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Assessing the Impacts of the London Project Center

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Abstract

The London Project Center was established in 1987 as WPI's first international site for students to complete the Interactive Qualifying Project. The center's history is largely unrecorded and lacks centralized formal documentation regarding its development and impacts on its stakeholders. Our team, through this project, assessed the impacts of the project center on its alumni and sponsoring organizations using an alumni survey and interviews with faculty and sponsors. We also documented an account of the center's origin and 30-year history.

Acknowledgements

Executive Summary

The London Project Center was WPI's first abroad location for students to complete their Interactive Qualifying Project (IQP) after the project system at the institution was established through the WPI Plan in 1970. The center was formally established in 1987, and will be celebrating its 30th anniversary in 2017. Over the past 30 years, the London Project Center has grown and changed, but there has been little centralized formal record of its development. Despite its vast outreach to sponsoring organizations and large number of completed projects, there are uncertainties regarding the center's origins and its evolution, as well as no way to ascertain for certain the impact the project center has had on its alumni and sponsors. We hoped to fill the knowledge gaps regarding the history and evolution of the London Project Center. Our goal through this project was to gain an understanding of the history and impact of the London Project Center (LPC) over the past 30 years. In order to achieve this goal, we developed the following three research objectives:

1. Achieve a comprehensive understanding of the effects the LPC has had on its alumni throughout their personal and professional lives.

2. Understand how student projects have affected sponsoring government organizations and nonprofits of London.

3. Compile a complete history of the London Project Center from its beginnings to current day and document how and why various aspects have changed over the years.

Background

As a result of the diversification of program audiences by US colleges and universities, enrollment in study abroad programs has increased substantially, with approximately three times as many students going abroad today as 20 years ago (Vande Berg, 2007). In cases where study abroad programs have shown repeated success, faculty and staff have acknowledged success is due to the students' ability to learn in ways that would not be possible on their own college campuses (Vande Berg, 2007). Until recently, there were large gaps in study abroad opportunities for students pursuing degrees in science, technology, engineering, and mathematics (STEM) fields due to strict curriculum and time constraints, as well as a lack of willingness from foreign

universities to go through the process of obtaining ABET accreditation (Fees, 2015). Programs that include the opportunity for studying abroad have needed to become flexible in order to accommodate participants in STEM majors (Oguntoyinbo, 2015). Many technical institutions, such as Worcester Polytechnic Institute, have even created models that integrate not only studying, but also hands-on project work into their students' experiences abroad, allowing students to gain real-world experience and hone their professional skills.

The WPI Plan is an integral part of the curriculum since its establishment in 1970. The foundation of the Plan was to combine project-based problem solving with theoretical practice, which included the implementation of the Interactive Qualifying Project (IQP) and Major Qualifying Project (MQP) (Launching the WPI Plan, n.d.). The IQP and the MQP were the two most innovative components of the Plan, and also the two most challenging to develop. The WPI Plan was derived from extensive research on education models at other universities, including Cambridge and Oxford in England, Ecole Polytechnique in France, and ETH in Zurich. WPI began its first abroad exchange program through the Plan in London, England in 1974 (Launching the WPI Plan, n.d.). This was the beginning of WPI's Global Project's Program, with William Grogan, Dean of Undergraduate Studies at the time, working to establish first project centers where today's students travel to complete their IQPs. At the time of the Plan's implementation, it was said to be 25 years ahead of its time. With the development of global awareness, and cross-cultural competency in engineering programs becoming more and more prevalent, WPI has worked to expand its opportunities for its students with over 40 unique project centers around the world (Project Centers, n.d).

Project-based learning focuses on the process of overcoming obstacles and applying knowledge in order to complete a task (Mills, 2003, p.8). Over the last several decades, many technical institutions, especially WPI, have placed a greater emphasis on application of theoretical principles, research, and teamwork skills in a project setting, promoting this idea of project-based learning (Mills, 2003, p.9). Graduates of universities that follow a project-based approach have shown stronger teamwork and communication skills (Mills, 2003, p.12). Additionally, with an increasing demand for innovative engineers to work in ever-changing technological fields, traditional "chalk and talk" education styles are unlikely to produce graduates with the skills to perform optimally in today's industry (Mills, 2003, p.13). Problem-based learning as a separate concept focuses on final results and solving an existing issue using a student-defined and student-

run approach. In this way, the IQP can be seen as a melding of problem-based and project-based learning, combining the student defined goal and proposal with the need to implement a solution in a methodical and comprehensive fashion. The WPI international IQP is a unique opportunity that stresses the teamwork and communication skills required to succeed in the professional world.

Methodology

WPI students who completed an IQP at the London Project Center are important sources of information in understanding the lasting impact that the project center has had. We needed to evaluate the experiences of project center alumni in order to determine how completing an IQP in London has affected their life personally and professionally. To accomplish this, we created an online survey, which served as a primary source of data collection for alumni experience. The survey consisted of closed ended items (CEIs) where respondents would select from scalar responses, as well as open-ended questions to allow for elaboration. Each question asked the alumni to rate one aspect of how their London IQP may have had an effect on their personal life, academic and professional careers, or their project's sponsoring organization. We also distributed a second online form to alumni that noted they would be available for future follow-up for the purpose of learning more about individual experiences and generating alumni testimonials.

Understanding how sponsoring organizations in London have been affected by the work of the LPC is critical to understanding the center's overall impact. We created a plan to conduct interviews with key people from London organizations that have sponsored one or more student projects through the London Project Center. A list of potential interviewees was compiled by searching through past projects for recent and repeat sponsors, as well as from the advice of Director Dominic Golding. As we performed interviews, more contacts were suggested to us by sponsor project liaisons. The interview protocol was designed to encourage sponsors to reflect upon their experiences working with WPI student teams and share how they feel the students' projects have had a significant impact, as well as any suggestions they have for improvement. Of the 15 sponsors we contacted, we were able to conduct 13 interviews either in-person or via telephone or internet calls.

In order to investigate the London Project Center and document how various aspects have changed over the past 30 years, we collected key historical information on the formation of the

center from those involved in its establishment. This was done through both interviews with WPI faculty who have had involvement with the project center, as well as searching through project records. We worked to compile any temporal data regarding the center into an ordered and logical account based on information gathered from faculty involved in the center, especially those who were part of its establishment. We also organized information gathered from contact with alumni of the center and past sponsors of the center in order to analyze changing demographics of projects and sponsors over the course of the cent9ber's existence.

Results and Recommendations

The results of our alumni survey provided us with an overwhelmingly positive response. From 733 valid emails we received 395 responses, for a response rate of 54%. Many alumni cited their IQP experience as being one of the most beneficial experiences of their academic career, supporting development of valuable professional skills that they carried into their professional lives and future endeavors. In our 13 interviews with project liaisons from sponsoring organizations, many reported the students exceeded expectations, and provided organizations with unique perspectives and solutions.

We created multiple deliverables with the use of our findings. The first was a digital timeline that displays the development of the project center and the various projects completed throughout the past 30 years. We also created a brochure about the scope of the London Project Center to be distributed at WPI's Global Fair, an event where students can learn more about each abroad project center. From the Qualtrics form distributed to alumni for follow up, we gathered information to be used for alumni testimonials. We prepared these materials in such a way that the are suitable for integration into the WPI London Project Center website to help prospective IQP students understand the value of completing projects through the LPC by learning the center's history and impacts on others.

Through the analysis and understanding of the data collected, we were able to draw the following three main conclusions regarding the impact of the London Project Center. First, students who complete projects through the London Project Center gain a greater understanding of other cultures, and become more comfortable traveling to new places. Second, the London Project Center IQP program fosters student growth, making for success in professional

environments. Third, students bring new ideas and innovative points of view to sponsoring organizations working to solve complex problems.

Taking into account the data collected through the alumni survey and sponsor interviews as well as these conclusions, we devised three main recommendations for our sponsor to increase the success of IQPs hosted through the London Project Center. First, we suggested informing the sponsors more accurately regarding the structure of the preparation term as making this information apparent to the sponsoring organizations early on in the process of setting up projects will make the transition between the preparation term and completion of IQP smoother. Additionally, if sponsors are allowed more contact with the advisors and ID 2050 professor during this period, the project can run more efficiently as all parties involved in guiding the project to completion can become aware of common expectations and determine a realistic timeline. Second, we recommended that the London Project Center work to host a small-scale reception each term for the sponsoring organizations. This opportunity for sponsors to network and share their experiences could increase their willingness to continue hosting projects with WPI, or could help open doors to working with additional organizations. Third, we proposed that the project center establish a follow-up protocol with the sponsoring organizations in London. This would help to combat alumni uncertainty regarding the impacts their projects have had on sponsors and the greater community beyond their 7 weeks in London, and would also help the center keep more centralized documentation of all the projects completed.

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1. Introduction

The London Project Center (LPC) has been an integral part of WPI's global Interactive Qualifying Project (IQP) program since its formal establishment in London 30 years ago. The WPI Plan mandates that all undergraduate students complete the IQP to provide a project-based learning experience to solve a social science issue, often working in groups with a local government or non-profit organization. During the initial integration of the WPI Plan, most students completed their IQP on campus, but gradually, organizations elsewhere became interested in sponsoring projects. This allowed students the opportunity to examine and address a real-world issue in an off-campus location, providing a very unique experience. The London Project Center was established as the first international site for WPI students to complete their IQPs in collaboration with local sponsoring organizations. The formal establishment of the center was in 1987, although students had been completing projects in London since as early as 1974 through a previously established exchange program. Over the course of that time, projects have been overseen by many different advisors, site directors and organized by different local coordinators, each contributing to the workings of the center and the organizations with which it has built rapport.

Since the LPC's beginnings, there has been little central formal documentation of the history of the center and of the impacts the center has had on its students and sponsoring organizations. Several directors have kept their own personal notes and organizations may have kept records of student projects, but WPI does not have any formalized documentation of the center's history or any record of follow up with those whom they have worked with in London.. The WPI Plan, established in 1970 to update traditional engineering education methods, had an emphasis on project-based learning and interdisciplinary studies. Therefore, as the first center to offer international opportunities, the LPC's history is closely connected to the formative years of the Plan, and WPI's Interdisciplinary and Global Studies Division. Understanding the LPC's history is invaluable to understanding how the WPI global program began and grew to what it is today, with over 46 off campus project sites.

There have been efforts in the past to document and improve the organization of the LPC, including the creation of a database containing a list of completed projects. However, the

database lacked information on the most recent projects and showed inaccurate or inconsistent entries, leading to greater uncertainty.

Our team, through this project, filled in the gaps of the project center's history in order to better understand how and why the project center operates the way it does today. To gather information, we interviewed past faculty advisors, LPC directors, and participating sponsors to collect information on the project center's history and perceived impact. We also surveyed LPC student alumni to collect data on their personal experiences, their opinions of the project center, and whether this experience had a perceivable impact on their future endeavors. We scheduled additional communication with alumni that showed interest in order to explore their experiences further. A collective analysis of this data was performed and the results were used to create materials for educating prospective IQP applicants about the LPC.

2. Background and Literature Review

2.0 Introduction

The WPI Plan mandates that all undergraduate students complete the IQP, a unique and innovative program that focuses on taking students out of the classroom to solve a social science problem in a long-term, team-based project. Off campus project centers, especially those which operate internationally, give students the opportunity to perform their IQPs addressing unique problems worldwide while immersed in new environments and cultures. Undertaking a significant project in an unfamiliar environment can enhance the experience by cultivating unique communication, problem solving, and critical thinking skills. In order to understand the impacts of the London Project Center, it is important to understand the nature and benefits of the IQP program as well as the prevalence and benefits of travelling abroad. In addition, in order to understand the history of the center, one must understand the development of the WPI Plan, which is tied closely to WPI's involvement in London and the beginnings of the global IQP program. This project aims to address a lack of centralized, formal documentation of the WPI London Project Center's history and to assess effects on those involved in the center since it originated 30 years ago. The lack of documentation resulted in uncertainties pertaining to the project center's impacts on participating students, impacts on project sponsors, and origins of the London Project Center. This section explores the history of the WPI Plan, with specific focus given to the IQP program, while providing insight into the significance of travel and study abroad opportunities in the STEM field that the LPC offers.

2.1 Study Abroad Programs and their Link to STEM Education

As companies have evolved a desire for graduates who display a deeper level of "intercultural competency," educational institutions have adapted to meet these demands (Twombly, Salisbury, Tumanut, & Klute, 2012, p. vii). In recent years, universities have increased opportunities for students to study abroad and experience other academic travel programs. While semesters abroad were once considered only for students of affluent background or those studying liberal arts, US colleges and universities have worked to make

studying abroad more accessible to students of all majors and backgrounds (Brewer & Cunningham, 2010). As a result of this diversification of program audiences, enrollment in study abroad programs has increased substantially, with approximately three times as many students going abroad today as did 20 years ago (Vande Berg, 2007). As universities increase the range of locations available to students interested in a global experience, these enrollment statistics have increased rapidly. Study abroad programs continue to evolve in response to changing student demographics, but program effectiveness has been found to correlate with individual student experience, as well as what students take away from this learning opportunity.

       In cases where study abroad programs have reported failure, it has often been found this failure is due in part to problems students have in adjusting to new experiences. For instance, students reporting failure may not have taken controlled risks, refusing to open themselves up to the wide variety of educational and cultural opportunities in which they might engage during their time abroad (Brewer & Cunningham, 2010). Students might also take the view that study abroad programs are a break from their learning experiences, a semester off in which they will still receive credit. It is in these instances where students report little value from the experience. In cases where study abroad programs have shown repeated success, faculty and staff have acknowledged success is due to the students' ability to learn in ways that would not be possible on their own college campuses (Vande Berg, 2007). Students are immersed in new environments and cultures that most often present challenges to their typical learning experiences.   Those studying abroad who put in the effort to adjust to these new environments have found that real-world experience not only enhances what they have learned, but also helps them absorb the material more completely (Brewer & Cunningham, 2010).

       Although study abroad programs have become more accessible to students over time, as seen in Figure 1, until recently there were still large gaps in the accessibility of completing time off-campus for students studying within the STEM fields (Bidwell, 2014).
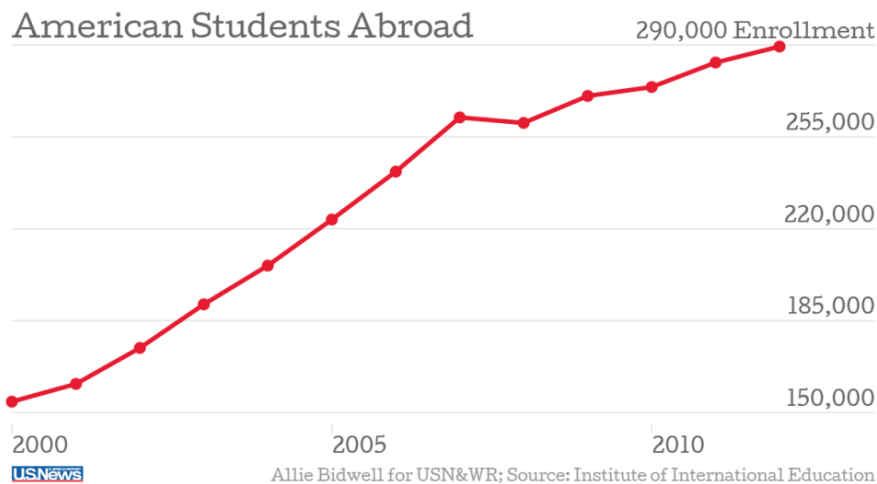
Figure 1. Students Pursuing Study Abroad from the Institute of International Education in 2014

The strict course of study for those pursuing science, technology, engineering, or mathematics degrees seemingly leaves no time for the pursuit of global education experiences, even for elective credit. Additionally, STEM faculty members feel as though they lack the necessary experience to help students in their fields complete successful, meaningful terms abroad (Vaz & Demetry, 2010). Many international universities are skeptical of jumping through the extra hoops and paying the extra fees for certification through the Accreditation Board for Engineering Technology, which poses a further hardship for engineering students to acquire credit for completed courses (Fees, 2015). Companies looking to hire STEM graduates often seek candidates who are knowledgeable in international policies as well as problem-solving skills. This employer-interest in global experience has helped drive the expansion of study abroad opportunities for STEM students. Programs that include the opportunity for studying abroad have become flexible in order to accommodate participants in STEM majors who have more rigid schedules (Oguntoyinbo, 2015). Many technical institutions, such as Worcester Polytechnic Institute, have even created models that integrate not only studying, but also hands-on project work into their students' experiences abroad. This allows students to get project-oriented, real-world experience by working to solve a problem for an organization or agency in the country in which they will be living (Demetry & Vaz, 2002). Project-based study abroad programs, like those in place at WPI, have proven an asset to STEM majors as they pursue internships during undergraduate study and careers beyond graduation. As the number of students pursuing degrees

in the STEM fields continues to increase, other institutions may adopt the model for project-oriented study abroad utilized at WPI, or create their own unique study-abroad models.

Current research into study abroad programs and their link to STEM education shows how STEM majors now serve as the driving force behind the growth in popularity of study abroad experiences for American students. According to a study completed by US News in 2014 and displayed in Figure 2, undergraduate students pursuing degrees in the STEM fields account for 23% of all students studying abroad; this has shown steady increase since the 2000's (Bidwell, 2014). In contrast, as Figure 3 demonstrates, students pursuing degrees in liberal arts now only account for 16% of all students studying abroad (Bidwell, 2014).
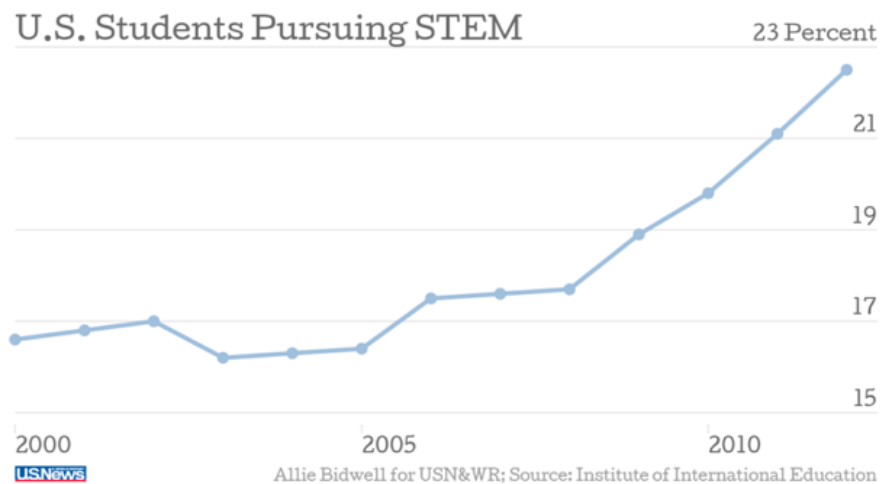
Figure 2. Graph of US STEM Students Pursuing Study Abroad from the Institute of International Education in 2014
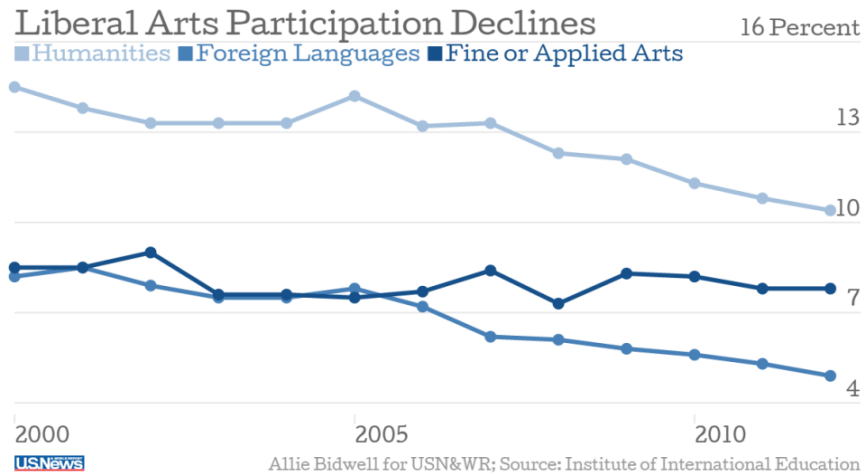
Figure 3. Graph of Decline in US Liberal Arts Students Pursuing Study Abroad from the Institute of International Education in 2014

Despite this recent trend, STEM students are still underrepresented in study abroad programs, as they compose only 36% of all undergraduates (Witherell, 2015). However, the growing momentum in STEM student enrollment indicates that study abroad programs are becoming more accessible and desirable to students concentrating in the STEM fields. Additionally, the integration of project-based learning into study abroad programs has continued to compel STEM majors to enroll.

2.2 The Creation of the WPI Plan

The WPI Plan is an integral part of the WPI curriculum, however it has not always been present. The Plan had modest beginnings, starting in the late 1950's when faculty members began revitalizing teaching at WPI. President Harry Storke developed a 10-year plan in 1963, which he hoped would transform WPI's rigid curriculum into something that would give students the education necessary for success in tomorrow's world. After only 5 years, in the spring of 1968, Storke decided to appoint a faculty planning committee to prepare "a comprehensive proposal of feasible educational directions the Institute should take" (The WPI Plan - 2009-2010, 2011). On May 29, 1970 after two years of weekly meetings, research, discussion, four major reports, and endless hours of debate Storke's team of faculty brought their proposal for a final vote (The WPI Plan - 2009-2010, 2011).

A key player in developing and implementing the WPI Plan was William Grogan, who served as Dean of Undergraduate Studies from 1970-1990 (In Memorandum, 2015). Grogan was part of the faculty team that developed the proposal, and gave continued contributions throughout the implementation and future success of the Plan. The foundation of the Plan was to combine project-based problem solving with theoretical practice, which included the implementation of the Interactive Qualifying Project (IQP) and Master Qualifying Project (MQP) (Launching the WPI Plan, n.d.). The IQP and the MQP were the two most innovative components of the Plan, and also the two most challenging to develop. The WPI Plan was derived from extensive research on education models at other universities, including Cambridge and Oxford in England, Ecole Polytechnique in France, and ETH in Zurich. Grogan is quoted as having stated, "WPI went from being one of the most traditional to one of the most avant garde science and engineering universities in the country" (Launching the WPI Plan, n.d.). In addition to the IQP and MQP, the Plan also required a Humanities Sufficiency to properly produce well-rounded engineering students (Launching the WPI Plan, n.d.).

William Grogan, as Dean of Undergraduate Studies, continued his work to unite WPI faculty in support of the Plan. Students and alumni alike were generally in favor of the Plan, admiring WPI for being one of the first schools to step forward with an emphasis on project-based learning. The faculty who opposed the Plan mainly were against it because it put the power of determining curriculum in the hands of committees (Launching the WPI Plan, n.d.). WPI began its first abroad exchange program through the Plan in London, England in 1974 (Launching the WPI Plan, n.d.). This was the beginning of WPI's Global Project's Program, with Grogan himself working to establish some of the first Project Centers where today's students travel to complete their IQP's.

At the time of the Plan's implementation, it was said to be 25 years ahead of its time. Thirty-five years after its implementation Grogan is quoted as having said, "We at WPI have gained an enviable position through the structure of our educational program. Our challenge now lies in developing the resources and collective self-confidence to again move ahead with a new vision for the future" (Grogan, n.d.).

Richard Vaz has been a leader in project-based learning since the beginning of his career. In 2011, he helped update the Plan by developing the university's learning outcomes, which are as follows:

1. have a base of knowledge in mathematics, science, and humanistic studies;

2. have mastered fundamental concepts and methods in their principal areas of study;

3. understand and employ current technological tools;

4. be effective in oral, written, and visual communication;

5. function effectively both individually and on teams;

6. be able to identify, analyze, and solve problems creatively through sustained critical investigation;

7. be able to make connections between disciplines and to integrate information from multiple sources;

8. be aware of how their decisions affect and are affected by other individuals separated by time, space, and culture;

9. be aware of personal, societal, and professional ethical standards; and

10. have the skills, diligence, and commitment to excellence needed to engage in lifelong learning (Vaz, 2012).

With the development of global awareness, and cross-cultural competency in engineering programs becoming more and more prevalent, WPI needed to expand its opportunities for its students. However, few international programs were available for a significant number of engineering students. Vaz stated "Factors facilitating scalability and sustainability of international engineering programs include progress toward graduation, engineering faculty involvement, and institutional commitment" (Vaz, 2008). Today, there are over 40 WPI project centers around the world that host project opportunities for students (Project Centers, n.d). The global IQP program has been invaluable to the WPI Plan and expanding academic opportunities.

2.3 Understanding the Unique Learning Opportunities Presented by the IQP

Project-based learning focuses on the process of overcoming obstacles and applying knowledge in order to complete a task (Mills, 2003, p.8). Quantifying the benefits of project based learning can be somewhat difficult. Although this learning method has the ability to enhance communication and teamwork, it comes at the cost of de-emphasizing traditional material. The curriculum offered at WPI specifically aims to establish a strong base in the fundamentals of a technical career. Today's professional environment is far different from that of 30 years ago. Greater access to information via the internet has de-emphasized knowledge as the

primary success factor in engineering. In this modern age where a plethora of information on even the most esoteric areas of study is readily available, understanding how to gather information has become much more important than having a large technical knowledge base.

In recent decades, many technical institutions, especially WPI, have placed a greater emphasis on application of theoretical principles, research, and teamwork skills in a project setting (Mills, 2003, p.9). Graduates of universities that follow a project-based approach have stronger teamwork and communication skills, while those with a more traditional lecture-based approach have more rigorous understanding of the fundamentals (Mills, 2003, p.12). Additionally, with an increasing demand for innovative engineers to work in ever-changing technological fields, traditional "chalk and talk" education styles are unlikely to produce graduates with the skills to perform optimally in today's industry (Mills, 2003, p.13).

Another concept, problem-based learning, focuses on identifying problems and proposing a solution. A problem-based approach is student defined and student run, challenging them to create their own parameters and methods. In this way, the IQP can be seen as a melding of the two concepts, problem-based and project-based learning, as it combines the student defined goal and proposal with the need to implement a solution in a methodical and comprehensive fashion. Problem-based learning began as a concept in the 1950-60s in response to the evolving medical field of the day. Critics of the medical educational system believed that traditional curriculums were not producing doctors who were able to adapt to the rapidly evolving field. (Yadav, 2011, p.255). As with project-based learning, benefits of problem-based learning are difficult to strictly quantify, but several small scale studies have been conducted. These results indicate that students in problem-based learning curriculums have comparable factual knowledge, yet demonstrate greater theoretical comprehension and report greater class satisfaction (Yadav, 2011, p.255). Meta-analysis of results from many studies have concluded that problem-based learning yields greater overall long term retention as well as student and teacher satisfaction, while traditional lecture formats increase gain in short term knowledge and increased scores on standardized exams (Strobel and van Barneveld, 2009, p.44).

The IQP also addresses the concerns of the interaction of "Science, Technology, and Society", or STS, another area of study which has seen a recent increase in popularity. The movement toward STS started in the 1960s and has aimed at teaching engineering and science students about the social impacts of their work. STS aims to inform students about their

professional responsibility to society and foster interest in social issues as well as how they relate to, and can be addressed by, technology (Schachterle & Watkins, 1992, p50). This same idea is central to the IQP, which is focused on combatting a societal problem from a unique angle in order to foster students' interest and aptitude for solving real-world problems.

According to the 1994 Engineering Professors Conference, the goal of engineering education is "to produce broad-based, flexible graduates who can think integratively, solve problems and be lifelong learners" (Matthew & Hughes, 1994, p. 234). This quotation is as pertinent today as ever, with fields constantly changing and evolving. Project-based and problem-based learning do not stress learning strictly factual information, but instead favor teaching how to acquire new skills and utilize them in novel environments. The WPI international IQP opportunity, while often not technical in nature, is a unique opportunity that stresses the teamwork and communication skills required to succeed in the professional world.

3. Methodology

Our goal through this project was to gain an understanding of the history and impact of the London Project Center (LPC) over the past 30 years. In order to achieve this goal, we developed the following three research objectives:

1. Achieve a comprehensive understanding of the effects the LPC has had on its alumni throughout their personal and professional lives.
2. Understand how student projects have affected sponsoring organizations in London.
3. Compile a complete history of the London Project Center from its beginnings to current day and document how and why various aspects have changed over the years.

In this chapter, we describe the methods we used in order to collect and analyze opinions and experiences from key individuals and organizations, and how the results of that analysis were used to develop a comprehensive timeline and understanding of the impact of the LPC. We also consider the ethical implications within our research and presentation of our results.

3.1 Achieving a comprehensive understanding of the effects the LPC has had on its alumni throughout their personal and professional lives.

WPI students who completed an IQP at the London Project Center were important sources of information in understanding the lasting impact that the project center has had. We needed to evaluate the experiences of project center alumni in order to determine how completing an IQP in London has affected their life personally and professionally. In order to collect data from a very large number of alumni, we planned to develop an intuitive method of distributing inquiry and receiving responses. To accomplish this, we decided to produce an online survey to collect information on the alumni's experience and assessment of the London Project Center.

The distributed survey (see Appendix A) served as a primary source of data collection for alumni experience. The survey contained questions asking alumni to evaluate different components of their IQP experience, as well as how they think that it has affected them. The primary questions were closed ended items (CEI's), which included a scale of responses for participants to choose from, such as "Very Significantly" to "Not at all", with incremental choices between the two. This allowed us to view the thoughts of the respondents numerically. We also

included a field for each CEI where alumni gave personalized open-ended responses to elaborate on their answers, if they chose to do so. By designing the survey in this format, we aimed to achieve a better response rate, as it gave the respondents a choice in the amount of time they decided to spend answering the series of questions. The goal was for our survey to take approximately 5-15 minutes for alumni to complete, depending on how detailed they chose to complete the open-ended responses. Our survey was created online in Qualtrics and distributed to alumni by email (See Appendix G). Qualtrics simplified survey creation, completion, and analysis of the responses, as all of the data was organized on the web platform. When we sent out an initial survey on May 11, 2016, Dominic Golding, Director of the London Project Center, included a message to explain the importance of alumni response in our project (See Appendix H).

One issue that could have occurred was a low number of survey responses from alumni, leaving us with an insufficient amount of data. In order to combat this issue, we included a raffle for a gift card as an incentive to encourage responses. We also sent several reminder emails over the course of the following week.   Before the mass distribution, we asked a small group of alumni to review our survey and provide feedback, to ensure the questions were straightforward. The survey response rate produced quantifiable data, and thus we were able to report the percentage of alumni who responded to the survey compared to those who did not.

In addition to creating and distributing an alumni survey, we reached out to several of the alumni that noted they would be available for follow-up through a second Qualtrics form. We drafted a separate set of questions regarding their personal experiences, gauging what they believe to be the value of IQPs abroad and why they would recommend the London Project Center to future applicants (See Appendix D). This allowed for deeper investigation into a collection of the responses that were received through the alumni survey, and created a pool of information from which we could create alumni testimonials.

3.2 Understanding how student projects have affected sponsoring organizations in London.

Through the IQP, WPI created a program that facilitates unique learning opportunities for its students while bringing positive changes to organizations all over the world. By encouraging outside parties to design and sponsor student projects, WPI ensures each organization involved will give students a unique opportunity to learn outside of a traditional academic environment, as

well as tailor the project to their own needs. Understanding how sponsoring organizations in London have been affected by the work of the LPC is critical to understanding the center's overall impact.

To complete this objective, we created a plan to conduct interviews with representatives from London organizations that have sponsored one or more student projects through the London Project Center. We first compiled a general list of people with whom we would like to speak, referencing records of recent and repeat sponsors, as well as advice from Director Dominic Golding. The list of interviewees was extended by taking note of sponsors listed in project reports, and any recommendations we received through interviews. We contacted the past sponsors using an email outline we created and filled in with each individual sponsor's information (See Appendix I). From the responses received, the meeting times for each interview were scheduled between the 23rd of May and the 10th of June.

Our first consideration in developing the interview questions was our target outcome from each interview: the London Project Center from the viewpoint of a sponsor. We decided to keep our interview questions more open-ended to give the interviewee the ability to freely share their experience. The goal of this semi-structured approach was to allow us to gain more information from each interview than we would have learned with specific, predefined questions.

The interview procedure consisted of arranging a period of roughly 30 minutes with a representative from each sponsoring organization, in which we discussed their experiences with the LPC (see appendix C). We determined that 30 minutes should be enough time to get all the information that we needed while not asking for too much of a person's time. We conducted most of the interviews in person at the sponsor's workplace or at a convenient location of their choice. We also conducted multiple interviews over the phone in cases where meeting in person was infeasible. Two members of our team attended each in person interview to ensure that conversations stayed on track and all relevant information was noted. All group members were present for phone interviews, but these were typically lead by only one member. We used a voice recorder with the permission of each interviewee from either a mobile phone or computer to keep track of our interviews and save them for further review. Any important quotes or key points mentioned were quickly noted on paper during the interview. After each interview, we reviewed the recording and arranged key notes in a typed document. This provided us with a neatly written outline of each interview to use as reference. Since a large majority of our data from interviews

was qualitative, we read through and analyzed our data to build the story of sponsor involvement in the LPC (See Appendix J for list and schedule of interviews). Although there was some fear in the beginning of the project that some sponsors would not respond to our request, we received a very good response rate.

3.3 Compiling a complete history of the London Project Center from its beginnings to current day and documenting how and why various aspects have changed over the years.

In order to investigate the London Project Center's history and document how various aspects have changed over the past 30 years, we collected key information on the formation of the center. We worked to compile any temporal data regarding the center into an ordered and logical account based on information gathered through interviews with WPI faculty involved in the center. This included faculty who were a part of the LPC's establishment, project advisors, and previous and current directors. The faculty interview protocol (Appendix B) consisted of in-person or telephone conversations of roughly 30 minutes, where we discussed how each faculty member witnessed the center change and grow, as well as their thoughts on the center's impacts. We cross-referenced the information that was provided to us from faculty by sorting through the existing database of completed London IQPs. This electronic database, provided to us by Professor Golding for use in our research, includes a listing of projects dating back to the early years of the center accompanied by their sponsoring organization and abstract.

The compilation of the LPC's history was an ongoing objective during our academic term in Worcester and during the implementation of our proposal in London. Our timeline of goals for data collection and compilation can be seen in Figure 4. Data collected from the database and initial information obtained from on-campus interviews allowed us to begin organizing data on the development of the center before traveling to London. As we collected further data and experience-based knowledge from alumni of the center, and with information from project sponsors in London, the timeline was amended and reorganized to achieve a comprehensive history of the center.

Weeks 4-7 in Worcester	Week 1 London	Week 2 London	Week 3 London	Week 4 London	Week 5 London	Week 6 London	Week 7 London
Faculty interviews, final preparation	Finalize interview protocol through meeting with sponsor	Contact sponsors, schedule first interviews	Begin conducting sponsor interviews	Continue sponsor interviews	Complete sponsor interviews, finalize information gathered from interviews		Final presentation and submission of final paper/ deliverables
Drafting of survey questions, conversion into Qualtrics	Send out alumni survey	Close alumni survey at end of week	Survey analysis			Finalize survey findings	

Figure 4. Timeline of Data Collection and Compilation

We collected data from all available sources and then effectively organized the data obtained. This data included experiences and opinions collected from experts in the project-based learning program at WPI, those involved in the establishment of the LPC, past and present center directors, and past and present project advisors. The data also included numerical and testimonial data from alumni of the center. The final aspect in the organized timeline of the LPC's history was a set of entries from the database of past projects. With the intention of producing a user-friendly visual representation of all historical data collected throughout our project, the creation of a physical timeline was the most effective medium to display this information.

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4. Data and Analysis

4.1 Alumni Survey

A primary aim of our project was to assess the impact completing an IQP through the London Project Center had on WPI students. One of the primary mechanisms we employed to that effect was an online survey distributed to all alumni of the LPC. This survey was intended to ascertain alumni's perceptions of their personal growth, overall experience, and impact their project had on the sponsoring organization. Out of 733 valid emails sent, we received 395 valid responses, for a response rate of roughly 54%. The survey was aimed to collect perceived growth in key areas of academic and personal development in order to judge how effectively the LPC program delivers on the goals of the IQP. This data was separated into two parts for analysis purposes: closed ended items, which asked participants to rate their response to questions on a five point scale, and free response sections, which asked participants to elaborate on their closed ended responses. We then determined the average response to each question using a scoring system. This was done by assigning a value of four to designate the most positive response (Very positively or Very Significant), incrementally down to zero to designate the most negative response (Very Negatively or No Significance). Averaging the values of the total set of responses, as well as examining the difference in response rates in certain subsets of the data, provided a good starting metric for analyzing and understanding the impacts on students and sponsors. The closed ended item section of the survey produced numerical data on personal growth and skill development in several different categories, such as influence in academic and professional life, effects on key project skills, and impact on personal growth.

The open ended responses were analyzed through a process of coding qualitative data. After researching qualitative data analysis (see Appendix F), we devised a way of interpreting the open ended responses. The results from each open ended question were organized into individual spreadsheets, where the responses could be easily read individually. Each response was analyzed in order to identify trends in the data, which were then adapted into response categories. Reading each individual response a second time allowed for the analyst to further categorize all of the data. This process was repeated for each open ended question. The categories and assorted responses could then be reviewed to gain an understanding of the general topics that alumni covered in

response to each question and trends in the overall data set. This data was used to verify our findings in the closed ended items.

4.1.1 Influence on Future

The first question in the survey for evaluating the success of the program asked participants to rate how completing their IQP through the London Project Center impacted their life academically and professionally. The question asked participants to rate the magnitude to which they believed they were impacted in three categories: How much the project "Impact[ed] your subsequent academic endeavors at WPI," "Creat[ed] new opportunities for you professionally," and "Chang[ed] or influenc[ed] your career goals." The results are presented in Figure 5.
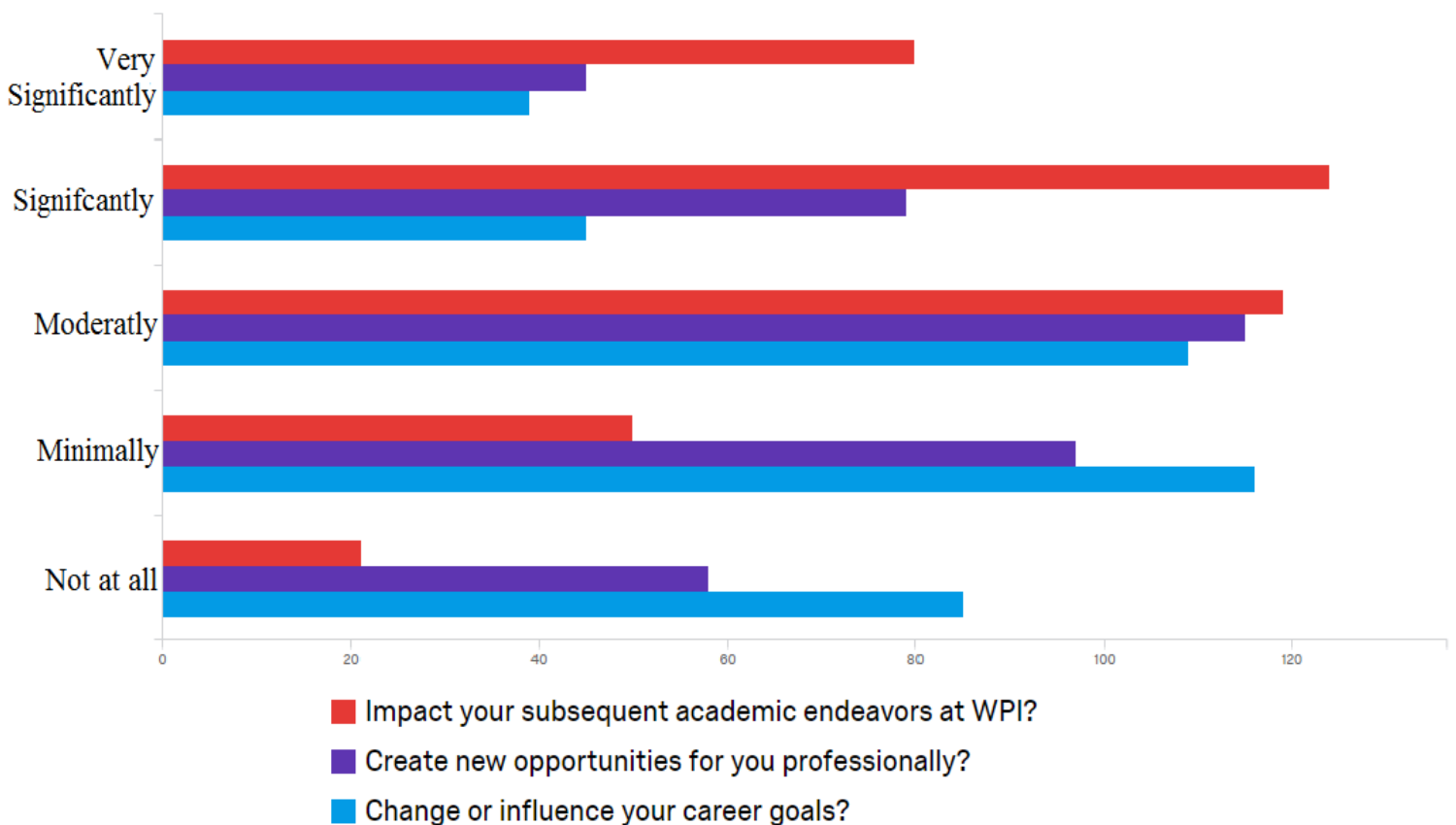
Figure 5. Perceived Personal Impact

Table 1. Influence Scores By Time Period

Average Influence Score	1987-1998	1998-2014
Impact Subsequent Academic Endeavors	2.50	2.48
Create New Opportunities Professionally	2.02	1.86
Change of Influence Career goals	1.79	1.52

Respondents rated impact on subsequent academic endeavors most positively, while they cited comparatively lower effects for the creation of professional opportunities and still lower for influence on career goals. This was not an entirely unexpected response, as skills gained through the IQP have many other academic applications and a successful project can help make professional connections or serve as a resume booster. Particularly with the impact on academics, this suggests that the rigorous project work prepares students well for the commitment needed in higher level classes as well as their Major Qualifying Project. It is likely that the relatively low score rating received for changing and influencing career goals is due to the non-technical nature of most IQPs, which limits the effects that it can have on the career path of students who are primarily studying science and engineering. It is interesting to note the breakdown of responses by year as displayed in Table 1, with earlier graduates citing higher influence on career goals and professional opportunities with roughly similar impact on academics. This is likely due to the fact that those who participated in the program earlier have advanced further into their careers and can see the impact on their professional lives more clearly while academic impact for most students only applies to the year or two after completing their IQP.

4.1.2 Impact on Skills

The survey also asked respondents to rate their skill growth over their IQP experience in the categories of teamwork, research, oral presentation, interpersonal communication, and working to deadlines. The overall results are shown in Figure 6.
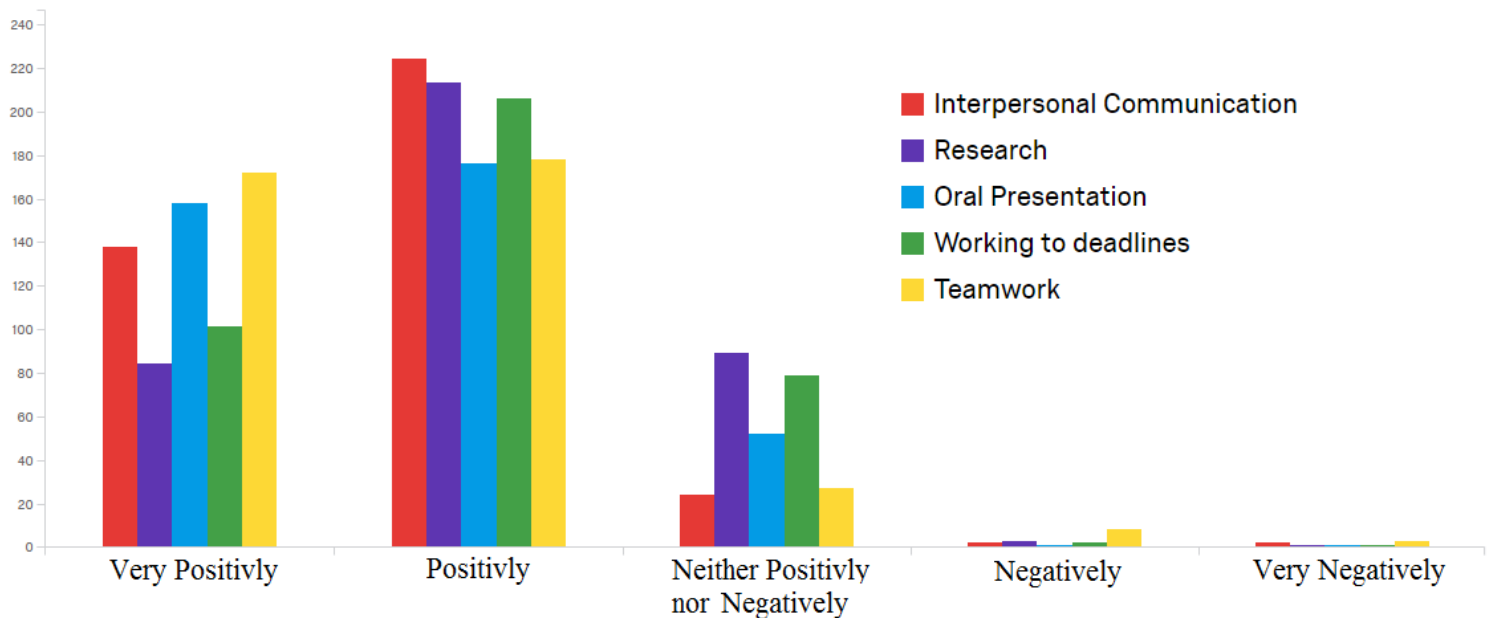
Figure 6. Impact on Alumni's Skills

The survey data showed alumni believed their greatest growth areas were in teamwork, oral presentation, and communication while citing comparatively lower, while still considerable, growth in research skills and the ability to work effectively to deadlines. This is likely because the teamwork and presentations demanded by the IQP are much more unique in their scope and scale than research and working to deadlines. The latter skills are very important, but opportunities to develop them are much more commonplace in other academic endeavors.

Table 2. Skills Scores By Time Period

Average Skill Development Score	1987-1998	1998-2014
Teamwork	3.53	3.23
Interpersonal Communication	3.30	3.26
Research Skills	3.10	2.93
Oral Presentation	3.21	3.26
Working to Deadlines	3.22	2.99

The data in Table 2 shows that those who completed their project before 1998 cited higher growth scores in teamwork, research skills, and working to deadlines, while having similar scores in the categories of oral presentation and communication. The reason for the difference is not entirely clear; it may be a product of faculty stressing different skills at the time, the growth and value of skills being viewed differently from different stages of one's career, or simply a statistical anomaly.

4.1.3 Impact on Growth

The final part of the survey, which measured impact on students, asked participants to rate their personal growth and increase in their global perspective, defined as: "your awareness of other countries' customs, your ability to learn and interact with people of cultures different from your own." This was completed on a five point scale identical to that which was used to measure impact on skills, and the results are shown in Figure 7.
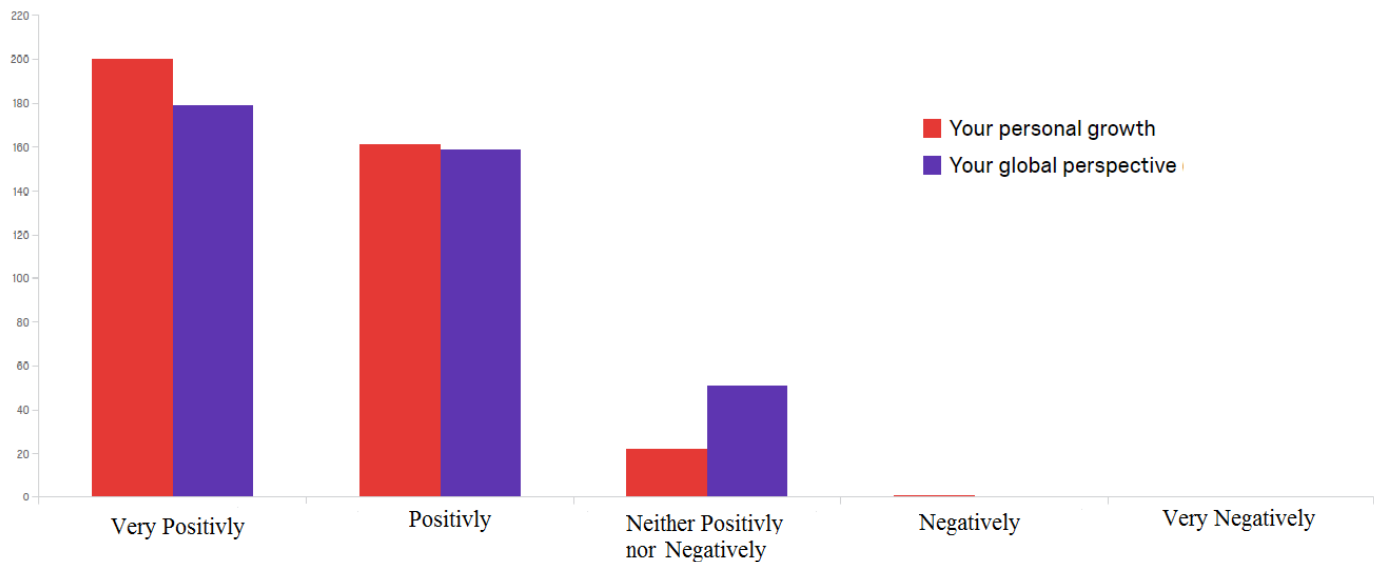
Figure 7. Perceptions of Personal Growth and Global Perspective

Table 3. Personal Impact Scores By Time Period

Average Personal Impact Score	1987-1998	1998-2014
Personal Growth	3.67	3.40
Global Perspective Growth	3.60	3.29

The responses to these questions were overwhelmingly positive. A total of 94% of responses concerning personal growth and 87% of responses concerning effect on global perspective were reported as "positively" or "very positively." Among all of the effects polled in this survey, personal growth is rated as the most positive, with global perspective not far behind. As can be seen in Table 2, this considerable effect is particularly high for earlier graduates. This suggests personal growth is one of the most important outcomes of an IQP through the LPC and the experience has lasting effects on students which are apparent in their later lives.

4.2 Sponsoring Organizations in London

The data regarding the London Project Center's impacts on sponsoring organizations was collected through two implementations of our methodology: the project center alumni survey and the sponsor interviews.

4.2.1 Survey Data – Impacts on Sponsors

Since the survey distributed to alumni was used to gain student's perspectives of the LPC's impacts, we determined it was important to inquire how the alumni believed their project had an effect on their sponsoring organization. Specifically, we asked the question: "To what extent do you feel like your project had a lasting impact on the organization by which you were sponsored?" Of the five response options (very significant, significant, moderate, minimal, not at all), "moderate" was the most reported at a rate of 48%. The second and third most reported responses were "minimal" and "significant" at rates of 23% and 18%, respectively. This distribution can be viewed in Figure 8.
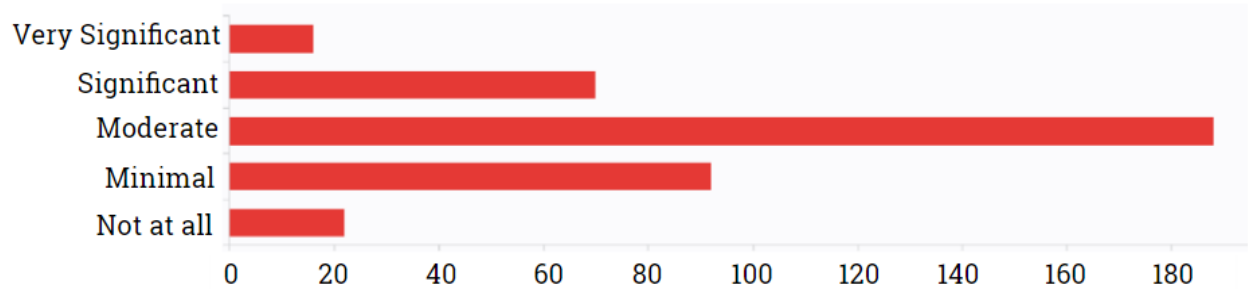
Figure 8. Alumni Perceived Impact on Sponsors

We performed a cross tabulation between the responses to this question and responses to "Which type of organization sponsored your project?" to compare how strongly students feel their project had a lasting impact between the different types of sponsors. The average values listed in Table 4 are the final "impact scores" for each type of sponsoring organization.

Table 4. Organization Impact Scores

Organization Type	Score
Museum	1.98
Social Service Organization	1.97
Professional Organization	1.73
National Government Organization	2.06
Local Borough Council	1.81

As seen in the above table, the organization scores were all relatively close, ranging from 1.73 for "Professional Organization" to 2.06 for "National Government Organization". The closest whole value to each score was two, corresponding to a "moderate" extent of impact, which was consistent with "moderate" being the highest overall reported response.

4.2.2 Sponsor Interviews

We were able to complete interviews with representatives from 13 different sponsoring organizations. The sponsors were generally quite interested in speaking with us. We reached out to contacts from 15 organizations, only two of which we were unable to set up a meeting. Overall, the response from interviewees were overwhelmingly positive in regards to the WPI

student teams and London Project Center program as a whole. Multiple themes and trends became apparent as the interviews were completed.

A majority of sponsors reported that student teams met or exceeded their expectations in work ethic, quality of work, and/or ability to accomplish tasks independently. Steve Cardis, who worked with teams in both the Merton Council and Kingston Council, commented on how he feels the commitment of students to their work and high degree of effort made them likely in almost all projects to meet or exceed the expectations of their sponsoring organization:

> The students were very committed to the projects, and really did put in a lot of effort to deliver the projects in the limited timescale… In the vast majority of the projects I was involved with, I would say that the commitment of the students was excellent and they fully mapped their brief. (S. Cardis, personal communication, June 10, 2016)

The considerable amount of effort that students put into the projects, especially within the limited timeframe, was mentioned consistently throughout the sponsor interviews. Bridget Clifford of the Royal Armouries at H.M. Tower of London explained that staff on site were genuinely pleased with the work and effort of the students. She stated:

> The level of effort that was put into [the projects] was taken very seriously… Watching the skills being brought in and also, quite often, some of the students, even when they're here just for a term, develop confidence and find out that they could do something... and thinking out of the box, is brilliant. (B. Clifford, personal communication, June 8, 2016)

Ms. Clifford also mentioned that the amount of research done beforehand in preparation for the projects was impressive, as the museum's subjects are not typically easy to look into. This continuing high level of effort exceeded the expectations of the Royal Armories staff: "They were very good ambassadors for the Institution (WPI)... They rose to the occasion and they threw themselves into it with enthusiasm" (B. Clifford, personal communication, June 8, 2016). Hannah Clipson, who is now Community Learning Officer of the Postal Museum, had worked

with WPI students at the Science Museum in a previous position. Having had a positive experience at the Science Museum, she noted seeing a continued excellent effort in the recent projects completed at the Postal Museum:

> I had such a positive project at the Science Museum, so my expectations were very high and they absolutely met them. I think that the students I work with come with such a great attitude and you can't fault that… the work ethic is incredible. (H. Clipson, personal communication, May 25 2016)

In addition to being a unique learning opportunity for WPI students, the IQP program in London has also been a learning experience for employees of sponsoring organizations. We learned that the opportunity to interact with a team of students from another country can be greatly beneficial to staff. During our interview with David Houston, who had worked with WPI student teams through projects at both the London Transport Museum as a Learning Officer and the Design Museum as Schools Producer, he reflected upon how the students brought positive energy to the workplace:

> I think that there was a real excitement about working with this young group of people, who just focused on this one thing, saying 'this is what we're going to do, we've got all these things, and this is what we're going to create at the end of it...' That was kind of the excitement for staff here… a kind of exoticness in having these people who… for some of them it's their first time in London… and being able to share your experience and share the city with them as well... there was a nice fun element to it. (D. Houston, personal communication, May 23, 2016)

David Houston then continued to describe an exceptional effort by the team who completed a project through the London Transport Museum, bringing inspiration to the museum staff. He stated, "The Transport Museum group were really focused, so it was the work ethic that I think really inspired everyone else. Just their level of work was beyond what we expected, so they set the bar really high, but they also inspired staff" (D. Houston, personal communication, May 23, 2016). He also described how the opportunity to work with the WPI student teams is a great

learning experience for the staff of an organization because they further develop skills in working effectively with outside contacts and interns: "It's also a bit of a learning experience. It's a good experience for those involved to learn how to manage people who would be at the start of their career" (D. Houston, personal communication, May 23, 2016). Every person involved with the student projects was able to learn from the interactions, including Mr. Houston:

> Once I gave [the WPI team] a few ideas, they ran with them... for me, as far as a management tool goes, it was very interesting to have the idea of learning someone's skills and learning their current position from experience… For all staff involved, it was a learning experience… We will learn as much if not more from them as they will learn from us. (D. Houston, personal communication, May 23, 2016)

Dr. Alexandra Burch, Director of Learning at the Natural History Museum, felt similarly about staff interactions with the WPI student teams. When explaining her work with WPI students through the Science Museum, she explained how the interactions taught the museum staff how to educate and work with a group of students that were unfamiliar with the museum process: "In terms of running that kind of work, you need to be able to explain to a group of people, who aren't familiar with the way a museum works… That provided us with a way of giving our own staff development and training" (A. Burch, personal communication, June 7, 2016). Hannah Clipson also described how the WPI projects have prepared their organization for further partnerships in the future:

> I think [the effect] is about partnerships as well, how we approach partnership working in the future and also about how we work with interns, it's teaching us best practice. Every single project we do teaches us new ways of doing things, or slightly better ways of doing things, so it really has impacted. (H. Clipson, personal communication, May 25 2016)

Hearing from multiple sponsors how hosting a WPI IQP allows not only for the students to develop their skills, but also for the staff of the organization to learn, was incredibly interesting.

This was knowledge that we could only have acquired through sponsor interviews, as the sponsors had a greater awareness of the projects' impacts on their organization than the students.

The WPI student teams often brought a new perspective to solving the sponsor's challenges. Many of the sponsors we interviewed believed that the most beneficial approach to hosting a project was to give a team a strong basis of information, then give freedom to the students to express their own ideas for solutions while providing advice to remain within the scope of the project. As Peter McDonald, Travel & Transport Planning Officer at Croydon Council, put it: "What I'm looking for is fresh minds on a problem that I haven't been able to solve myself, so I need to give them the tools to do the job, but there's no point telling them how to do the job, otherwise I could've done it myself" (P. McDonald, personal communication, May 26, 2016). Mr. McDonald tried to ensure that his open-ended approach to sponsoring teams was well-suited to student-led projects: "The challenge has always been to been to come up with a project that is defined enough, but not too defined" (P. McDonald, personal communication, May 26, 2016). The downside to this method was that a student team may not touch upon all aspects of their project that a sponsor was hoping for, but more often than not, the students' work found new ways to solve problems or further developed a sponsor's ideas. Many sponsors reported that WPI students, being from a technical institution, were able to solve technical or mathematical challenges that their organization would otherwise have difficulty confronting. When describing a project where students assisted in redeveloping a gallery for the Science Museum, Dr. Burch explained:

> There was a huge amount of data collected, and the WPI team had a very
> particular way of analyzing that data, but because of their skill set, they were able
> to bring a very strong statistical analysis to the data, so that was really useful…
> Also, they knew how to create videos, so we were able to draw upon their skills.
> (A. Burch, personal communication, June 7, 2016)

She touched upon this point again when explaining another project that incorporated a mobile device tour for a different gallery:

Whilst there were teams in the museum who probably did have that skill, they were already working on projects… It allowed us to test quite early in terms of thinking, so we're ahead of the curve in terms of how might you use a digital mobile device to deliver this type of content and support a different kind of interaction with an already existing gallery. (A. Burch, personal communication, June 7, 2016)

Across all projects, the ability of the students to bring fresh ideas, particularly when applying technology, opened opportunities for the museum to develop with the teams' efforts:

Sometimes, when you're working in a museum, you can end up with quite an institutionalized way of thinking… all organizations have their own culture... so bringing in external people really helps challenge that. And bringing in a group of people who are younger… more forward thinking particularly in the use of tech, was also really useful. (A. Burch, personal communication, June 7, 2016)

The technical abilities of the students, alongside the knowledge of the experienced museum workers, allowed for a cohesive work process throughout the museum's projects:

There I felt it became more of a partnership where our skills were round the knowledge of the visitor and how they use the space, and the challenges for the team's skills were how you might then use other things to crack that problem. (A. Burch, personal communication, June 7, 2016)

Hannah Clipson also found many benefits in the WPI teams' skills and alternative perspective when hosting projects that included the development of digital media:

It has allowed us to see what's achievable. We do have a digital team… but it was just a new way of looking at things... from a 'young head' as well. You're bringing knowledge from America, so it's new and it's different, so I think it allowed us to see new ways of doing things and what could be achieved… Our

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staff have the expertise and they know what's out there, but in terms of 'how do you deliver it?' This can be time consuming, and we don't always have the capacity to explore this. It's a really nice tangible way of showing 'here you go, here's our findings, here's what you can do with digital.' (H. Clipson, personal communication, May 25 2016).

In many of these cases, had the WPI student teams not participated in the project, the organization would have spent additional time and funding in obtaining the resources to achieve their goal. Through the student projects, these organizations were able to explore new areas, such as implementing technology, without interfering with their normal responsibilities.

Through our interviews with various organizations, we found that sponsors believed students create high quality and well-respected work that is generally useful. One instance where this particularly stood out was in our interview with Adrian Hewitt, the former Principal Environment Officer of Merton Council. Mr. Hewitt led many projects that assessed the use of renewable energy in the Borough of Merton, including a three-term project centered around the Merton Rule, a revolutionary policy in reforming the requirements for businesses to implement renewable energy sources. When telling us of his experiences with WPI teams, he explained the following:

> I think [the WPI projects] played a part in emerging London awareness about sustainable energy management and sustainable energy infrastructure… WPI projects were taken very seriously in Merton… the politicians from all the political parties were always very interested... The leaders would come along to the WPI presentations, so would the politicians who had responsibility for energy and for municipal planning. One of the WPI projects played directly into a trans-European project I was involved in. We would have presentations from WPI students in the council chamber… At an administrative level and a political level, the WPI projects significantly raised the profile of this issue and resulted in changes happening in Merton for residents and for businesses. (A. Hewitt, personal communication, June 1, 2016)

This quote demonstrates a high level of direct impact that the WPI student projects can create. The work for the Borough of Merton drew the attention of many people in the industry and delivered results to an incredible standard. Peter McDonald told us about a project that had been done for the Borough of Croydon that generated very useful research:

> That initial research, summarizing what the issue is: air quality in London, and ways of addressing it... some of the key graphs on changes in traffic levels and air pollution, they've been a really good source of material that I've sometimes then used in other documents and briefings that I've put together... I've been able to send them to other colleagues to explain what I'm doing and why I'm doing it. (P. McDonald, personal communication, May 26, 2016)

This is a case where students' research had an effect on other work outside their initial project, as it has been used as reference for several other purposes. Another insight from Mr. McDonald's experience with student teams is that there can be more aspects to a project that are beneficial than simply the direct deliverable:

> With some of the projects, the value has been not necessarily in the answers they give me, but the quality of the questions they have managed to ask… It's your ability to communicate with people from other professional fields that will stand you out against the rest of the field." (P. McDonald, personal communication, May 26, 2016)

Generally, the sponsors we interviewed have been very satisfied with the LPC's opportunities. When asked which areas WPI or its students could work to improve the program for sponsors, most of the suggestions pertained to the organization of the program before students arrived in London. Some sponsors felt that they had proper contact with the students in the preparatory pre-departure phase, but not with the project advisors. Therefore, they felt that the students had a proper understanding of the project's scope and sponsor's requests, yet the advisors understanding was weaker. This made communication between all parties more difficult once the teams arrived. Most of the negative comments were in regards to situations where student teams

struggled to work cohesively, thus inhibiting progress. However, this is something that would be difficult for anyone but the team itself to correct.

4.3 London Project Center History

4.3.1 Faculty Interviews

We interviewed select members of the WPI community who were involved in the London Project Center's development and history (See Appendix K). The interviews helped us gather information to paint an informative story that can be documented for future revision as needed. We began by interviewing those who contributed to the initial beginnings of the project center. Professor Lance Schachterle provided us with information about Dean William Grogan's talk pertaining to the WPI Plan in 1970, and how the head of the electrical engineering department of The City University London showed interest in the curriculum at this event. The head of the department established contact between Professor Maria Watkins and Professor Schachterle, who then traveled to London to give a talk for The City University in 1971. Schachterle, Watkins, and other faculty from each university decided to create an exchange program between The City University and WPI. Partnering with a British university was agreeable because it offered abroad opportunities with the benefit of a common language. Professor Schachterle advised London IQPs in the 1970's during some of the project center's first attempts towards hosting IQPs internationally. Eventually, it became clear the partnership with The City University London was not suitable for completing IQPs, as the City University focused on technical education, and the purpose of the IQP was to solve a social science issue. Lance Schachterle became head of the newly established IGSD (Interdisciplinary and Global Studies Division) and decided to establish an official residential program in London, which is now known as the London Project Center.

We were also able to talk to Professor John Zeugner, who was the first full time advisor and worked in London with the students from 1987-1992. Professor Zuegner advised for the new center while Professor Schachterle traveled to London to set up a network of project sponsors through known contacts. We discovered that students lived in private housing after severing ties with the City University London, however this caused issues as the high traffic of students in and out of homes were often disruptive to neighbors. As a result, it was arranged for students to live in commercial rental housing provided by entrepreneur Ian Watkins, the son of Maria Watkins.

Ian Watkins is the current owner of Acorn Housing, which the LPC still has a relationship with today. London was chosen primarily because students and faculty found the language and cultural similarities agreeable. Initially, there was trouble getting students and faculty to travel to more exotic locations. Professor Zeugner had difficulty convincing students and faculty to go to the Bangkok, London and Venice sites until 1998, where student interest increased significantly due to an awareness initiative by the IGSD. Zeugner was the first residential advisor because he was the only faculty member interested at the time. Soon, more members of faculty became interested in advising, especially the young members of faculty who lacked family obligations. A selection system for advisors was devised after the center was established and interest rose.

Professor Paul Davis first advised in 1992 and later became director of the project center in 1994, holding the position until 2009. Davis contacted Lance Schachterle to express his interest in becoming involved with the London Project Center. As the center director, Davis traveled to London over A and B term to review the housing arrangements, acquire sponsor agreements, and review the proposed projects. Originally, the London IQP was offered in terms C, D, and E, however due to the increased number of international project centers and economic logistics, the decision was made to eliminate C term offerings after 2008. Professor Davis was not fond of decreasing the terms offered, however it was difficult to acquire and coordinate suitable projects for all three terms. From about 1995 until roughly 2003, Jenifer Hawks worked as a project liaison and found many projects working with nonprofits due to her professional connections.

In 2009 Professors Dominic Golding and Robert Krueger became Co-Directors of the London Project Center following Professor Davis stepping down. Together, they worked to expand the number of projects hosted by local boroughs, with a particular emphasis on projects pertaining to sustainability. Professor Dominic Golding has since become the sole Director of the London Project Center, as Professor Krueger moved to directing the Worcester, England project center in 2015.

4.3.2 Database / Survey data (project types)

Since the London Project Center's establishment, the types of projects offered have been pivotal in the center's identity. Due to the contacts Maria Watkins possessed, a large portion of the earliest projects were involved with professional organizations such as the Institute of

Electrical Engineers. When Jenifer Hawks worked as liaison from 1995-2003, the projects were sponsored by a significant number of nonprofits because of her connections with the organization Action for Blind People. After Hawks left, and Professors Krueger and Golding later took over the position of directors, there was an emphasis on green energy and education initiatives, as those subjects were where their personal interests lie, and there was also a higher demand from sponsors.

4.4 Project Deliverables

4.4.1 Timeline of London Project Center and Updates to Database

One tangible outcome of our project was the creation of a timeline showcasing the history of the London Project Center, the evolution of projects offered there, and the changes in directorship. This allowed for a centralized visual of data we collected throughout the entire project, including background information on the center, the early implementation of the WPI Plan, and IQPs completed each year. As our project involved the collection of a sizeable amount of opinion-based and experience-based data, it was helpful to compile the most important temporal aspects into a timeline for use by our sponsor in education and celebration of the center. The timeline was created in a digital format, which has allowed it to, in theory, be made more accessible to a larger audience. It can now be preserved and edited over time to reflect the completion of future IQPs in London and to reflect any future changes in directorship. The timeline was created using the online presentation maker, Prezi, and may be embedded into the London Project Center website in the near future, allowing the public to view it easily and gain an understanding of the LPC's development. Figure 9 shows the timeline as it appears in presentation format. The different colors along the top line indicate changes in directorship, which are further explained in the boxes above the line. Each year along the timeline has a listing of all the projects by term underneath the line, including the link to each project's final report.
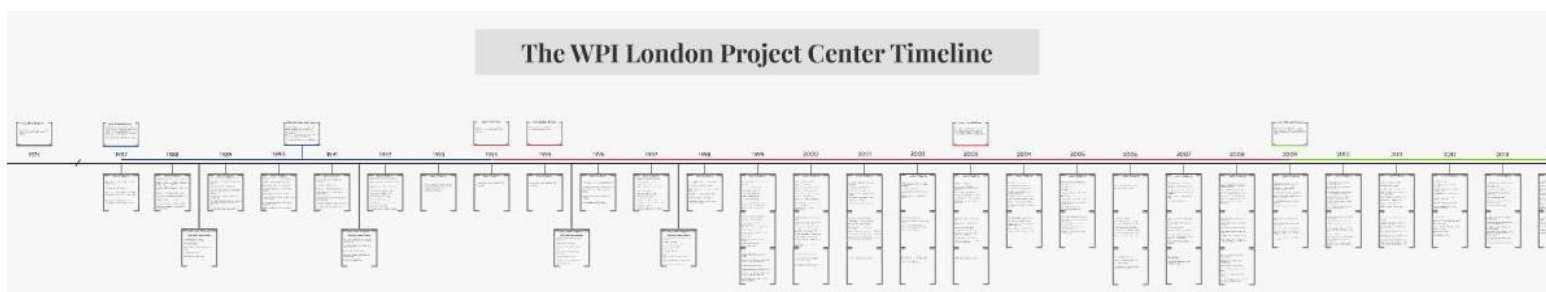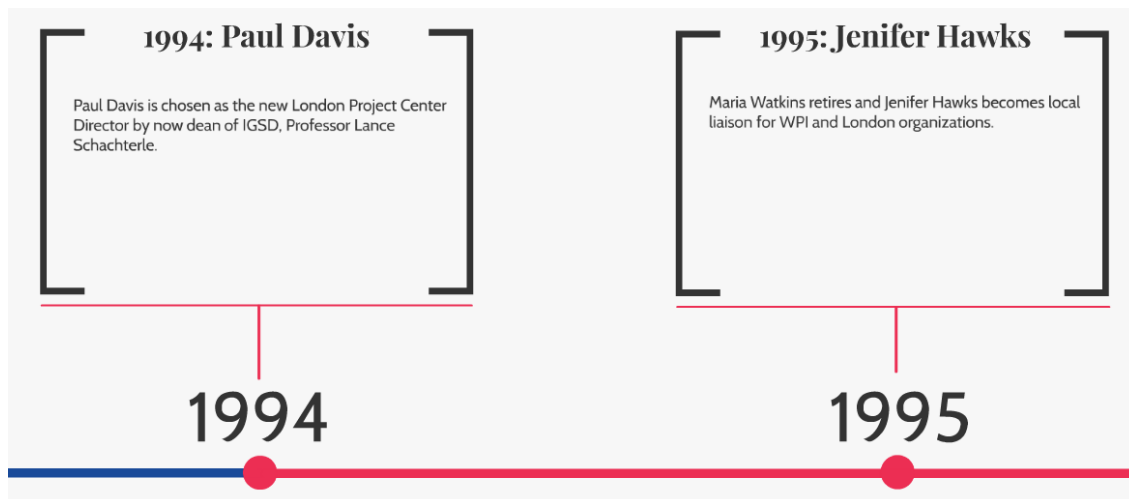
Figure 9. Screenshots of London Project Center Timeline

During the process of creating this timeline, we made updates to the existing database for the London Project Center to fix any discrepancies and ensure newly completed projects are present. Due to the format in which the original database was created, we were not authorized to make changes within the physical database itself. Ultimately, in order to be able to make the changes necessary, we chose to download a copy of the entire database into Excel format. We then were able to edit the project year, term, title, abstract, and report link in order to address discrepancies that we came across in our research and interviews. Adding recent projects, such as those completed in D Term 2016, to the database was also manageable once it had been downloaded into this format. The Excel database, with our updates highlighted, was passed along to our sponsor liaison to transfer the changes to the original database format, if he should choose to do so. Figure 10 indicates one section of the Excel database where updates were made, with red colored boxes reflecting changed entries, and beige boxes indicating new additions.

	B	C	D	E	F	G
	2003	D	http://www.wpi.e	Developing an Online Community for Nurses	Marie Curie Cancer Care	Charity
	2003	D	http://www.wpi.e	WPI-Nuffield Curriculum Centre -- London City	The Nuffield Curriculum Centre	Other
	2003	C	http://www.wpi.e	Website Reconstruction and Public Relations E	Upkeep	Charity
	2004	C	http://www.wpi.e	Improving Communication Systems	Arthritis Care	Charity
	2004	D	http://www.wpi.e	Tracking Organizational Progress at Arthritis Ca	Arthritis Care	Charity
	2004	D	http://www.wpi.e	Assessment of Brent Residential Parking Policie	Borough of Brent	Local Authority
	2004	C	http://www.wpi.e	Are Residents Reading My Merton Magazine?	Borough of Merton	Local Authority
	2004	C	http://www.wpi.e	Live Work Site Analysis for the Borough of Mer	Borough of Merton	Local Authority
	2004	C	http://www.wpi.e	Community Outreach Website Development fc	Lewisham Strategic Partnership	Local Authority
	2004	C	http://www.wpi.e	Mining the Census Data for the Borough of Me	Borough of Merton	Local Authority
	2004	D	http://www.wpi.e	Working Towards a Greener Borough: Recyclin	Borough of Merton	Local Authority
	2004	D	http://www.wpi.e	Sustainable Energy in London Borough of Mert	Borough of Merton	Local Authority
	2004	C	http://www.wpi.e	Website Exhibition for the Charles Dickens Mu:	Charles Dickens Museum	Museum
	2004	D	http://gordonlibra	Expanding the RADAR and Enabling Partnershi	Enabling Partnership	Charity
	2004	C	http://www.wpi.e	The Knight is Young at the HM Tower of Londoi	H.M. Tower of London	Museum
	2004	C	http://www.wpi.e	Corporate Information Database and Intranet/	Royal Association for Disability and Rehabilitation (RADAR)	Charity
	2005	C	http://www.wpi.e	Data Management Tools for a Non-Profit Organ	Age Concern Camden	Charity
	2005	D	http://www.wpi.e	City Knowledge and Municipal Data Infrastruct	Borough of Merton	Local Authority
	2005	D	http://www.wpi.e	Distribution Route Assessment for a Combined	Borough of Merton	Local Authority
	2005	C	http://www.wpi.e	Merton City Knowledge	Borough of Merton	Local Authority
	2005	C	http://www.wpi.e	Merton Resources	Borough of Merton	Local Authority
	2005	C	http://www.wpi.e	Pilot Resident Consultation as Part of a Combir	Borough of Merton	Local Authority
	2005	C	http://www.wpi.e	Virtual Museum Tour	Centre for Accessible Environments	Charity
	2005	D	http://www.wpi.e	Virtual Tour for the Charles Dickens Museum	Charles Dickens Museum	Museum
	2005	C	http://www.wpi.e	Community Involvement and the Commonside	Commonside Community Development Trust	Charity
	2005	C	http://www.wpi.e	Material Science Website for the Royal Armoui	H.M. Tower of London	Museum
	2005	D	http://www.wpi.e	Radar Communications Network: Testing, Verif	Royal Association for Disability and Rehabilitation (RADAR)	Charity
	2005	C	http://www.wpi.e	RADAR: Designing a Communication System	Royal Hospital for Neuro-disability	Charity

Figure 10. Screenshot of Updated Database Section

4.4.2 Brochure for Global Fair

Additionally, we created an informative brochure we envision being useful for education and celebration of the LPC. The brochure allowed for further documentation of the results we collected, one geared toward educating prospective London IQP applicants. We included a brief description of the center, important facts about the types of projects completed in London, the terms projects are offered, and the evolution of sponsoring organizations. We also included quotes gathered from alumni testimonial responses in order to give this deliverable a more personal touch. We chose to create the template for the brochure in Microsoft Publisher, as this format was easily accessible to all members of our team. Figures 11 and 12 below show the completed brochure template. We made the template available to the IGSD and our sponsor liaison, in order to produce and distribute our brochure at events such as the Global Fair in the fall or integrate a copy into the project center website.

Quotes from Alumni

"You build (confidence) in knowing that you can travel to another country, thousands of miles away from your family and US-based support structures, and be successful and independent." - Ron Skoletsky, BS EE '90 and MS ECE '92

"In particular the London Project Center affords students with the opportunity to work collaboratively with professionals in environments which will be quite similar to what students will be in after graduation." - Jovanna Baptista, BS MAC '00

"London is an amazing city, and an important city, perhaps more than I understood when I first arrived. Don't be fooled that just because English is the primary language that it will be less of an experience. If you like history, art, culture, finance, technology... you will have unlimited opportunities to pursue these interests." - Peter Tousignant, '90

Questions?

Find more information at the London Project Center Website at: http://wp.wpi.edu/london/

Or contact London Project Center Director Dominic Golding at: golding@wpi.edu

The WPI
London Project
Center

Interdisciplinary and Global Studies Division
Worcester Polytechnic Institute

Figure 11. Brochure Template (Cover) for London Project Center

What is the London Project Center?

The London Project Center, first established in 1987, is the longest running international WPI project center. Over 300 student research projects have been completed, sponsored by more than 100 organizations in Greater London. The London Project Center is not a physical building in London. Rather, it is one of many 'virtual' centers hosted through the WPI IGSD's Global Perspective Program. Nonetheless, the London Project Center arranges a variety of interesting projects, as well as quality residence for students each year.

Projects

Many different types of organizations sponsor projects through the London Project Center, in both the Spring and the Summer each year.

Types of Projects:

- Museums or Galleries (e.g. Imperial War Museum, Science Museum)
- Local Government Authorities (e.g. Borough of Hounslow, Borough of Lambeth)
- Private/Semi-private Corporations (e.g. Transport for London, Crossrail)
- Professional or Scientific Organizations (e.g. Royal Institution of Chartered Surveyors, Institute of Electrical Engineers)
- Social Service Organizations (e.g. Commonside Community Development Trust, Royal National Institute for the Blind)
- National Government Agencies (e.g. Department of Environment and Climate Change)
- Educational Institutions (e.g. WPI London Project Center, Imperial College)

Terms offered:

- D term (Mid March - Early May)
- E term (Early May - Late June)

Why Choose The London Project Center?

The London Project Center offers a unique set of opportunities for students wishing to complete their IQP abroad. Projects in London give WPI students the experience of learning in a professional and engaging environment. Students reside in 2-4 bedroom apartments, fully equipped with kitchens and appliances. The apartments are located in central London, walking distance from many major attractions.

The common language and culture that is similar enough, while still unique, make London a great choice for any person new to international travel. London is a central hub for those wishing to explore the rest of Europe, with fast travel to France, Belgium, Ireland and many other exciting places.

WPI

http://wp.wpi.edu/london/

Figure 12. Brochure Template (Inside) for London Project Center

4.4.3 Alumni Testimonials for Center Website

The alumni testimonial section once again pulled from information gathered in contact with alumni of the LPC. It aimed to allow those completing IQPs in London in the future to learn about the experience before arriving in the city. We chose to reach out to alumni who had indicated they would be willing for follow-up contact in the original survey. We emailed 58 alumni of the project center, asking them to consider providing us with their testimonials. Supplying these alumni with a follow-up Qualtrics form, we asked them to briefly describe their experience in London, paying careful attention to what they believed to be the value in IQPs abroad and why they would recommend the London Project Center to a prospective applicant (See Appendix D). We also asked within the form for them to indicate their name, year of graduation, degree program, and a brief synopsis of their professional life post graduation, with an

additional section allowing them to upload a profile image. We sent a follow-up email several days later as a reminder for the alumni to fill out our form. When we closed the form on June 19, we had received 3 valid responses. Using this information, we were able to create templates, which included pictures and brief bios for each alumnus or alumna, followed by his or her answers to the questions. This was made available in a new tab on the project center's webpage following Professor Golding's approval and may potentially be incorporated into the celebration for the London Project Center's anniversary, at the discretion of our sponsor liaison and the IGSD.

5. Conclusions and Recommendations

5.1 Conclusions

5.1.1 Students who complete projects through the London Project Center gain a greater understanding of other cultures and a global perspective, which promotes their ability to grow and travel further.

In our discussions with advisors and other faculty involved in the London Project Center, we tried to determine what London brings to WPI's global IQP program as a whole. A key point that we consistently received from WPI faculty who had advised in London or were involved in its development was that London offers a unique opportunity to travel abroad. It allows students to experience a new culture, while not having the additional barriers of a significantly different language, living conditions, or climate. This is also a major part of the reason that London was chosen to host the first international project center. As the WPI global program has expanded, it has steadily moved into more diverse and exotic locations.

We have heard anecdotally from both advisors and alumni that going to London expands students' cultural perspective and increases their confidence in regards to global travel and dealing with different cultures. This idea is supported by alumni survey results, which rate personal growth and global prospective growth as areas that were most positively affected by the London IQP experience. We have found through both the open ended question responses from the alumni survey and interviews with past advisors and directors that many feel London can provide an excellent opportunity to introduce students to world travel and has quite often been a stepping stone into exploring Europe.

5.1.2 The London Project Center IQP program fosters students' growth and professional development and develops critical career skills.

Students who complete the IQP at the London Project Center often experience personal growth while working on a project abroad, which helps them in their later professional careers. From the results collected in the alumni survey (See Sec. 4.1 and Appendices A, E) we were able to determine how many students had a positive growth experience during their time in London, in what areas the growth affected them, and the cause of this growth. Many alumni responded that

their key areas of personal growth were in maturing and experiencing a taste of the "real world," living completely away from home, and working on a project in a professional environment. Many alumni attribute some of the strongest relationships they formed in their college experience to their time completing IQP in London. In addition to building relationships, the London IQP experience also develops students' ability to work with a variety of people, especially those outside their fields, a skill which serves them well in the professional world.

Professional growth also occurs as a result of the students' experiences during their time in London. The project work in London is similar to what students face when entering the workforce; many skills they develop on IQP will give students an edge when starting their career. Sponsors often noted in our interviews how they watched students grow from college students to high functioning professional adults, capable of exceeding expectations and overcoming obstacles. A student's personal growth over his or her time spent in London completing IQP greatly aids their subsequent professional endeavors.

5.1.3 Students bring new ideas and innovative points of view to sponsoring organizations working to solve complex problems.

Students often bring a set of unique skills and new perspectives in creating a solution to their sponsor's challenges. This has had great positive effects on not only their projects, but also their sponsoring organizations. Through speaking to sponsors in London, we have found this concept rings true and contributes to the success of tackling the organization's most complex problems. WPI students are often well versed in mathematical and technological processes through traditional courses, so their skills can be used effectively to fill in resource and knowledge gaps that might exist within the sponsoring organization. Confidence in these skill areas has allowed WPI students to formulate and implement forward thinking solutions that often reach above and beyond sponsors' expectations.

Coming from a technical educational institution in the United States, WPI students often have a perspective unlike any member of the staff at their sponsoring organization. This outside perspective has also been noted to produce forward thinking solutions, as the students may view the problem in a new and innovative way. Several sponsors noted that working in the same environment day to day can over time lead to "tunnel vision" and has prevented them from being

able to come up with the most effective solutions to certain challenges. Bringing in students who normally do not work with the organization can lead to ideas that are new and often effective, as they lack this "tunnel vision" phenomenon. Students' enthusiasm for the project can also add energy to the workplace and increase the productivity of the staff, which in turn allows for better workflow and project outcome. Additionally, as the WPI students completing projects in London are often not accustomed to working with outside organizations, they provide these organizations with the learning opportunity of building relations with outside contacts. This teaches members of the organization how to educate effectively and manage newer groups that have no prior experience in that particular environment. The results of our analysis show that not only have WPI students in London been educated through the IQP process, but the sponsoring organizations in London have also learned and grown.

5.2 Recommendations

5.2.1 Structure of Preparation Term and Communication Concerns

In speaking to sponsoring organizations in London through our interviews, it became apparent that the structure of the preparation term completed by students prior to their arrival in London was often unclear to the sponsors. Several sponsors were unaware that students were reporting to not only their advisors, but also an ID 2050 professor during the term before completing their IQP. This uncertainty regarding whom the students needed to keep aware of their work made for gaps in communication between the sponsor and the students, advisors, and professor teaching the course. During interviews, we found ourselves informing past and present sponsors of the structure of ID 2050 and PQP in terms of the involvement of the course professor and advisors.

One recommendation we have devised to combat these gaps in understanding and communication is to provide the sponsoring organizations with a written outline of the process of ID 2050 and PQP. This would allow those in London who are less familiar with the structure of the WPI curriculum to acquire some idea of how these aspects operate to prepare students for the following term abroad. The document could be easily emailed to sponsors once they have confirmed a project through the London Project Center, and could include FAQs as well as contact information for the advisors and the ID 2050 professor. Making this information apparent

to the sponsoring organizations early on in the process of setting up projects will in turn make the transition between the preparation term and completion of IQP smoother.

The sharing of contact information between advisors, sponsors, and ID 2050 professors would help promote additional communication to address the issue of conflicting expectations from many individuals involved. The sponsors often expressed in hindsight that they would have benefitted from contact with not only the students prior to their arrival, but also the advisors. Currently, as a part of ID 2050, students are required to set up a meeting with their sponsor as soon as possible in order to introduce themselves and gain information on the initial scope of the project from their sponsoring organization. Several of the sponsors we interviewed suggested that a similar meeting with advisors would also be helpful in the early stages of the preparation term. This meeting would allow the sponsors and advisors to communicate their separate expectations for the students' work over the 7 terms in London, as well as reach a consensus on the desired outcomes of the project. Providing contact information to both parties would further promote the occurrence of this meeting, and would once again smooth out the transition for students, advisors, and sponsors.

5.2.2 Sponsor Reception

Another comment that was recurring in our sponsor interviews was the mention of a reception at the beginning of the project term in some years. This allowed all the sponsors working with WPI during that term to mingle and share experiences, as well as get a chance to learn a bit more about the other projects being completed. Many sponsors cited this event as being impactful to their understanding of just how much students were capable of completing, using the other projects to gauge their expectations. When asked what WPI could do to change or improve its work with their organizations, several sponsors suggested the reimplementation of this reception event. In speaking with our sponsor liaison, Professor Dominic Golding, we learned that the occurrence of this reception is dependent upon time, money, and director or advisor willingness. In some terms, these factors yield easily to the occurrence of the reception, while in other terms it is not, for one reason or another, feasible to hold a reception. We recommend that the center work to make this event, or a smaller-scale version of this event, a recurring tradition of the project experience in London. This would allow sponsors to see a larger impact and could increase their willingness to continue hosting projects with WPI.

5.2.3 Follow-up Between Sponsors and Alumni

In the free-response that correlated with the alumni survey question regarding impact on sponsors, an overwhelming number of alumni cited not knowing whether their project had an impact on their sponsoring organization or the greater community beyond the 7 weeks they spent completing the project. Many noted that they had no way of knowing if their deliverables were implemented or if their recommendations had aided their sponsor in the long run. Several even noted wishing their sponsor would have contacted them beyond the completion of the project to discuss in what way the project's final recommendations had resulted. This contradicts the information we received in our sponsor interviews, as most sponsors commented on the positive impact the WPI projects had on their organization.

A suggestion we have to combat alumni uncertainty regarding the effects their projects have had on sponsors and the greater community is the establishment of a follow-up protocol between the sponsoring organizations and WPI. This would allow the school to be accountable for all IQP projects completed in London, and would make record keeping much more accurate. If sponsors became comfortable following up with the school after, for example, a six-month period to explain any and all impacts the project had facilitated during that time, WPI would be able to chart the impact of its students' work more efficiently. WPI could then contact the alumni that had completed the project and make this information known to them as well. Allowing the alumni to have this point of follow-up will help them see the value of the work they completed during their time in London, and it will make their experience in London that much more special. It might be difficult to implement this system over just one term, but if attempts are made to promote follow-up between sponsoring organizations and WPI or its alumni, the impact of London Project Center's work in following years will become easier to measure.

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Appendix A: Alumni Survey Questions from Qualtrics Form

London Project Center Alumni Survey

Thank you for taking the time to complete this survey, it will be greatly helpful towards our development of an understanding of the impact of the London Project Center. Please note that your responses will be used to generate statistics for our final report. All questions are optional and all responses will be anonymous. No names will be included in the final report, without the explicit consent of the person being quoted.

Q1 When did you complete your IQP? (Term and year)

(Drop down menus for term and year)

Q2 Which type of organization sponsored your project?
- ○ Museum or Gallery (e.g. Science Museum, Tate) (1)
- ○ Social Service Organization (e.g. Royal National Institute for the Blind, Commonside Development Trust) (2)
- ○ Professional or Scientific Organization (e.g. Institute of Structural Engineers, Royal Geographical Society) (3)
- ○ National Government Agency (e.g. Department of Environment and Climate Change) (4)
- ○ Local Government Authority (e.g. borough council) (5)
- ○ Private/Semi-private Corporation (e.g. Crossrail, Transport for London) (6)
- ○ Other (Please specify) (7) _____

Q3 How important were each of the following aspects of the London Project Center in influencing your decision to complete your project in London?

	Very important (1)	Important (2)	Moderately important (3)	Minimally important (4)	Not important (5)
Geography (1)	○	○	○	○	○
City Setting (2)	○	○	○	○	○
Interesting Projects (3)	○	○	○	○	○
Opportunities to explore a new culture (4)	○	○	○	○	○
Similar language and familiarity (5)	○	○	○	○	○
Available in desired terms (6)	○	○	○	○	○

Q4 Looking back at your experience in London, how did completing IQP at the London Project Center...

	Very significantly (1)	Significantly (2)	Moderately (3)	Minimally (4)	Not at all (5)
Impact your subsequent academic endeavors at WPI? (1)	○	○	○	○	○
Create new opportunities for you professionally? (2)	○	○	○	○	○
Change or influence your career goals? (3)	○	○	○	○	○

Q5 Please comment on the reasoning behind your above answers to the fullest extent possible.

Q6 How did your IQP experience at the London Project Center influence you in the following skill categories?

	Very positively (1)	Positively (2)	Neither positively nor negatively (3)	Negatively (4)	Very Negatively (5)
Interpersonal Communication (1)	○	○	○	○	○
Research (2)	○	○	○	○	○
Oral Presentation (3)	○	○	○	○	○
Working to deadlines (4)	○	○	○	○	○
Teamwork (5)	○	○	○	○	○

Q7 Please comment on the reasoning behind your above answers to the fullest extent possible.

Q8 How did your IQP experience at the London Project Center influence...

	Very positively (1)	Positively (2)	Neither positively nor negatively (3)	Negatively (4)	Very negatively (5)
Your personal growth? (1)	○	○	○	○	○
Your global perspective (your awareness of other countries' customs, your ability to learn from and interact with people of cultures different from your own)? (2)	○	○	○	○	○

Q9 Please comment on the reasoning behind your above answers to the fullest extent possible.

Q10 Looking back, how did completing your IQP at the London Project Center impact your subsequent academic endeavors at WPI?
- ○ Very Positively (1)
- ○ Positively (2)
- ○ Neither positively nor negatively (3)
- ○ Negatively (4)
- ○ Very negatively (5)

Q11 Please comment on the reasoning behind your above answers to the fullest extent possible.

Q12 To what extent do you feel like your project had a lasting impact on the organization by which you were sponsored?
- ○ Very significant (1)
- ○ Significant (2)
- ○ Moderate (3)
- ○ Minimal (4)
- ○ Not at all (5)

Q13 Please comment on the reasoning behind your above answers to the fullest extent possible.

Q14 To what degree would you recommend completing a project through the London Project center to another student?

❍ Strongly recommend (1)
❍ Recommend (2)
❍ Neither recommend nor advise against (3)
❍ Advise against (4)
❍ Strongly advise against (5)

Q15 Please comment on the reasoning behind your above answers to the fullest extent possible.

Q16 (Optional) What is your name? Your name will not be disclosed to outside parties of this project, but you may be contacted for a follow-up clarification on your responses and/or asked for permission to attribute you to a quote.

Q17 What is your gender?

❍ Male (1)
❍ Female (2)
❍ Other (3)
❍ Prefer not to respond (4)

Q18 Do you have any photographs from your London experience that you would be willing to submit for potential inclusion in a London Project Center 30th anniversary celebration? If so:

❍ Yes (1)
❍ Maybe (2)
❍ No (3)

Q19 Please submit photographs to: lpc-16e4@wpi.eduFor proper attribution please provide your name, year/term of completion, and short description of photos.These photographs may be used in a slideshow or other type of display created by the project center for a 30th Anniversary Celebration.

Q20 If you would like to be entered to win an Amazon.com gift card, please include the email you would like to be contacted at below. (The email you provide will only be used to notify you if you win).

Appendix B: Interview Questions - Professors/Advisors (WPI)

May we record this interview to have it as reference for our later studies?

<u>Directors</u>

- Confirm role in the London project center (from what we researched prior to interview)
  - Is there anything else that we should know?

- How did you become part of the London Project Center? How did you become director?

- What do you see as being the greatest impact of the WPI project experience?
  - How do you know that the experience had that impact?

- How have you observed the London Project Center change and evolve?
  - How has the nature of the projects changed?
  - Changes in everyday life in london - residential options, activities
  - What can you tell us about the process of finding and working with sponsors, and how that process or the sponsors that you worked with changed over time?

- What do you see as being the greatest impact of the London project center?   Please explain how you know that the experience had that impact.
  - Academic skills - learning experience
  - Student life - social impact, impact on cultural awareness
  - What do you think are the most valuable things that sponsors get out of the projects?
  - Were there any particularly impactful projects that stood out amongst the others?

- What do you look for when interviewing prospective London IQP applicants?

- How did your involvement with the London Project Center come to end? (for those no longer involved)

- Would you be willing to answer any additional questions or clarifications, if needed, over email?

- Do you have any photographs that you would be willing to submit for potential inclusion in an anniversary celebration?
  - Photographs submitted to: lpc-16e4@wpi.edu
  - We will keep these in a drive, along with backups

May we record this interview to have it as reference for our later studies?

- What do you see as being the greatest impact of the WPI IQP project experience?
    - How do you know that the experience had that impact?

- What do you see as being the greatest impact of the London project center?   Please explain how you know that the experience had that impact.
    - Academic skills - learning experience
    - Student life - social impact, impact on cultural awareness
    - What do you think are the most valuable things that sponsors get out of the projects?
    - Were there any particularly impactful projects that stood out amongst the others?

- Why do you like to advise in London? Why do you reapply each year?

- Did you observe any significant changes in the project experience during your different trips to London?
    - What was the nature of the project(s)? (How have they changed?)
    - Changes in everyday life in london - residential options, activities

- Would you be willing to answer any additional questions or clarifications, if needed, over email?

- Do you have any photographs that you would be willing to submit for potential inclusion in an anniversary celebration?
    - Photographs submitted to: lpc-16e4@wpi.edu
    - We will keep these in a drive, along with backups

R. Vaz and important people to speak with about Project-Based Learning

May we record this interview to have it as reference for our later studies?

- Discuss role in project-based learning and London Project center based on our background research. (Especially from ASEE conference material and report on alumni.)

- What do you see as being the greatest impact of the WPI IQP project experience?
  - o How do you know that the experience had that impact?

- What makes you as passionate as you are about project work?

- What value does the LPC bring to the overall IQP program?

- What makes LPC unique when compared to other project centers?
  - o As far as challenges to students, faculty involvement, sponsor involvement.

- Would you be willing to speak with us again in the future for clarifications, if needed, over email?

- Do you have any photographs that you would be willing to submit for potential inclusion in an anniversary celebration?
  - o Photographs submitted to: lpc-16e4@wpi.edu
  - o We will keep these in a drive, along with backups

Appendix C: Interview Questions - Sponsors (London)

- How long have you been involved in your organization?

- How long have/had you been in connection with the London Project Center?
  - If you have not personally worked with the Center, do you know of anyone that has worked with the Center? Could we reach out to him/her?
  - What types of projects has the London Project Center and WPI facilitated for your organization?

- How has the London Project Center impacted your organization?
  - How do you know it had that impact? Can you explain a specific instance?

- If your organization has sponsored multiple projects through the London Project Center, why have you found it beneficial to keep sponsoring projects?

- If your organization only sponsored one project, what were the reasons behind the decision to stop sponsoring projects?

- Was there anything about the project experience (from a sponsoring end) that you would suggest WPI work to improve?

- On average, how closely did you personally work with the students in which your organization sponsored? (Very closely - not very closely)

- How independently would you say the students worked while involved with your organized?

- Would you be willing to speak with us again in the future?

Appendix D: London Project Center Alumni Testimonial Qualtrics Form

This survey will be used to complete an alumni testimonial section of the London Project Center web page, all of your responses have the potential to be published publicly on the LPC site. Our hope is that adding your testimonials will encourage current students to consider applying to the London Project Center when completing IQP. Thank you for your time and for sharing your experiences with us.

Q1 What is your name?

Q2 What was your major and your year of graduation?

Q3 Can you give us a brief synopsis of your professional life post-graduation?

Q4 Why do you believe it is valuable to complete IQP abroad?

Q5 What is the most valuable takeaway from your IQP in London?

Q6 Why would you recommend the London Project Center to students applying abroad for IQP?

Q7 How did completing your IQP in London open new doors for you academically and professionally?

Q8 What was your favorite aspect of your IQP experience in London?

Q9 What was the most interesting place in London you visited?

Q10 Please upload a suitable picture of yourself to be attached to your testimonial profile (head shot preferred).

Q11 Thank you for your responses! You will be notified if your testimonial will be published on the London Project Center website. If you would like to see projects students have completed in recent years, or where your testimonial will be published, please continue to http://wp.wpi.edu/london/

Appendix E: Additional Survey Data
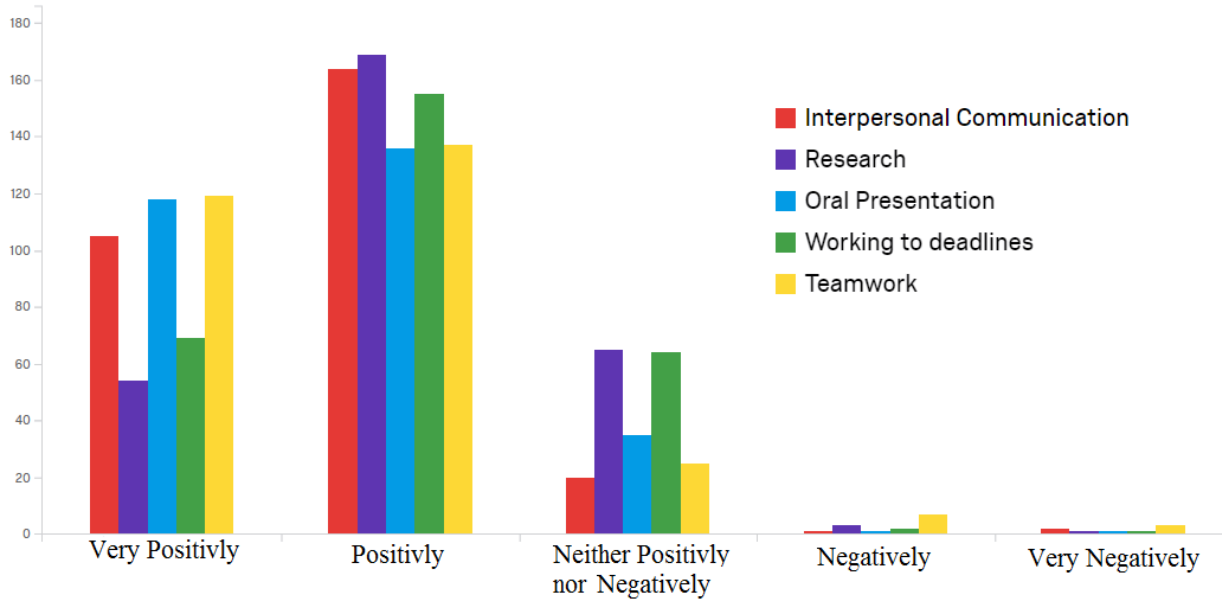
#	Field	Interpersonal Communication		Research		Oral Presentation		Working to deadlines		Teamwork	
1	Very positively	35.84%	105	18.43%	54	40.41%	118	23.63%	69	40.75%	119
2	Positively	55.97%	164	57.68%	169	46.58%	136	53.08%	155	46.92%	137
3	Neither positively nor negatively	7.17%	21	22.53%	66	12.33%	36	22.26%	65	8.90%	26
4	Negatively	0.34%	1	1.02%	3	0.34%	1	0.68%	2	2.40%	7
5	Very Negatively	0.68%	2	0.34%	1	0.34%	1	0.34%	1	1.03%	3
			293		293		292		292		292

1998 - 2014 skills survey response
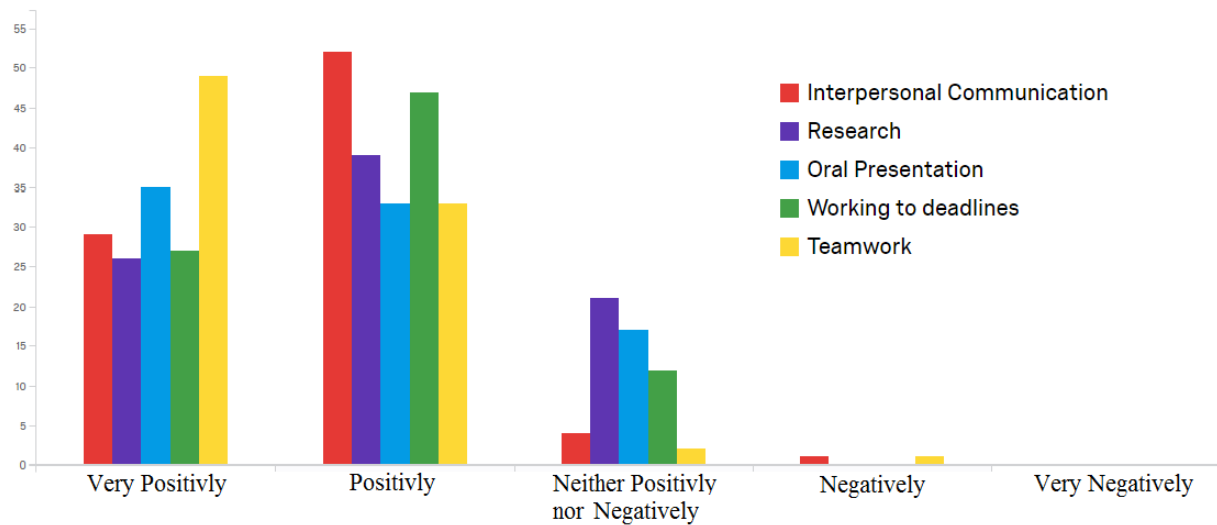
#	Field	Interpersonal Communication		Research		Oral Presentation		Working to deadlines		Teamwork	
1	Very positively	33.72%	29	30.23%	26	41.18%	35	31.40%	27	57.65%	49
2	Positively	60.47%	52	45.35%	39	38.82%	33	54.65%	47	38.82%	33
3	Neither positively nor negatively	4.65%	4	24.42%	21	20.00%	17	13.95%	12	2.35%	2
4	Negatively	1.16%	1	0.00%	0	0.00%	0	0.00%	0	1.18%	1
5	Very Negatively	0.00%	0	0.00%	0	0.00%	0	0.00%	0	0.00%	0
			86		86		85		86		85

1983 - 1998 skills survey response

Appendix F: Conducting effective social science research

In order to form an understanding of the London Project Center's impacts over the last 30 years, one must first understand what information is needed and how to carry out the research. In order to capture the entire scope of the impacts of the center, the study will involve acquiring multiple perspectives from many participants and stakeholders, including alumni of the center, faculty advisors, and individuals from sponsoring organizations, or a person involved in another related manner. We hope to find information pertaining to how the center has affected each individual, those they interacted with, and their surroundings as a whole. In order to find this information, we looked into how to conduct effective evaluation research. The focus of evaluation research is to determine how aspects of society, ranging from individuals to the society as a whole, have been affected by efforts to cause changes in social patterns (Schutt, 2014). The difference between evaluation research and other forms of social research is that it is focused specifically on programs designed to facilitate change in subjects (Schutt, 2014). More specifically, evaluation research involves an impact evaluation, which is defined as "analysis of the extent to which a treatment or other service has an effect" (Schutt, 2014, p. 455). An analysis of the London Project Center's impacts would fall under this category because the center's goal is to create learning opportunities for students through projects that simultaneously benefit the sponsoring organizations.

Evaluation research can consist of multiple alternative research orientations, two of which would be qualitative research and quantitative research (Schutt, 2014). The two differ in types of data that the researcher seeks. Qualitative research aims to create an image of the subject through a collection of representations, a solely interpretive approach (Denzin & Lincoln, 1994). Essentially, qualitative research focuses on interpretation through the senses, thought, and emotion rather than numerical values and statistics. Qualitative research is most widely used for controlled experiments that analyze human behavior and interactions (Ritchie, Lewis, Nicholls, & Ormston, 2013). Conversely, quantitative research is used to analyze changes in numerical data, a method oriented towards mathematical logic. Research done to find the impacts of the London Project Center may include means that are both qualitative and quantitative. An example of qualitative data would be varying experiences of personal growth within students. Quantitative data would be, for example, the average increase in the number of London sponsors from year to year.

Due to the involvement of human subjects in evaluation research, there are a number of ethical values to consider. Ethics in any type of social research can be very sensitive and lead to serious issues between the parties involved. Two of the most common, yet undoubtedly important practices in evaluation research are avoiding offense and ensuring consent. Social research has potential to be quite intrusive towards those who partake in a study ("Social Research," 2002). For example, a person may not be aware that they are being studied, may find offense in the researcher's questioning, or may not be comfortable with their answers being published. As a researcher, one would want to ensure that all parties are comfortable and that none of these problematic situations may arise. In addition to receiving initial consent from those involved, two important practices to reduce chance of issue are to always explain to an individual that their participation is entirely voluntary, and to remember that they are entitled to refuse giving information at any time should they feel uncomfortable ("Social Research," 2002). Another very important factor to consider when doing evaluative research is confidentiality. Both the identities of individuals involved and the information they share with the researchers must always be secured. Such data should not be distributed to any outside parties, unless definite approval was given by the individual to release the information ("Social Research," 2002). In cases where participants may be directly quoted, the respondents must give permission before the data is used. The identities of participants must remain anonymous until they agree to allow their name to be used in publication. With the use of modern information technology, data security is at greater risk. To reduce chances of data being compromised, researchers should always limit the use of devices to those authorized to access the information ("Social Research," 2002). As the documentation of the historical timeline of the London Project Center will require the gathering and organization of data obtained from direct interviews and surveys with individuals, we have obtained approval from WPI's Institutional Review Board (IRB) to conduct said interviews and surveys. We fully intend to follow proper ethical considerations when implementing our research methods.

When seeking effective research methodology, one common option that arises is survey research. Survey research is where data is collected through a number of individuals who respond to a questionnaire (Schutt, 2014). The questions may ask for information about the individual or others with which he or she interacts (Schutt, 2014). Surveys can be designed to gather information in many different ways, making them a staple of any social research.

The most important aspect in survey design is the content of the questions. The questions within the distributed survey are designed to collect unique data from each individual, therefore they must be easy for the participants to understand, yet specific enough to draw usable data for the researchers. A good practice is to always provide explanations for the terms used in the survey, since the respondents may not be as knowledgeable as the researchers are on certain topics (Quinn, 2014). Additionally, a researcher should avoid phrasing questions in ways that can sway respondents' opinions and lead to biased responses (Quinn, 2014). The goal is to observe the respondents thoughts, not to bias responses in order receive the answers for which the researchers show preference. We plan to compose and distribute a survey containing unbiased questions so that we can collect data that is as objective as possible.

Since a single survey can be distributed to large groups of participants at once, it can be difficult to review a large collection of open-ended responses. As a result, it is common for researchers to design questions that can be quantitatively reviewed, yet represent responses that would usually be qualitative (Kasunic, 2005).

In order to organize and make sense of the large amount of qualitative data received from both the distributed survey and interviews, we needed a plan for analyzing open-ended, non-scalar responses. As recommended by both our project advisors and project liaisons, we began to research analysis or "coding" strategies for this type of data.

An article by David R. Thomas, University of Auckland, allowed us to identify exactly what type of analysis we were looking for. The article introduced two categories of qualitative data analysis: inductive analysis and deductive analysis. Inductive analysis involves taking a data set with no preconceptions and sorting through the data to generate theories based on trends found (Thomas, 2006). On the other hand, deductive analysis involves testing predefined hypotheses, where the data is then sorted to either prove or disprove the hypotheses (Thomas, 2006). Because our research is not based on a written hypothesis or any preconceived trends, it was determined that inductive analysis would be our method of choice. We created a unique inductive analysis scheme that allowed us to best uncover impact and effect from qualitative data. The scheme is to be tailored to each question in our survey and interviews.

Appendix G: Email form to send to alumni regarding alumni survey

Dear Alumnus or Alumna of the London Project Center,

Following up on Professor Golding's recent email, we would like to ask if you could please take 5-15 minutes to complete the survey we have created. Any information you can provide will be valuable to our development of an understanding of the impact of the London Project Center. All survey respondents who are interested will be entered to win a $50 Amazon gift card, and there will be 3 winners. The survey will be closing at 5pm EST on May 20th.

The survey may be found at: http://wpi.ut1.qualtrics.com/SE/?SID=SV_6gNsTZXShid9XJr

If you have any questions about the project or the survey, feel free to email us at Lpc-16e4@wpi.edu.

Thank you so much for taking the time to help us out as we complete our IQP.
Best Regards,
WPI London Project Center IQP Team
(Calum, Lauren, Emily, and Michael)

Appendix H: Email form from Professor Dominic Golding regarding alumni survey

Dear Alumnus or Alumna of the London Project Center,

As you may know, WPI has been conducting IQPs in London since the early 1980s and the London Project Center officially opened in 1987. Since this time, students have completed more than 300 projects with various museums, local government agencies, professional organizations, and community groups in London on a wide variety of topics. We are planning to celebrate the 30th anniversary of the London Project Center at WPI in the fall of 2017 and hope you may be able to join us for those celebrations. We will send details in due course.

In looking forward to this event, I have been working closely with a group of WPI students (Calum Briggs, Lauren Getz, Emily McGlame, and Michael Padberg) who are conducting their IQP in London this E term. They will be assessing the impacts of the London Project Center projects on the students, faculty advisors, project sponsors, and wider community. As part of this project, Calum, Lauren, Emily, and Michael have put together an online survey designed to collect information about alumni project experiences in London and will send you a link to the survey shortly. I would be most grateful if you would take a few moments to complete the survey. The information you provide will be invaluable to me, the students, and WPI as we strive to build on the successes of the past 30 years in London and plan for the future.

If you have any questions about the project and/or the planned celebrations, please call or send me an email.

With many thanks for your invaluable feedback and best regards,
Dominic Golding
Director, London Project Center

Appendix I: Email form to send to sponsoring organizations regarding interviews

Dear _____ (formal name and title (Ms./Mr./Dr./Professor))

We would like to introduce ourselves as a team of four undergraduate students from Worcester Polytechnic Institute (WPI). We are currently working to complete our Interactive Qualifying Project (IQP), through the WPI London Project Center. The goal of our project is to understand the impact of the London Project Center over the past 30 years, including the effects that students have had on London organizations and the community. Our final project will include a timeline of the London Project Center's origin and development, noting all of the projects completed.

We are very enthusiastic to be working on this project and are beginning to reach out to contacts from organizations that have previously sponsored a project through the WPI London Project Center. Over the last seven weeks, we have been doing background research and developing interview strategies. During our research and by speaking to our sponsor, Professor Dominic Golding, we found that [your organization] has sponsored [their involvement]. We are interested in learning how WPI students have had an impact through these projects, and would be very grateful to hear any pertinent knowledge you would be willing to share about the projects sponsored by [your organization] and your personal experiences with the WPI London Project Center.

Would you be available for a short interview, about 30 minutes, before June 10th, so that we may discuss your experience working with WPI students?
Ideally, we would hope to meet in person for a recorded interview. We would be happy to meet with you wherever you find convenient. If an in-person meeting would not be possible, we would also appreciate speaking with you by phone.

Please contact us through our e-mail alias:
Lpc-16e4@wpi.edu. This alias will direct your message to each member of the group simultaneously.

Thank you for any insight you are willing to share with us.
Sincerely,
Michael Padberg, Lauren Getz, Emily McGlame, Calum Briggs.
WPI London Project Center IQP Team

Appendix J: Schedule of interviews with sponsoring organizations in London

Name	Role	Organization	Date of Interview	Interviewers
David Houston	Schools Producer-Learning	Design Museum and LTM	Monday, 23 May @ 1pm (28 Shad Thames, London)	Emily, Michael
Hannah Clipson	Community Learning Officer	The Postal Museum	Wednesday, 25 May @ 4pm (Freeling House Phoenix Place London WC1X 0DL)	Lauren, Michael
Peter McDonald	Travel & Transport Planning Officer at Croydon Council	Croydon	Thursday, 26 May @ 1pm (8 Mint Walk, Croydon)	Michael, Calum
Joyce Ip	Planning and Regeneration	Brent (previously)	Tuesday, 31 May @ 1pm (Civic Center, Lampton Road, Hounslow)	Emily, Calum
Adrian Hewitt	Former Principal Environment Officer	Merton (previously)	Wednesday, 1 June @ 11:00 (phone)	Everybody
Elizabeth Poulter	Inspire Engineering Officer	London Transport Museum	Thursday, 2 June @ 11am (London Transport Museum)	Lauren, Emily
Lauren Hillier	Education Program Manager	Crossrail	Thursday, 2 June @ 10am (Crossrail Offices Canary Wharf)	Michael, Calum
Ben Alsop	Project Curator: Citi	British	Friday, 3 June @ 12pm (British	Calum, Lauren

	Money Gallery	Museum	Museum info desk)	
Naomi Martin	Director	Commonside Community Development Trust	Monday, 6 June @ 10:30am (Caffe Nero, Elizabeth Street)	Lauren, Emily
Jenifer Hawks	Director, Art Alive	Project Center Liaison (previously), Sponsor through Art Alive	Tuesday, 7 June @ 10am (Skype)	Everybody
Alexandra Burch	Director of Learning	Science Museum (previously)	Tuesday, 7 June @ 4pm (Natural History Museum)	Emily, Michael
Bridget Clifford	Keeper of Tower Armouries	H.M. Tower of London	Wednesday, 8 June @ 2pm	Emily, Lauren
Steve Cardis	LDF Manager	Merton Council (previously) and Kingston Council	Friday, 10 June @ 3pm (Phone)	Everybody

Appendix K: Schedule of interviews with past and present WPI faculty

Name	Role	Date of Interview	Interviewers
Prof. Dominic Golding	Center Director	April 4, 2016 (Skype)	Michael and Calum
Prof. John Zeugner	First faculty advisor	April 20, 2016	Michael and Emily
Prof. Lance Schachterle	Involved in early stages of center	April 21, 2016	Michael and Lauren
Prof. Paul Davis	Previous Center Director	April 22, 2016 (phone)	Michael and Calum
Prof. Constance Clark	Faculty advisor	April 25, 2016	Michael and Emily
Dean Richard Vaz	Dean of IGSD	April 26, 2016	Michael and Calum
Prof. Ruth Smith	Faculty advisor	April 26, 2016	Emily and Lauren
Asc. Dean Rissmiller	Asc. Dean of IGSD and faculty advisor	April 27, 2016	Emily and Lauren
Prof. Patricia Stapleton	Faculty advisor	April 28, 2016	Lauren and Calum
Prof. Emeritus James Demetry	Faculty advisor	April 28, 2016	Lauren, Calum, Michael, Emily
Prof. Scott Jiusto	Faculty advisor	May 12, 2016 (Skype)	Michael and Lauren