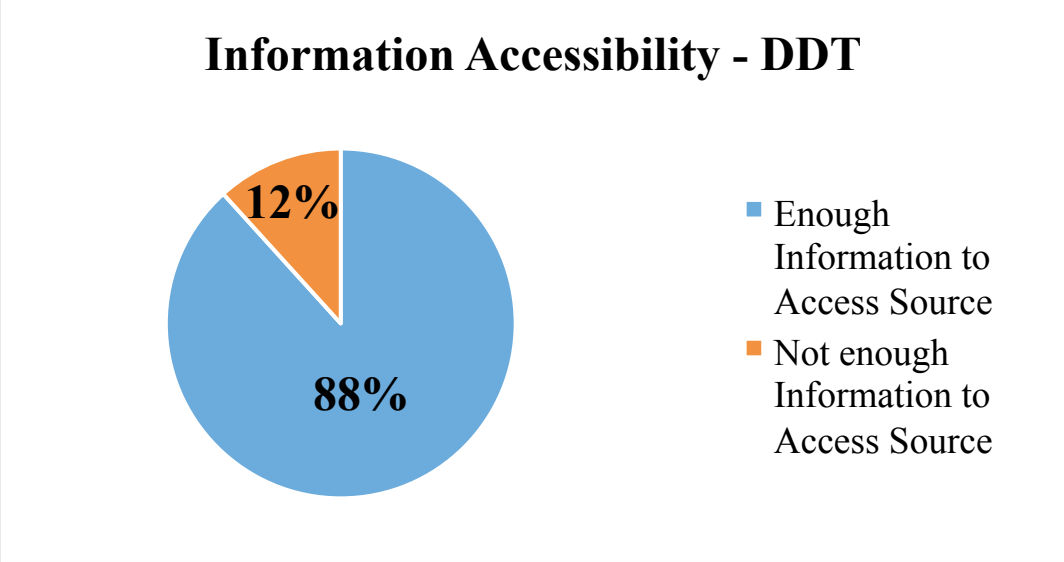


Figure 15: Information accessibility based on citations from DDT seminar

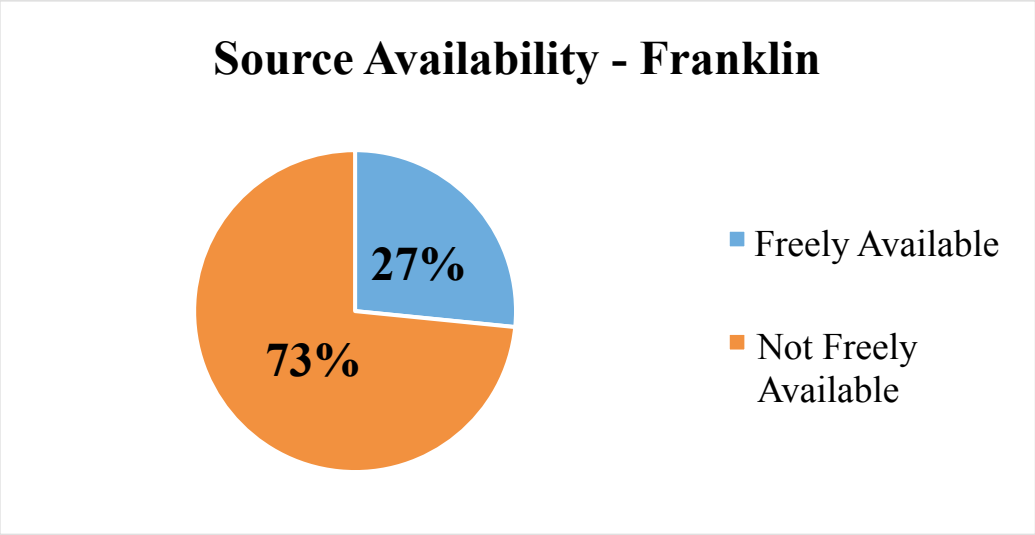


Figure 16: Availability of Franklin seminar citation sources

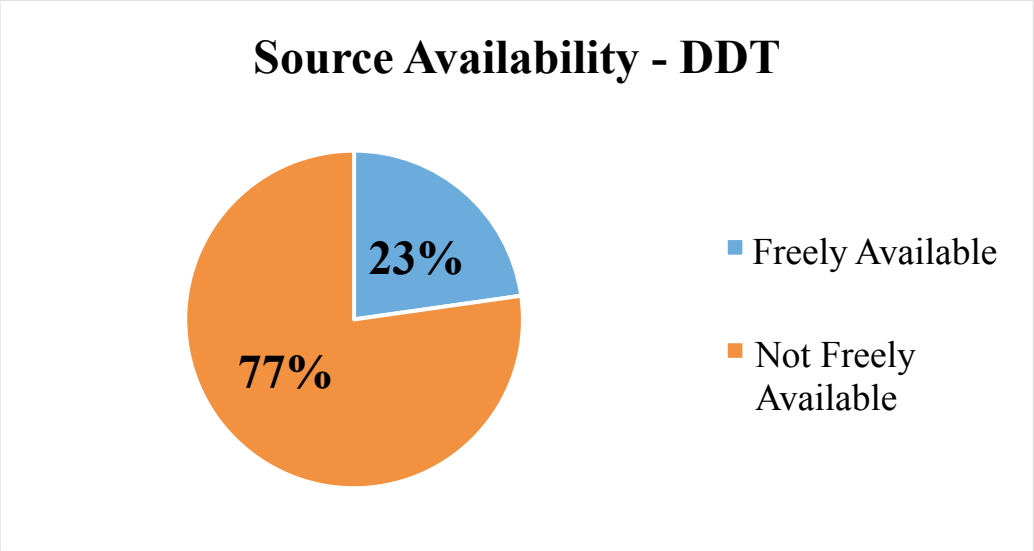


Figure 17: Availability of DDT seminar citation sources

Each of these charts is based off an average number of citations; the DDT seminar had an average number of 12.08 citations per bibliography while the Franklin seminar had an average number of 8.78 citations per bibliography.

We compared the composition of citation sources between the groups to see if there was a significant difference between the various source types that each collection of citations contains. These source types are primary sources, peer reviewed sources, commercial websites, book sources, journal articles, and other. The results of this analysis can be seen in Figure 11. The percentages this graph displays are the percentages of the total number of citations whose source falls under at least one of the categories. Since a number of sources do not cleanly fall into one category, certain sources are counted multiple times. As such, the percentages for each seminar do not sum to 100% of citations.

We analyzed each citation for proper Chicago formatting, the accessibility of each source based on the citation information, and whether or not a paid subscription, fee, or purchase is required to access the source. As show by Figures 16 and 17, the average percentage of citations with proper Chicago formatting is 46% for the Franklin seminar and 81% for the DDT seminar. This is a very significant difference between the two seminars. Comparing these values to the confidences reported in the self-evaluation rubric, we see that the Franklin seminar reports a much higher confidence in their ability to properly cite sources compared to the percentage of properly cited sources in their bibliographies. The DDT seminar, which reported a slightly smaller rating for the same confidence, cited a much higher percentage of sources correctly.

The percentages associated with each source's accessibility resulted in very similar values between the two seminars. Among the Franklin seminar, 87% of citations yielded sources when searched for by the information contained in each citation. Likewise, 88% of citations in the DDT seminar also yielded sources.

Yielding slightly less identical results, our analysis shows a high percentage of sources cited by both seminars are sources that required a paid subscription or purchase for access. 27% of sources used by the Franklin seminar were freely available, while 23% of sources used by the DDT seminar were freely available.

Based on our analysis we conclude that the DDT seminar used a higher variety of source types in their bibliographies as well as a greater percentage of correctly cited sources. We attribute this in part to the library session held at the beginning of the study due to the variety and sophistication of sources found in databases featured and mentioned during the library session compared with those from the Franklin seminar.

While these points are not directly relevant to our study's goal, we believe it is important to note that the information accessibility and source availability percentages are very similar between the two seminars. The vast majority of sources necessary to complete a research project like the HU3900 seminars are available by paid services with which WPI subscribes. We believe this is an interesting topic for further investigation by a future team.

4.5.1 Possible Result Limitations

The composition of citation source analysis does not account for the nature of each seminar and the differences in relevant and useful source material: the Franklin seminar focuses on the science and works of Benjamin Franklin while the DDT seminar focuses on Rachel Carson's Silent Spring and the political and cultural impacts that it made. The themes of these seminars dictate the type of sources that are relevant to itself, but no necessarily each other. Therefore, the results of this analysis cannot be directly attributed to the addition or lack of the library session.

Further, we believe there were limitations in our definition of citation source types. We aimed to tabulate what types of sources the seminar students used in their final bibliographies. In constructing our evaluation tool we used idiosyncratic definitions for the types of sources that we were examining in some cases instead of the accepted nomenclature used for various types of sources. As a result, we believe that these results may not be reproduced if analyzed by another team using the same exact tool. We believe this could be remedied with a redesign and reapplication of this tool, but due to time limitations this is not a feasible task for our team.

Chapter 5: Conclusions

Based on our mixed methods research, we were able to gather useful data to assess information literacy of HU3900 students. Through our three methodological components - ethnography, collection of survey data, and bibliography assessment-we concluded the following:

- Student self-reported confidence levels were higher than what was evidenced from an analysis of their works cited. Their perceptions regarding their own research skills are not consistent with their actual level of work produced for their final research papers.
- Students in the DDT seminar who worked with librarian Lynne Riley during the library research session used a broader set of research tools and more types of sources. A greater diversity in the range of sources and databases accessed were observed in this group. Library sessions may have an immediate and positive impact on the way students carry out searches.
- Even though students began with similar levels of exposure to information literacy training, they took very different routes to finding sources during the research sessions in Anderson Labs depending on whether or not they had instruction in this class. This supports the idea that there needs to be persistent information literacy education across the HUA experience and WPI curriculum due to the challenging nature of transferring research skills across disciplines. For example, even if students did great research in GPS or IQP, they will need new techniques for being most effective in finding sources in the humanities

disciplines. Information literacy concepts need to be consistently reinforced for students to perform well.

- The vast majority of sources students needed for their humanities projects were not freely available and required a subscription to access.
- Students who participated Lynne Riley's research session had significantly better rates of citing sources accurately.

Chapter 6: Future Recommendations

The mixed method research technique has provided helpful insight into the research habits of HU3900 students. After in-depth analysis of the results obtained, our team came up with a set of recommendations for both the humanities faculty as well as the Gordon C. Library and future projects.

6.1 Recommendations for HU3900 Faculty

Overall, information literacy needs to be focused at the center of any inquiry seminar syllabus. Our results have shown benefits of adding library sessions into HU3900 coursework. Library instruction should be built into the course syllabi so information literacy concepts are consistently reinforced to students. Information literacy objectives should be explicitly defined in the student outcomes section of HU3900 syllabi. We hope our results have provided evidence for faculty to see the value of library instruction throughout the course of their seminar.

6.2 Recommendations for Gordon C. Library

Gordon C. Library should continue to encourage HU3900 faculty to promote information literacy skills. This involves asking faculty to utilize the programs they have in place to improve information literacy among students in HUA seminars. It would be helpful to interview faculty about whether or not they use library instruction in their seminars and why. The Gordon Library should also continue to assess the range of current practices among faculty for incorporation of information literacy concepts into seminars.

6.3 Recommendations for Future Projects

Future projects are encouraged to utilize our mixed method technique because of the strength of the results gathered. Our methodology can be applied to assessment of HU3900 courses in varying disciplines such as English Literature and philosophy.

For future ethnographic studies, project teams should focus on eliminating the bias associated with the research history evaluation. There is major bias in using the Summon database because the students are involved in a library session and are instructed to start their searching at that point. Future iterations of our project should design methodology that gets the students to start searching where they naturally would on their own. Students also should further interpret our data against data collected in future projects if given the opportunity. Due to time constraints, we were unable to do cross analysis of the research methods by student. Our goal was to evaluate our results based on the differences seen between seminars. Other projects could focus on the progress of individuals by analyzing the three different methodologies simultaneously. It also may be of interest to distribute a post-self-evaluation rubric as well. That way, projects could compare the differences in student confidence level as the term progressed.

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Appendices

Appendix A: IRB Approval

WORCESTER POLYTECHNIC INSTITUTE

Worcester Polytechnic Institute IRB# 1
HHS IRB # 00007374

21 January 2015
File: 15-005

Re: IRB Expedited Review Approval: File 15-005 "Assessing and Improving the Information Literacy Skills of WPI Humanities and Arts Inquiry Seminars"

Dear Prof. Cullen,

The WPI Institutional Review Committee (IRB) approves the above-referenced research activity, having conducted an expedited review according to the Code of Federal Regulations 45 (CFR46).

Consistent with 45 CFR 46.116 regarding the general requirements for informed consent, we remind you to only use the **attached stamped approved consent form**. You are also required to store the signed consent forms in a secure location and retain them for a period of at least three years following the conclusion of your study. You may also convert the completed consent forms into electronic documents (.pdf format) and forward them to the IRB Secretary for electronic storage.

The period covered by this approval is 21 January 2015 until 20 January 2016, unless terminated sooner (in writing) by yourself or the WPI IRB. Amendments or changes to the research that might alter this specific approval must be submitted to the WPI IRB for review and may require a full IRB application in order for the research to continue.

Please contact the undersigned if you have any questions about the terms of this approval.

Sincerely,

Kent Rissmiller
WPI IRB Chair

100 INSTITUTE ROAD, WORCESTER MA 01609 USA

Appendix B: Participant Consent Form

Informed Consent Agreement for Participation in a Research Study

Investigators: Meghan Lutz, Lindsey Gallagher, Anthony Ward

Contact Information: Email: mllutz@wpi.edu
ltgallagher@wpi.edu
ajward@wpi.edu

Title of Research Study: Assessing and Improving the Information Literacy Skills of WPI Students Fulfilling their Humanities and Arts Requirement

Sponsor: Gordon Library

Introduction:
You are being asked to participate in a research study. Before you agree, however, you must be fully informed about the purpose of the study, the procedures to be followed, and any benefits, risks or discomfort that you may experience as a result of your participation. This form presents information about the study so that you may make a fully informed decision regarding your participation.

Purpose of the study:
In this experiment, we will investigate the research habits and practices of students currently enrolled in a Humanities and Arts inquiry seminar (HU3900). The results of this experiment will help identify common practices and such students and improve information literacy education in the HU3900 seminars.

Procedures to be followed:
You will log in to a computer and clear your Firefox browser internet history. You will be given a pre-observation questionnaire and an evaluation rubric to complete prior to the start of the observation period. You will then be given fifteen minutes to research the topic pertaining to your inquiry seminar theme using whichever methods you are most comfortable with. You will record citations for sources you deem reliable and credible for your topic. After the research period we will record the citations you gather as well as your internet history.

Risks to study participants:
There are no foreseen risks in participating in this study.

Benefits to research participants and others:
There is a possibility you may find sources that will benefit you in writing you final paper.

Record keeping and confidentiality:
Records of your participation in this study will be held confidential so far as permitted by law. However, the study investigators, the sponsor or it's designee and, under certain circumstances, the Worcester Polytechnic Institute Institutional Review Board (WPI IRB) will be able to inspect and have access to confidential data that identify you by name. Any publication or presentation of the data will not identify you.

Compensation or treatment in the event of injury:
In the unlikely event of physical injury resulting from participation in the research, you understand that medical treatment may be available from WPI, including first aid emergency care, and that your insurance carrier may be billed for the cost of such treatment. No compensation for medical care can be provided by WPI. You further understand that making such medical care available, or providing it, does not imply that such injury is the fault of the investigators. You do not give up any of your legal rights by signing this statement.

Cost/Payment:
You will not receive any form of payment or compensation.

For more information about this research or about the rights of research participants, or in case of research-related injury, contact:
Prof. Joseph Cullon, HUA Department, WPI, 100 Institute Road, Worcester, MA (Tel. 508-831-5919). You may also contact the chair of the WPI Institutional Review Board (Prof. Kent Rissmiller, Tel. 508-831-5019, Email: kjr@wpi.edu) or WPI's University Compliance Officer (Michael J. Curley, Tel. 508-831-6919).

Your participation in this research is voluntary. Your refusal to participate will not result in any penalty to you or any loss of benefits to which you may otherwise be entitled. You may decide to stop participating in the research at any time without penalty or loss of other benefits. The project investigators retain the right to cancel or postpone the experimental procedures at any time they see fit. Data obtained in this experiment will become the property of the investigators and WPI. If you withdraw from the study, data already collected from you will remain in the study.

By signing below, you acknowledge that you have been informed about and consent to be a participant in the study described above. Make sure that your questions are answered to your satisfaction before signing. You are entitled to retain a copy of this consent agreement.

_____ Date: _____
Study Participant Signature

_____
Study Participant Name (Please print)

_____ Date: _____
Signature of Person who explained this study

Appendix C: Pre-Observation Questionnaire

What is your major?	
What year are you?	
Do you live on or off campus?	
Do you have any prior research experience?	
Did you take a Great Problems Seminar your freshman year?	
Have you completed your IQP yet?	
Have you completed your MQP yet?	
Have you ever met one-on-one with research librarians for previous course research?	
Have you ever participated in a group research session as part of a class?	

Appendix D: History Evaluation Checklist

Databases (list order)

- Summon
- Google Scholar
- General Search Engine
- Specialized (Major/Field Specific i.e. Pub Med)
- Other _____

Filters

- Key word
- Published Year/Date
- Full text
- Author
- Subject/Field
- Source Title (Journal name, etc.)
- Source Type (Newspaper, journal, book, etc.)
- Peer Reviewed/Scholarly

Appendix E: Self-Evaluation Rubric

How efficient do you think you when performing library/bibliographic and information research?	Not efficient Very efficient 1 2 3 4 5
How many times have you reached out to librarians for research help?	1 2 3 4 5 +
What type of sources do you use most? (Circle all that apply)	Website Book references Online journal Paper journal Online encyclopedia Article Textbook Other:_____
How many classes have you had library instruction in?	0 1 2 3 4 5 +
If more than 0, how helpful did you find it?	Not helpful Very Helpful 1 2 3 4 5

Appendix F: Process Survey

Through your research,

How apparent was it that… Multiple sources addressed different viewpoints of your topic? There are gaps in research literature about your topic? There were many different experts on your topic?	**Not apparent Very apparent** **1 2 3 4 5** **1 2 3 4 5** **1 2 3 4 5**
How difficult was it to… Guide your research pertaining to your topic? Use sources to find other useful resources?	**Not Difficult Very Difficul**t **1 2 3 4 5** **1 2 3 4 5**
How confident did you feel in your ability to … Properly cite the sources you found? Distinguish between credible and non-credible authors?	**Not Confident Very Confident** **1 2 3 4 5** **1 2 3 4 5**

What was the most valuable lesson you learned over this term respecting library research and information literacy?

What would you like to learn more about with respect to library research and information literacy in the humanities and arts?

Just for DDT: Please provide any additional feedback you may have about the library session you attended at the beginning of the term.

Appendix G: Final Bibliography Assessment

Quantified Information:

# of Primary Sources	
# of Peer Reviewed Sources	
# of Commercial Websites	
# of Book Sources	
# of Newspaper Articles	
Other (Please List)	

Citation Accuracy:

Did they use proper Chicago format?	
Is there enough information to access the source?	
Is the source freely available or require a subscription?	