

Helping WPI Students Make Better IQP Choices

An Interactive Qualifying Project Report

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This report represents the work of three WPI undergraduate students submitted to the faculty as evidence of completion of a degree requirement. WPI routinely publishes these reports on its web site without editorial or peer review

Abstract

Worcester Polytechnic Institute's on-campus Interactive Qualifying Project (IQP) reports on average have not been meeting the desired levels of student learning set by WPI. Therefore, our goal was to improve the quality of the on-campus IQP by first determining student knowledge, motivation, and attitudes toward the project, and then using these findings to develop appropriate recommendations that WPI can implement. Through faculty and student interviews we recommended to WPI that improved resources, better communication, and increased guidance can expand student understanding of and motivation toward the IQP.

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One of our most intriguing interviews was with Dean William Grogan. Dean Grogan was an essential factor in convincing the WPI faculty to embrace the IQP, and offered a behind the scenes look at the IQP - a point a view not many students or faculty are lucky enough to have.

Finally, we would like to thank each student who took the time to do an interview with one of us. Our recommendations would be non-existent without their fantastic feedback.

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Executive Summary

Project Goal and Objectives

The Interactive Qualifying Project (IQP) is one of Worcester Polytechnic Institute's (WPI) most distinctive elements, making for a technological university similar to few others. The IQP plays an important role in WPI's education by letting "students learn something about the role of science and technology, its impact on society, its place in meeting human needs and human efforts to regulate, control, promote and manage our changing technologies" (Interactive Qualifying Project (IQP), 2010). When completing the IQP students have the option to either work on-campus or off-campus. WPI periodically conducts thorough reviews of both on-campus and off-campus IQPs submitted during the school year in order to get an idea about the current status of the projects. Assessment Coordinator D. DiBiasio summarized the evaluations of the team of faculty reviewers that evaluated several IQP reports. Faculty reviewers that evaluated the quality of past IQPs found that most off-campus student projects are achieving WPI's learning outcomes for the IQP, while a significant fraction of on-campus projects are not (Dibiasio, 2003). In general, the on-campus project reports tend to be of lower quality.

Our goal for this project is to improve the quality of the on-campus IQP by first determining student knowledge, motivation, and attitudes toward the project, and then using these findings to design appropriate recommendations that WPI can implement. We want to understand students' opinions about the project before we decide on any way to help. We then hope to develop information sources based on our findings that could benefit students by making them more aware of the advantages of an on-campus IQP and also how to appropriately choose a project. Finally, we will compile all the information we have learned and develop recommendations to WPI about what type of new systems should be put into place and why they would be beneficial to students based on our conclusions.

Methodology

We initially interviewed faculty who have been involved with the IQP since its implementation in the WPI curriculum to gain the faculty's perspective. Our background research indicated that intrinsic motivation may contribute toward students' choice and completion of a successful project, so we followed up the faculty interviews with student interviews in an attempt to discover how they perceive the project, what improvements would be most beneficial, and what ways intrinsic motivation can be increased. We organized the student interviews into three target groups: juniors without IQPs, juniors working on IQPs, and sophomores who will be choosing IQPs. Once compiled, we analyzed the student feedback quantitatively and qualitatively in order to provide WPI with appropriate recommendations.

Findings

Our findings, derived from student responses, are organized into five major themes. Within each theme, we discuss specific feedback pertinent to our project's problems and goals.

Attitudes and Motivation of Students toward the IQP: In this section, we present our major findings regarding student feedback on the IQP as a whole.

- *WPI students do want to find interesting projects, but many are unaware of the available resources.*
- *Many juniors with IQPs reported that if students are motivated to discover a project of interest and successfully find one, then they have more potential to produce high-quality results.*

The majority of students interviewed are/were looking forward to the IQP. They exhibited good attitudes toward the project, and want/wanted to find something of interest, regardless of how challenging the project may be.

Student Attitudes and Motivation towards the IQP Selection Process: This section refers to student feedback on the process of actually choosing a project.

- *There seems to be little motivation for sophomores to start the process of finding an on-campus IQP, and project resources seem to be unhelpful with the result that students are ending up with projects that are not of personal interest to them.*
- *Many students expressed the desire for better advertising, organization, and online resources that could potentially help students better find projects of interest.*

The students interviewed felt the process of choosing an IQP needs improvements in various aspects. When juniors without projects were asked why they thought the process was poor, no common trend emerged from the responses, reflecting that there may be multiple problematic aspects. In addition, sophomores claimed that students could use more motivation early on to get started by improving project advertising and resources.

Student Knowledge of IQP Learning Outcomes: In this section we discuss student knowledge of the IQP's importance and its learning outcomes.

- *Many students interviewed did not grasp the entirety of the IQP's learning outcomes.*

Students mentioned the development of group work skills and solving real world problems the most as what they believed are the learning outcomes of the IQP. On the other hand, all three target groups failed to recognize the development of research, writing, and problem solving skills as part of the learning outcomes of the IQP.

Student Attitudes towards Current IQP Resources: This section discusses student desires for improvements to IQP resources.

- *Students desire a way to find projects that are personally interesting as well as a way to find partners with similar interests.*
- *Most students interviewed were aware of some of the resources WPI has to offer, but did not find them helpful.*

- *Students expressed the desire for WPI to re-evaluate the general advertisement and usefulness of their IQP resources in order to provide available, updated IQP information.*

The interviewed students felt that the IQP resources were difficult to find, difficult to use, and did not contain the information they were seeking.

Student Preferences for New IQP Resources: The following section describes students' suggestions for improvements to current IQP resources.

- *The biggest finding among all students interviewed is that a single resource, where students can go to find information on all available IQPs, does not exist.*
- *Many juniors who have already completed or who are currently working on an IQP expressed the feeling that a new online resource could have helped them through the choosing process.*
- *The advertisement of on-campus projects and resources appears to be extremely ineffective.*
- *Faculty posting projects do not provide sufficient information about the projects on the IQP resources and are often absent from informational seminars such as the IQP fair.*

As a whole, students interviewed want better guidance, increased advertisement of projects, and improved informational resources when choosing an IQP. Evidently, the online IQP information WPI offers is either unhelpful or unknown seeing as students voiced the need for an online IQP resource with available project information above all.

Recommendations

From the findings we developed potential solutions to the problems discussed. Initially we describe how the project programs website can be improved and how it can become more user-friendly. Secondly, we make recommendations to increase the level of communication and guidance for students throughout the IQP selection process. Every solution we present in this chapter refers to a specific course of action, as well as the specific group or groups within WPI that are most capable to make these changes.

WPI's Projects Program Website

Webpage Content

- *We recommend that the IGSD enhance the content on the IQP website where on-campus projects are posted. Students desire the website to contain a list of available on-campus projects, with specific details for each, and should have the option to click an "interested" button as an initial way to form project groups.*
- *We recommend that the webpage showing on-campus project listings also contain a way to find partners. An additional link should be available at the top of the page titled "Students in need of a project" which directs students to a list of names and emails of every student grouped by major who has not "signed up" for a project.*

- *We recommend that there be an easier way for students to quickly and effectively find a project on the webpage displaying available on-campus projects. A search bar should be added to the top of the on-campus project listing webpage where students can choose from a drop-down advanced search menu with categories such as advisors, project keywords, terms offered, number of students signed up.*
- *We recommend that the IGSD update the on-campus webpage that shows the list of available projects more consistently by removing projects as soon as students have registered for them. The IGSD should allow for an administrator's assistant or even a work study student to access the website, so that they can take registered projects off the website every term when PRJ reports come in.*

Website Structure

- *We recommend that the IGSD modify the structure of the website to make the list of available projects more obvious on the projects programs webpage. Students who tried to navigate the projects program website found the process confusing and unhelpful.*
- *We recommend that WPI make it easier for students to locate the IQP webpage through the WPI website. According to students, it would be most beneficial to have a link to the IQP webpage located within the "Student Resources" webpage of the WPI website.*
- *We recommend that the IGSD change the two links under the title "IQPs" on the webpage to "on-campus" and "off-campus" links, rather than "Faculty Sponsored" and "Externally Sponsored", and that the webpages thereafter also change titles respectively.*
- *In order to give students information about the IQP as a whole, we suggest that also under the title "IQPs" there be an easy to understand, user-friendly informational table.*

Communication and Guidance

- *We recommend that the IGSD increase the advertisement of available resources that help with choosing an IQP. The findings indicated that students are motivated to find a project, but are unaware of how to.*
- *We recommend the IGSD include the IQP learning outcomes with every available IQP resource. Along with the learning outcomes, we also recommend that faculty IQP advisors include suggested background courses to help students reach them.*
- *We recommend that academic advisors suggest that their sophomore students start looking into IQPs for their junior year and provide some information and useful links to help get them started.*
- *We recommend that the IGSD motivate sophomores towards the IQP early on by sending periodic emails.*
- *We recommend that WPI, specifically the offices of the IGSD and the Registrar, reach out to juniors and seniors without projects more aggressively. The findings indicated that students without IQPs in their junior year seem to be forgotten.*
- *We recommend that the Student Activities Office run programs for students to receive first hand early guidance with the IQP. Students could benefit from student Project Advisors (PAs) to help them through initial IQP steps.*

- *We recommend that WPI offer an informational seminar for students where they can receive a tutorial on all the resources, PA programs, project departments, and any other data relevant to the IQP.*

1 Introduction

The Interactive Qualifying Project (IQP) is one of Worcester Polytechnic Institute's (WPI) most distinctive elements, making for a technological university similar to few others. The IQP gives students the opportunity to work on non-technical projects that help solve real world problems through hands-on group work. WPI's project-based curriculum provides an experience that quite possibly could give WPI graduates a competitive edge in the professional world.

The IQP plays an important role in WPI's education by letting "students learn something about the role of science and technology, its impact on society, its place in meeting human needs and human efforts to regulate, control, promote and manage our changing technologies" (Interactive Qualifying Project (IQP), 2010). The IQP gives students the chance to acquire research, writing, and problem-solving skills and is usually completed during a student's junior year. Students can work on projects that are either within their major or outside it, offering them the opportunity to get involved in projects that broaden the spectrum of their education and make them better-rounded.

When completing the IQP students have the option to work on-campus or off-campus. Faculty reviewers that evaluated the quality of past IQPs found that off-campus student projects are achieving WPI's learning outcomes for the IQP, while a significant amount of on-campus projects are not (Dibiasio, 2003). A 2007 review of on-campus IQP reports revealed that the lower educational quality of the on-campus projects has not improved over the years (Rissmiller, Achievement of IQP Learning Outcomes As Indicated in 2007 IQP Review Of Projects Completed On Campus, 2008). It seems that certain aspects of WPI's on-campus projects are problematic for students attempting to complete a successful research report, yet their origin is unclear. Are students not motivated enough when it comes to an on-campus IQP? Are students under informed about the on-campus IQP and how to find a project of interest? Would students benefit from more sources of information about the IQP and why it is important? The answers to these questions could help determine recommendations to improve the quality of the on-campus IQP, and hopefully make students regard the on-campus project more highly.

Our goal for this project is to improve the quality of the on-campus IQP by first determining student knowledge, motivation, and attitude toward the project, and then using these findings to design appropriate recommendations that WPI can implement. We will start by interviewing faculty to understand the history of the IQP and also to learn of changes made since its creation. Our next step will be to interview various student groups in order to gather student feedback regarding the IQP. We want to understand students' opinions of the project before deciding on any way to help. Based on our findings, we will develop recommendations that students find most beneficial.

2 Background

In this chapter we provide a detailed description of the different aspects of the Interactive Qualifying Project. The first section presents a general explanation of what the IQP is, the reason for its creation, and why the University finds it important that all students complete one. We then illustrate the history of the IQP and the changes that have taken place which have molded the on and off-campus projects. Finally, we describe the results from past studies of the on-campus IQP system regarding low quality projects and students not understanding the learning outcomes of the project.

2.1 What is the IQP?

The WPI Plan was voted into effect in 1970. This Plan promoted a hands-on learning technique that encompassed four project degree requirements: a Major Qualifying Project (MQP), an Interactive Qualifying Project (IQP), a Competency Exam, and a Humanities and Arts Sufficiency. WPI initially created the IQP to “encourage students to understand how technology affects society” (Dorsey, 1996), and made it a recommendation, rather than a requirement. However, the IQP would soon become WPI’s “most distinctive academic requirement” (Interactive Qualifying Project (IQP), 2010) with around 60% of all projects completed at one of the off-campus project centers in Africa, the Americas, Asia, Australia, and Europe.

The IQP is completed with at least one faculty advisor and one or more students. It produces a workload equivalent to three WPI course credits. WPI hopes that its students will gain the knowledge to “understand, as citizens and as professionals, how their careers will affect the larger society of which they are apart” (Interactive Qualifying Project (IQP), 2010) after completing a project. WPI intends for the IQP to be “an intentionally broad and integrative experience” (Interactive Qualifying Project (IQP), 2010). One external reviewer goes as far to say that the IQP “is probably the best outcome indicator the college (WPI) has of whether students are accomplishing the goals the college has set for them” (Shoenburg, 2004).

2.1.1 Why was the IQP Created?

Worcester Polytechnic Institute found itself at a crossroads in 1963. Although WPI was a respected institution of higher technological learning, it had reached a stalemate of educational structure and innovation (Dorsey, 1996). “From my perspective, WPI was dead in the water. There was simply no reason [for students or faculty] to stick around” stated Dean William Grogan, co-founder of the WPI Plan (Dorsey, 1996). When educational freedom was what they wanted, WPI offered a rigid structured curriculum

and put restrictions on social life (Dorsey, 1996). Mike Dorsey exemplified this idea: “In a typical four-year curriculum, most undergraduates had only two electives. Class attendance was mandatory. Saturday mornings were spent in classes or in drills for ROTC, which was required of all students. Women, who were not yet allowed to attend WPI, were prohibited from residence hall rooms without supervision” (Dorsey, 1996). He also claimed that it seemed to students that WPI did not think they were ready to make decisions on their own, and therefore made the decisions for them (Dorsey, 1996).

Another issue was the high tuition versus the educational values. The tuition the school required did not seem to reflect its curriculum (Dorsey, 1996). It was likely that students could complete the same education elsewhere for much less. There was no incentive for students to attend WPI and pay the high fees. “Here I am at Worcester Tech, and I can’t think of a reason why I would want to go here. What does this school offer that I couldn’t get somewhere else for less money?” stated Professor Bill Shipman (Dorsey, 1996), who would eventually be appointed as chairman of the Faculty Planning Committee.

In 1968 Harry Purnell Storke was inaugurated as president and made the decision that it was time to implement a new system for WPI. He created the Presidential Planning Committee that would go on to produce the WPI Plan which was loosely based on the Oxford-Cambridge Model of education. This model based graduation requirements on a student’s ability to apply learned knowledge, rather than on the ability of a student to simply gather facts from courses alone (Dorsey, 1996). The committee wanted to produce a curriculum revolving around independent studies and projects to “provide realistic and intimate learning situations for both students and faculty” (Dorsey, 1996). As a part of this project-focused program proposal, the committee formed the Interactive Qualifying Project.

2.1.2 How does the IQP Benefit Students?

The IQP attempts to provide students with an opportunity to use their education to solve problems rooted in both technology and society in a real-world capacity. WPI offers an environment to complete such a project, since it is a technological institution and has an Interdisciplinary and Global Studies department dedicated to the integration of WPI students into society. The IQP also helps students discover absorb educational aspects that are useful in all academic endeavors as well as future career paths. Professor DiBiasio, former Assessment Coordinator of the IGSD, believes the IQP puts WPI students a step ahead when it comes to hands-on work experience. He also states the IQP encompasses certain skills such as teamwork, communication, and problem-solving as they apply to culture and society, and that these talents are beneficial to have prior to entering into the job market.

The IQP allows students to gain a perspective on topics concerned with technical, social, and humanistic context, and its overall purpose has nine specific faculty-approved learning outcomes, as seen verbatim below (Learning Outcomes of the IQP, 2007).

- Demonstrate an understanding of the project's technical, social and humanistic context
- Define clear, achievable goals and objectives for the project
- Critically identify, utilize, and properly cite information sources, and integrate information from multiple sources to identify appropriate approaches to addressing the project goals
- Select and implement a sound approach to solving an interdisciplinary problem
- Analyze and synthesize results from social, ethical, humanistic, technical or other perspectives, as appropriate
- Maintain effective working relationships within the project team and with the project advisor(s), recognizing and resolving problems that may arise
- Demonstrate the ability to write clearly, critically and persuasively
- Demonstrate strong oral communication skills, using appropriate, effective visual aids
- Demonstrate an awareness of the ethical dimensions of their project work

2.2 How has the IQP Evolved?

The original Interactive Qualifying Project had a different structure and system than that it does today. In this section we will review how the IQP was structured when it was first made, how it has changed over the years, what the present IQP system is like, and what similarities and differences exist among the on and off-campus projects.

2.2.1 The Interactive Qualifying Project in the 1970's

The Zwiebel Committee was created to design the original IQP. Initially WPI created the IQP as an academic option, rather than a university requirement, but members of the committee were unsure whether there would be a sufficient amount of project topics and if faculty would be willing to advise them. Instead WPI offered students the opportunity to complete two Major Qualifying Projects (MQP); projects with topics related to one's major. WPI monitored pilot IQPs to see if they could meet the goal of WPI created the Plan and the Zwiebel Objectives as a rubric to evaluate these pilots (The Zwiebel Committee, 1972). It became apparent soon after that a shortage of project topics would not be an issue. Within four years the IQP was voted in as an academic requirement (Schachterle, 2010).

WPI made courses available to students during their freshman and sophomore years that assisted in the development of skills needed to produce a successful project: “Introduction to Projects” and “Preparation for Interactive Projects” (Trask, 1973). For each student group that was working on a project there were usually two faculty members assigned to help them through the process: a technical advisor, and a non-technical advisor. These advisors helped to guide the students and support them as necessary.

During the years following the creation of the IQP, faculty members became increasingly involved and new faculty members were constantly encouraged to take part in the program (Schachterle, 2010). WPI also offered faculty members summer workshops, supported by a grant from the National Science Foundation, aimed to give advisors knowledge about how to properly lead a group of students through their project (Trask, 1973).

In 1974 the opportunity first came for students to complete their project off campus. This site, established in Washington D. C., gave students a chance to relate technology to government. The project was unique because it ran all four terms and was supported and sponsored by government agencies (Schachterle, 2010).

2.2.2 Various Changes over the Years

WPI created many committees throughout the life of the IQP that focused organizing and implementing the project, as well as recommending suggestions for improvements. (Keil, 2010). Among many changes, thirteen IQP divisions were created to categorize different projects into similar themes. Professor Lance Schachterle, Associate Provost for Academic Affairs, and his colleagues formed the topic themes during the 1980s. These different divisions each had faculty leaders who managed the projects in their division. The themes also made it easier for students to find an advisor who had knowledge in the field of their choice (Schachterle, 2010). In addition, the “President’s IQP Award” was created as a competition that would praise students who did exceedingly well on their projects (The Operational Catalog of Worcester Polytechnic Institute, 1974).

Structurally, one of the bigger changes involved expanding the newly established off campus project centers around the globe. Creating new project centers required massive amounts of time and effort, especially due to the fact that WPI was required to find housing, health service locations, and sponsors (Schachterle, 2010). Students and faculty would also be required to take a one-third unit preparatory course before departing to their project sites. The process of creating new sites was so extensive that WPI formed a new academic division in 1973 - The Division of Interdisciplinary Affairs

(DIA). Now titled the Interdisciplinary and Global Studies Division (IGSD), this office was responsible for generating off-projects, encouraging relationships with sponsors, providing faculty development, and reporting program results (Trask, 1973). Within the last two decades the IGSD created the position of Assessment Coordinator, whose goal was to gather and develop evidence to present to accreditation and funding agencies on behalf of projects and WPI. Current Department Head of Chemical Engineering Professor David DiBiasio, was chosen for this position in 2000 and used the information gathered during his time as Assessment Coordinator to minimize defects and recommend improvements to the IQP as a whole.

In an interview Professor Schachterle asserted that the expectation for faculty complete research appears to have increased significantly since the creation of the IQP. According to Schachterle, faculty members at WPI today cannot receive tenure without performing fairly meaningful research. Schachterle went on to explain that some faculty members find the research beneficial because their reputation improves and financial incentives are accrued, in addition to receiving tenure. Professor Schachterle also feels that the increased research expectation of new faculty members has created a situation where faculty are discouraged from advising IQPs until they obtain tenure. With the ever increasing number of students and faculty, this situation could have unforeseen consequences (Schachterle, 2010).

2.2.3 Current Structure of the IQP

Presently, students have the choice between staying on-campus to do their project or going to one of fifteen off-campus IQP centers, with about 50% of students choosing the latter (Global Perspective Program). All off-campus projects are completed in groups, while on-campus IQPs can either be group projects or done individually. Some students choose to do their project in an area of study within their major even though there are many projects available outside of one's major. Students usually find out about projects through such sources as the WPI website, emails, faculty, and/or friends. Projects typically involve finding a distinct problem (unless a sponsor has already done this), creating a goal to solve that problem, deciding on objectives and research questions that will help meet that goal, and devising a methodology effectively gather data.

In the beginning of sophomore year, students are faced with the decision of having to choose between traveling to another location to work on a project or staying on campus. If a student decides to go off-campus for the project, they first need to think about where they want to go based on the locations WPI offers. Informational sessions provide students with an opportunity to learn about the locations and what types of projects and environments they may encounter. Students thereafter follow a set of deadlines to apply

for an off-campus IQP. For example, students must submit a detailed application by a certain date and set up an interview with the director of the IQP site.

Students who choose to remain on-campus for their IQP find projects in a different manner. There is no deadline system or project application for on-campus projects because every student needs to do an IQP. Students may find projects in various ways such as the on-campus IQP fair in the spring where students can talk with advisors and network, and the on-campus IQP website where advisors post projects. WPI expects students to take the initiative in finding a project of interest. Students are free to form their own groups or can have an advisor make one for them. There is plenty of flexibility when it comes to on-campus work, and students have ample time to find a project or even create one of their own.

All projects are led by one or more advisors who are either knowledgeable in the subject area, or in the researching, writing, and problem-solving aspects of the IQP. Their purpose is to point students in the right direction through suggestions and comments when necessary.

There exist thirteen project divisions, as seen on the website, that divide the on-campus projects into different categories of interest. However, it is unclear at this point if students are still finding them helpful or whether they are ignoring them. As Professor DiBiasio states, “I mean I look at those divisions, and I think they are kind of weird and maybe they worked thirty years ago, but I don’t think they work now” (DiBiasio, 2010).

2.2.4 Objective Comparison of On-Campus vs. Off-Campus IQPs

Differences between the on-campus and off-campus IQPs emerge when students start to decide which IQP they want to pursue. The websites provided to students are visually and structurally quite different. Professor DiBiasio explains that, “... if you go to the website, you see the Global Program, there are lots of pictures, you see the map, and I do not know what you see when you go to the on-campus site. Nothing? Just a list of projects?” (DiBiasio, 2010).

Another main difference is that off-campus projects have two preparatory requirements. The Pre-Qualifying Project (PQP), worth 1/6 of a unit, is where students work with their advisor and each other on understanding the problem they will be facing at their site. The other requirement is the ID2050 course, worth 1/3 of a unit, which teaches students appropriate research and writing skills. Students complete both requirements the term before they leave, which allows for groups to go to project sites prepared to help out the external sponsor and deliver an acceptable report. On-campus projects require no such preparatory courses. There are no specific qualifications for

students doing an on-campus IQP that WPI has established. Each faculty member can advise their project however they see fit as long as they abide by the general guidelines. However, faculty members are not always prepared for on-campus advising. Professor DiBiasio admitted that the first IQP that he advised was of poor-quality because he did not know what he was doing. It was not until he advised an off-campus project, where he had the preparatory courses with the students and worked with a sponsor, that he was able to advise effectively.

Students that complete their project off-campus in one term receive one unit of credit equivalent to three courses at WPI, while on-campus projects have more flexibility. They still receive one unit of credit, but the project can be completed over multiple terms rather than one term. For example, students often decide that the project will be spread over three terms, while taking other courses. This gives them a chance to take required classes that are only offered during specific terms, and gives faculty members a chance to still teach courses, attend meetings, and complete any other work/research which would not be feasible if they went off-campus. However, as Professor DiBiasio points out, this can become a problem because “efforts are diluted by everything else that is going on”(DiBiasio, 2010). He also mentions that when he advised on-campus IQPs in the past it was hard to use what he learned off-campus to help the students because the structures of the project are so different and everyone working on-campus can get distracted (DiBiasio, 2010). There are both advantages and disadvantages to the on-campus and off-campus IQPs, which leaves it up to the student to decide which route to take.

2.3 Concerns Regarding the On-Campus IQP

In this section we describe different inside and outside evaluations of IQPs over the years which aim at understanding the quality of the projects. We begin by summarizing the results of these evaluations which address the value of students’ projects as a whole. We then examine all aspects of report content and in particular the achievement of IQP goals. Finally, we discuss how the results of the evaluations may relate to student motivation.

2.3.1 Low Quality Projects

WPI periodically conducts thorough reviews of both on-campus and off-campus IQPs submitted during the school year. The goals of each review are to measure the overall IQP quality, project advising, as well as students’ comprehension of the learning outcomes. Reviews are also used as evidence for ABET (Accreditation Board of Engineering Technology) accreditation, a certification sought out by engineering programs. These reviews are carried out by a team of faculty reviewers who are trained to read and evaluate numerous IQP reports (DiBiasio, Summary of Results from the

Summer IQP Review, 2001). Over the years each review has had a recurring theme: there are major differences between the off-campus and on-campus IQP report quality. (DiBiasio, Summary of Results from the Summer IQP Review, 2001). The IQP review committee devised a one to five scale (five being the best) to generalize the results of the IQP reviews.

DiBiasio’s 2001 Summer IQP Review deemed that the overall quality of on-campus IQPs was on average rated less than three, whereas off-campus IQPs were rated on average above four (Figure 1). The review evaluated 77 reports written by 240 students at off-campus project centers, and 119 reports written by 244 on-campus students. It found that 29% of the on-campus reports were unacceptable, compared to only 3% of off-campus reports. (DiBiasio, Summary of Results from the Summer IQP Review, 2001).

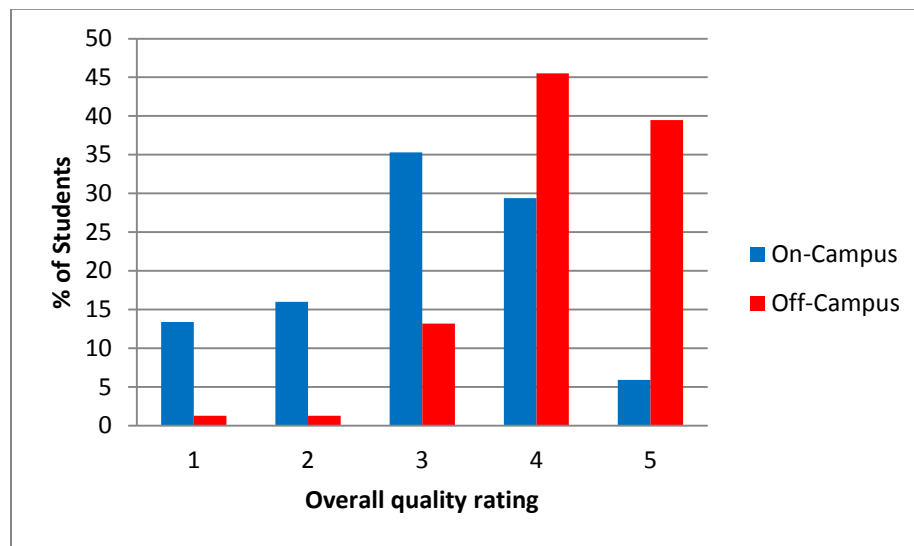


Figure 1: Distribution of average overall quality ratings

(DiBiasio, Summary of the Full IQP Review, 2001)

In the 2004 Summary of the Full IQP Review, DiBiasio outlines that although several on-campus IQP goals are very much aligned with ABET outcomes, nearly all aspects of on-campus IQP projects are deficient compared to that of off-campus IQPs (Figure 2). Unacceptable on-campus reports were lacking in background sections, application of methods, and in-depth analysis (DiBiasio, 2001).

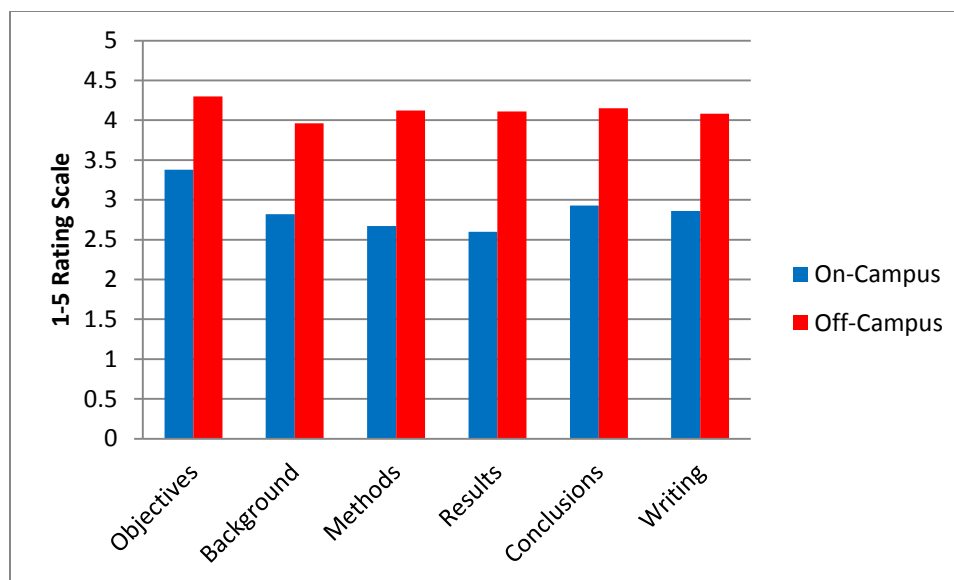


Figure 2: Initial average rating results from 2004 review

Scale: 1=poor, 3=acceptable, 5=excellent. Cohort size was 64 on-campus report and 34 off-campus reports (DiBiasio, Results of the Summer IQP Review, 2004).

Results from the 2004 IQP Review indicated an average overall rating of 2.37 ± 0.22 for on-campus projects compared to an average overall rating of 3.6 ± 0.24 for off-campus projects. The review rated 63% of the on-campus reports below acceptable quality compared to 13% of the off-campus reports. Also, more than half (57%) of off-campus reports were rated very/good excellent compared to only 20% of on-campus reports (DiBiasio, Results of the Summer IQP Review, 2004). With regards to the average ratings of the report content based on objectives, background, methodology, results and analysis, writing/presentation, and an overall evaluation, the off-campus projects were superior in every category (Table 1). In every review, it appears that the on-campus IQP has failed to live up to overall quality of the off-campus IQP. A large number of on-campus IQPs have been in the unacceptable range of overall quality, which contrasts to the small amount of off-campus IQPs (3%) in the unacceptable category. Since WPI does these reviews after the IQP has been graded and handed in, it is surprising that the overall grade distribution is still similar to both the on-campus and off-campus (Table 2). Although the IQP reviews in 2004 rated 63% of on-campus projects below the acceptable range, 59% of students received an A.

	On-Campus	Off-Campus
Objectives	3.2	4.3
Background	2.7	3.7
Methodology	2.3	3.5
Results and Analysis	2.3	3.5
Writing/Presentation (ABET 3g)	2.8	3.7
Overall Evaluation	2.4	3.6

Table 1: Average Rating for Report Content Items

(DiBiasio, Results of the Summer IQP Review, 2004)

	On-Campus	Off-Campus
%A	59	74
%B	35	26
%C	6	0

Table 2: Grade Distributions for Reviewed Projects

(DiBiasio, Results of the Summer IQP Review, 2004)

2.3.2 Students not Fulfilling Learning Outcomes

The IQP’s purpose is to give students a sense of the social impact of technology. Dean Grogan goes as far to say that the most important thing that students gain from the IQP is “self-confidence” (Appendix H). Students stand to gain valuable problem solving skills from the IQP which makes it troubling that project reports on-campus were lacking in many aspects. This section illustrates educational consultant Robert E. Shoenberg’s concern in his report on the value of the IQPs where he states, “Students never quite internalize the purposes of the program, particularly its problem solving element” (Shoenberg, 2004).

It is difficult to quantify the actual value students gain having gone through the IQP process because the only thing the school is left with is their project report. Professor Thomas H. Keil, a seasoned on-campus IQP advisor, described having received poor project reviews although the students had learned a lot about the social impact of technology and the structured process of problem solving. The reports were judged to be poor because they did not demonstrate the learning outcomes of the IQP (Keil, 2010).

ABET criteria (Appendix R) are usually used for evaluation in official IQP Reviews because they describes common goals for engineering programs. The IQP directly contributes to students learning several of the ABET outcomes, namely the abilities to communicate effectively, understand professional and ethical responsibilities,

recognize the need and ability to engage in lifelong learning, understand contemporary issues, understand the impact of engineering solutions in a global and societal context, and to work in interdisciplinary teams (Woods, 1999). The 2004 IQP Review conducted by DiBiasio found on-campus project reports' average ratings for all the ABET outcomes to be below acceptable, whereas ABET outcomes for the off-campus IQP were achieved by the majority of projects. In the 2001 review, many of the on-campus reports did not satisfy the ABET criteria of "understanding the impact of engineering on society".

2.3.3 On-Campus Problems from a Motivational Perspective

WPI aims to maximize the educational value of the on-campus IQP by setting learning outcomes for students to work towards. Unfortunately, on-campus student project work is still of lower quality than off-campus work. This brings up an important question: why aren't students producing the same quality work if the objectives are the same? Lack of student motivation towards the on-campus IQP and a lack of guidance for students before starting their IQP could be possible factors in the quality discrepancies associated with the on-campus IQP. Motivation can be interpreted in many different ways, but the underlying causes that affect motivation are important because of their relation to the problem at hand.

There are two types of motivation: intrinsic and extrinsic. Extrinsic motivation is when an action is done to achieve a goal or reward, and intrinsic motivation is when an action is done for personal enjoyment (Clark & Schroth, 2010). Another explanation is that, "intrinsic motivation is defined as motivation to engage in an activity for its own sake, whereas extrinsic motivation refers to motivation to engage in an activity as a means to an end" (Clark & Schroth, 2010).

Interest is diverse and should not be classified simply into liking or disliking a topic. Interest can be divided into two main classifications: situational interest and personal interest. Situational interest engages someone in a task to promote achievement. Personal interest is different in that it is directly related to liking or disliking a particular task (Linnenbrink & Pintrich, 2002). If intrinsic motivation is stimulated, it will simultaneously satisfy personal interest and in the long term will accomplish the goals of extrinsic motivation as well.

Lack of motivation in people and students can stem from numerous things including a lack of a clear understanding of the goal and objectives of a task, a lack of productive guidance and feedback, the task at hand not being within range of the student's ability, a lack of preparedness for the subject matter, and also relying on extrinsic motivation for projects rather than intrinsic motivation (Seijts & Crim, 2006).

A prime motivator for people is often the achievement of objectives. Jason Eddington and Matthew Mossbarger's report on motivating employees describes financial and non-financial methods used to help their employees develop, perform, and excel in their work (Mossbarger & Eddington, 2003, April 24). Although this report contains information on how employers can motivate employees, it also contains useful information which can relate to college students' lack of motivation regarding projects. Project work is closely related to a real-life job because students have to work with team members to complete a goal. Eddington and Mossbarger's report outlines that productivity can be improved when a company focuses on goal setting and communication. Similarly, if the goals and objectives of a task are not clear people will have trouble finding motivation to achieve an objective which doesn't exist. Setting goals is a good way to define an employees' purpose in a company and helps to set a standard for them to gauge their success (Mossbarger & Eddington, 2003). The same goes for students doing an IQP. Not knowing the importance of the IQP and its learning outcomes can cause confusion in the understanding and direction of the project.

Along with the understanding of a task's objectives, the understanding of one's own ability and the perceived feasibility of a task are important motivational factors. Gerard H. Seijts and Dan Crim's report on employee engagement goes on to question whether there is a strong relationship between employee involvement and organizational performance (Seijts & Crim, 2006). They suggest that good leaders not only challenge employees, but instill the confidence that the challenges can be met. Not giving people the knowledge and tools to be successful can be unethical and de-motivating. It is also likely to lead to stress, frustration, and ultimately lack of engagement (Seijts & Crim, 2006). Giving students available knowledge and tools facilitates involvement and increases motivation.

Lack of overall motivation can be addressed by increasing intrinsic motivation through the creation of personal interest in subject matter, rather than extrinsically pushing students to accomplish a task based on a goal, and by making the goals and objectives of a task very clear.

2.4 Summary

The IQP began as a way for students to gain exposure to project-based learning as part of a larger plan that would redefine the structure of education at WPI. It serves as a basis for the connection between technology and society, and allows students to address the humanistic responsibilities they should be more aware of early in life. This project should prepare students to solve a problem they may encounter in a 'real-life' situation and learn how to write a well-thought out research report.

Compelling evidence from various IQP reviews reveals that on-campus IQP reports are generally of lower quality than off-campus even though the objectives for both projects are the same. One may start to wonder whether students who stay on-campus are only extrinsically motivated to achieve their IQP goals, and what the impact of stimulating intrinsic motivation would be.

3 Procedures

In this chapter we provide an overview of the steps we took in order to gather the information and feedback needed to provide recommendations to WPI. We initially interviewed faculty who have been involved with the IQP since its creation to gain the faculty's perspective. Our background research indicated that intrinsic motivation may contribute toward students' choice and completion of a successful project, so we followed up the faculty interviews with student interviews in an attempt to discover how they perceive the project, what improvements would be most beneficial, and what ways intrinsic motivation can be increased. Once we compiled the student feedback, we analyzed it quantitatively and qualitatively in order to provide WPI with appropriate recommendations.

3.1 Research into the History and Evolution of the IQP

After exploring the history and evolution of the IQP, we attempted to answer four research questions through in-depth faculty interviews:

- What was the original intent of the IQP?
- What changes have been made to the IQP since its implementation?
- What was the involvement level of different caliber faculty members?
- What recommendations do faculty members, recognized for their influence on the IQP have?

To complete our first objective, we spoke with faculty members who, over the years, have significantly contributed to the IQP. These stakeholder interviews increased our understanding of the evolution of the IQP, and gave us a better idea of the changes that could be made to improve the quality of the on-campus IQP. Faculty interviews were guide approached with a flexible set of questions so that any follow-up questions could be asked. Interviews took place in person, on campus, and whenever or wherever was most suitable for the interviewee. Interviews were tape recorded with the consent of the subject and hard copies of the interview questions were always used to structure the interview. The information was transferred from the tape recorder to Microsoft Word 2010 for documenting purposes.

We started by interviewing three professors who were working at WPI when The Plan was beginning to take shape: Professor of English Lance Schachterle, Professor Emeritus of ECE James Demetry and Professor of Physics Thomas Keil. They have advised many IQPs and have considerable knowledge regarding specific facts and background of the IQP. In addition, during 1981 they performed a self-study of the IQP in order to determine its status.

We felt their input would be helpful in understanding the changes that have occurred to the IQP and how we can help the system. The interview transcripts can be found in Appendix D, E, and F.

We also interviewed Professor David DiBiasio, whose interview transcript can be found in Appendix G, and Dean William Grogan, found in Appendix H. Both of these men have held key positions at WPI (former IGSD assessment coordinator and Dean of Undergraduate Studies, respectively). DiBiasio's current involvement in the IQP process, as well as Grogan's extensive knowledge of the subject matter helped us determine potentially beneficial recommendations.

3.2 Determine Student Knowledge, Motivation, and Attitudes at WPI toward the IQP

To identify student knowledge, motivation, and attitudes at WPI toward the IQP, we conducted student interviews with three target groups to help answer the following four research questions:

- Do students understand the purpose and learning objectives of the IQP?
- Are students motivated enough to find IQPs that interest them in order to produce a successful project?
- Are students aware of available resources that can help them find an IQP that they can be successful with?
- Do students feel choosing and completing a good IQP is worth part of their undergraduate time while at WPI?

We organized the target groups into students who will be or have been involved with an IQP. The three target groups emerged from these students:

3.2.1 Juniors without IQPs

We interviewed many juniors who currently did not have an IQP because we were particularly interested in knowing what has kept them from finding an IQP. We expected that this target group would have the least motivation of all the interviewees and we hoped to determine what type of improvements would increase their motivation to effectively go through the process of choosing an IQP. We planned to identify whether the student had been looking into projects or had yet to begin the process. Interviews continued until we recognized reoccurring themes throughout the students' answers. The most difficult limitation of this target group was in size, since there are not many students in their junior year that do not have an IQP. Finally, we analyzed individual student responses quantitatively and qualitatively. The interview questions are in Appendix I.

3.2.2 Juniors Working on On-campus IQPs

We also interviewed juniors who were in the process of completing an IQP. This type of student was of interest to us because we were curious to find the motivation that provoked them to find an IQP in their sophomore year. We expected this target group to be motivated about their project and have useful feedback regarding what methods and resources worked effectively for them when choosing an IQP. This target group was larger based on the fact that most juniors either had a project or had completed one. To prepare for these interviews, we created a short list of important questions that is in Appendix J.

3.2.3 Sophomores who will be Choosing On-campus IQPs

Lastly, we interviewed sophomores who had not chosen an IQP, but would be beginning the process soon. We predicted that this target group would provide helpful, unbiased results because most sophomores had little or no involvement with the IQP at that point and could share their current challenges with the choosing process. From this group, like all other student target groups, we desired to gain student recommendations that will help improve the IQP choosing process. The list of questions used for this target group is in Appendix K.

Talking with each of these specific student groups helped us determine the level of student knowledge pertaining to the purpose of the IQP and its learning objectives. We used the WPI junior and sophomore email aliases to reach out to the students willing to interview voluntarily. A potential bias of this method is that students with strong opinions may be more inclined to participate. We used interviews to find out whether or not students were motivated to choose personally interesting projects, and if they were aware of available resources to help them pick such a project. Student interviews were guide approached with a flexible set of questions so that any follow-up questions could be asked. Interviews took place in person, on campus, and whenever or wherever was most suitable for the interviewee. Interviews were tape recorded with the consent of the subject and hard copies of the interview questions were always used to structure the interview. The information was transferred from the tape recorder to Microsoft Word 2010 for documenting purposes. We analyzed the interview results using a quantitative and qualitative approach, which involved choosing common emerging themes from student responses and quantifying those themes.

3.3 Develop Recommendations for Enhancing Student Motivation and Attitudes toward the On-campus IQP Based on Target Group Feedback

Recommendations made to WPI for improving the on-campus IQP were determined by focusing on the following four research questions:

- What IQP informational sources would benefit students?
- What resources would assist students in finding IQPs, partners, and advisors?
- What types of resources would increase faculty-student communication, as well as improve the level of guidance students receive from WPI for the IQP?
- What would motivate students to complete successful, on-campus IQPs?

Our background research on motivation indicated that not giving people the knowledge and tools to be successful is likely to lead to stress, frustration, and ultimately lack of engagement (Seijts & Crim, 2006). Similarly, we found that if the goals and objectives of a task are not clear, then people will have trouble finding motivation to achieve an objective which doesn't exist. This is why our third objective was to determine what types of resources can successfully help students choose an on-campus IQP by analyzing data collected from the previous objective (3.2).

Data collected in interview form from the previous objective was separated into qualitative and quantitative response provoking questions for each target group. Questions that could be analyzed quantitatively gave us a statistical perspective on student motivation and attitudes towards the IQP process. Quantitative analysis helped determine the overall problems associated with the IQP process. On the other hand, questions that could be analyzed qualitatively contained more specific information on what students wanted to change about the on-campus IQP process. Qualitative responses from every student were subdivided into repeated themes for each individual question. For example, if five students expressed the need for a website database and one student expressed the need for a social network of IQPs, then two themes would have emerged out of those six responses. This thematic development was applied to every student response and the themes that were repeatedly expressed helped determine what the majority of students desire. Often thematic correlations between different questions were made in order to further clarify our findings and solidify our results.

3.4 Summary

The faculty interviews helped us gain an overall understanding of the current problems with the on-campus IQP by describing the project's evolution, while the student interviews offered several suggestions for improvements. The analysis of the information gathered from all interviews should assist in designing various solutions to students' problems with the on-

campus IQP. These possible solutions will be an accumulation of all the evidence supporting the need for changes to the system, and will be recommended to WPI.

4 Findings

In this chapter, we present our research findings. We begin by discussing students' general attitudes towards the IQP and its selection process. We then go on to describe student knowledge of the IQP learning outcomes. Finally, we conclude the chapter with student's attitudes towards current and prospective IQP resources. Initial analyses of the raw data are located in Appendices L - Q.

4.1 Attitudes and Motivation of Students toward the IQP

In this section, we present our major findings regarding student feedback on the IQP as a whole. We tried to understand student attitudes and motivation towards the project itself. The majority of students interviewed are/were looking forward to the IQP. They exhibited good attitudes toward the project, and want/wanted to find something of interest, regardless of how challenging the project may be.

WPI students do want to find interesting projects, but many are unaware of the available resources. Since both the sophomores and juniors without IQPs have yet to find a project, we were curious to know if they saw the IQP as simply another WPI requirement or if they were personally looking forward to it. Twelve of the seventeen sophomores interviewed stated they have positive attitudes towards the IQP. Unfortunately of those twelve students, six were unaware of any resources to help them find a project. Only two sophomores were aware of both the website and on-campus fair, while two students said they knew only of the fair, and one student mentioned knowing only of the website. No one mentioned the IGSD.

Similarly, six of the ten juniors without an IQP said they were looking forward to doing a project. Of the four juniors without projects who did not share their classmates' positive attitudes, three had been trying to find a project with no success. One student remarked, "At this point I am desperate to find an IQP and don't care what project I choose. I'm taking the first IQP I can find." In addition, when asked who currently does not have a project, the majority of those who responded "no" stated that they would rather take classes than do an IQP.

Many juniors with IQPs reported that if students are motivated to find a project of interest and are able to successfully find one, then they have more potential to produce high-quality results. These juniors were asked if the level of difficulty played a role when choosing a project and seventeen of the twenty said no. Of those seventeen students, twelve explained their answer by stating that if the project interested them then they would not care about its difficulty level. From the twenty interviewed juniors with projects, thirteen said they choose their project based on interest.

4.2 Student Attitudes and Motivation towards the IQP Selection Process

Key information about the IQP selection process was discovered through the student interviews. *There seems to be little motivation for sophomores to start the process of finding an on-campus IQP, and project resources seem to be unhelpful with the result that students are ending up with projects that are not of personal interest to them.*

Twelve of seventeen sophomores interviewed had not begun looking for a project yet because there had been nothing to provoke them to do so. Six of the twelve said that some sort of deadline system would help, while the other half expressed the need for a better informational IQP resource. Of the five sophomores who had begun looking, three did so because the project is required by WPI and they need to find partners.

Sixteen of twenty juniors with projects interviewed said they were unsatisfied with the selection process of the IQP. Personal social networks such as friend circles, project groups, and word of mouth in general provided eight of the twenty juniors interviewed with ways find IQPs. The remaining twelve referred to the IQP fair, website, and faculty members to find a topic. Many students felt the selection process was lacking in organization, guidance from WPI, project advertisement, and overall stature compared to the off-campus projects. As one student claimed, “on-campus students get secondary treatment” compared to those going off-campus.

Many students expressed the desire for better advertising, organization, and online resources that could potentially help students better find projects of interest. Half of the ten juniors without projects stated that they had wished there was better guidance and feedback from WPI about projects, while the other half stated they wish they had a better online IQP informational resource to refer to. In addition four of these juniors also said they would improve project advertising, three would create a new accessible informational resource, two would increase structure, and one would make sure there was some sort of screening process.

Overall, the students interviewed felt the process of choosing an IQP is lacking in various aspects and needs improvements. When juniors without projects were asked why they viewed the process so poorly, no common trend emerged from the responses, reflecting that there may be multiple problematic aspects. This supports the sophomore claim that students could use more motivation early on to get started by improving project advertising and resources.

4.3 Student Knowledge of IQP Learning Outcomes

From the background research we learned that not knowing the importance of the IQP and its learning outcomes could cause confusion in the understanding and direction of the project.

Students were asked if they knew what they are expected to gain from their IQP in an effort to understand their knowledge of the IQP learning outcomes.

All three target groups mentioned the development of group work skills and solving real world problems the most as what they believed are the learning outcomes of the IQP. On the other hand, all three target groups failed to recognize the development of research, writing, and problem solving skills as part of the learning outcomes of the IQP. More than half of the sophomores and juniors expressed some sort of knowledge of the IQP's learning outcomes. Only three sophomores mentioned problem solving and none mentioned research or writing. Solving real world issues and group work were the most commonly mentioned responses for sophomores and juniors with IQPs. Similarly, only one junior without an IQP mentioned writing skills, while the rest of the respondents mentioned group work skills, getting experience outside your major, and professionalism.

Recent on-campus IQP report reviews (DiBiasio, Results of the Summer IQP Review, 2004) have deemed the writing, research, and problem solving aspects of on-campus IQP reports to be of low quality on average, compared to off-campus IQPs. The reviews express the on-campus IQP report's deficiency in background chapters regarding inadequate research and writing skills. The results from the IQP reviews become less surprising when every student interviewed failed to completely grasp the learning outcomes of the IQP, especially with respect to those three aspects.

4.4 Student Attitudes towards Current IQP Resources

Most students interviewed were aware of some of the resources WPI has to offer, but did not find them helpful. Juniors and sophomores interviewed expressed some knowledge of WPI's IQP resources with most respondents mentioning the website and the IQP fair. The majority of juniors without IQPs mentioned being aware of the website, the IQP fair, and the IGSD, but only one student found the IGSD helpful, and no students found either the IQP fair or the website helpful. Half of the juniors with IQPs who used the website had difficulty with its use and half of the sophomores were not aware of the existence of any resources. In addition, a large amount of juniors who knew of some resources found them to be unhelpful, unclear, and confusing.

Students expressed the desire for WPI to re-evaluate the general advertisement and usefulness of their IQP resources in order to provide available, updated IQP information. Most students were unaware of any resource, which brings into question the methods WPI uses to advertise its projects. One student went so far as to claim that he learned the existence of the website from a non-WPI student.

Students desire a way to find partners with similar interests. None of the resources WPI offers has a way to find partners, and some students said they did not have a project because they could not find any partners. Of the ten juniors without IQPs interviewed, five said they plan on finding partners for their project by talking to friends, two said they had no idea, and one said he was working alone because he did not know anyone that still needed a project. Twelve of the twenty juniors with IQPs chose their friends as partners. Ten of these students said they had a negative experience and 80% of them stated that their group was not able to determine common goals for the project. In contrast, four out of the remaining eight juniors that found topics and partners through sources other than friends claimed that they had a positive project experience, and 80% of these students said that their group has been able to agree on project goals. This suggests that students choosing their friends as partners may not form the best project groups and could have benefited from having a resource to find partners other than friends.

4.5 Student Preferences for New IQP Resources

The following section describes specific improvements students suggested that could benefit the current IQP resources. *As a whole, students interviewed want better guidance, increased advertisement of projects, and improved informational resources when choosing an IQP.* The online IQP information WPI offers is either unhelpful or unknown seeing as students voiced the need for an online IQP resource with available project information above all.

The biggest finding among all students interviewed is that a single resource, where students can go to find information on all available IQPs, does not exist. “No student really knows where to begin finding projects, groups, advisors, etc. It would be nice if everything was in one place,” a student stated.

When asked why they have yet to find a project, five of the ten juniors interviewed without IQPs stated that they would have benefited from more guidance from WPI. Furthermore, 80% of those same students stated that when they emailed a professor regarding potential IQPs, responses were slow and inconsistent.

Many juniors who have already completed or who are currently working on an IQP expressed the feeling that a new online resource could have helped them through the choosing process. Thirteen of twenty juniors with IQPs interviewed would have wanted an online resource that primarily has a way to find projects, but also partners and advisors. Similarly, five out of ten juniors without IQPs stressed the desire for some sort of online resource containing specific project information *and* a way to network with partners and advisors. In addition, a strong majority of sophomores (fifteen out of seventeen) interviewed claimed that

they wanted some sort of online resource containing a searchable list of projects with inclusive details to assist students in choosing an on-campus IQP.

The advertisement of on-campus projects and resources appears to be ineffective. This notion was solidified as eleven of the seventeen sophomores interviewed stated they had not looked at any IQP project resources. Part of the reason for this was that nine of these eleven sophomores were unaware as to where the resources could be found. Nine out of twenty juniors with IQPs also thought that on-campus project resources could use advertising improvements. Students also expressed the desire for improvements of offline IQP resources that could help future students choose projects. Six juniors with IQPs and three juniors without IQPs stated that both advertisement and quality of the on-campus IQP fair needs to be upgraded.

Faculty posting projects often do not provide sufficient information about those projects and are often absent from informational seminars such as the IQP fair. Often times, professors do not show up to discuss their projects with students attending the fair. Students that looked to professors as a source of “what to do” when looking for a project felt lost when professors were unresponsive to emails or absent from informational seminars. Both juniors with IQPs (two) and juniors without IQPs (two) also stated the need for preliminary advisor guidance. Students wish for academic advisors to play a role while students first get the IQP choosing process in motion.

4.6 Summary

The interviews with students provided the necessary feedback to draw conclusions on students’ general attitudes towards the IQP and its selection process, their knowledge of the IQP learning outcomes, and their attitudes towards current and prospective IQP resources. The feedback indicated that students felt the process of choosing an IQP is lacking in various aspects and needs improvements. Many students expressed the desire for better advertising, organization, and online resources that could potentially help them find projects of interest. The biggest similarity found among all students interviewed is that a single resource, where students can go to find information on all available IQPs, does not exist.

Most students interviewed were aware of some of the resources WPI has to offer, but did not find them helpful. The advertisement of on-campus projects and resources appears to be extremely ineffective. Overall, students expressed the desire for WPI to re-evaluate the general advertisement and usefulness of their IQP resources in order to provide available, updated IQP information, and a way to find partners.

Students generally do not grasp the learning goals WPI has set for the on-campus IQP. All three target groups mentioned the development of group work skills and solving real world

problems the most as what they believed are the learning outcomes of the IQP. On the other hand, all three target groups failed to recognize the development of research, writing, and problem solving skills as part of the learning outcomes.

As a whole, students interviewed want better guidance, increased advertisement of projects, and improved informational resources when choosing an IQP.

5 Recommendations

In this chapter we present potential solutions to the problems described in the Findings chapter of the report. Initially we describe how the project programs website can be enhanced to be more user-friendly. We then go on to make recommendations to increase the level of communication and guidance for students throughout the IQP selection process. Every solution we present in this chapter refers to a specific course of action, as well as the specific group or groups within WPI that are most capable to make these changes.

5.1 WPI's Projects Program Website

From the findings it became evident that the WPI IQP websites need updating and improvement, since students seemed to use these online resources the most, yet seem to dislike the structure and content of them. Our results showed that the on-campus IQP webpage¹, particularly the portion containing a list of available projects, needs improvement so that it is easily accessible and contains all the information students are looking for relating to the IQP. These changes in return should help students find more personally appealing projects.

5.1.1 Webpage Content

We recommend that the IGSD enhance the content on the IQP website where on-campus projects are posted. Our findings illustrated that this website does not contain the specific project information students desire. At the moment the projects on the website include the following information:

1. Project title
2. Departments
3. Code/Sequence #
4. Faculty advisor name and a link to their information
5. Co-advisor name and information (if applicable)
6. Corporate/External sponsor (if applicable)
7. Preferred terms the project will take place
8. Preferred team size
9. Project description

However, feedback from students suggested that this webpage should also contain the following information:

- A description of the topics related to the project that may interest students
- An indication as to the number of students interested in the project and/or signed up

¹<https://www.wpi.edu/cgi-bin/FacultyProjects/viewProjects.cgi>

Students should have the option to click on an “interested” button next to each project so that any other student interested in that same project can view the names and emails of the students who expressed interest for communication purposes. Additionally, advisors should post the names of the individuals who agreed to do their project in order to help network students who are looking for partners. This method could be advantageous because students could see how many openings are in each project and make it easier for advisors to effectively create a group.

We recommend that the webpage showing on-campus project listings also contain a way to find partners. While having access to various students’ contact information-attained from the projects those students are “interested” in is one possible way for students to communicate, we suggest that there be a more direct way for students in need of a project to find each other. Therefore, we recommend that there should be an additional link at the top of the page titled “Students in need of a project” which directs students to a list of names and emails of every student grouped by major who has not “signed up” for a project. This list should be updated whenever a new student signs up for a project.

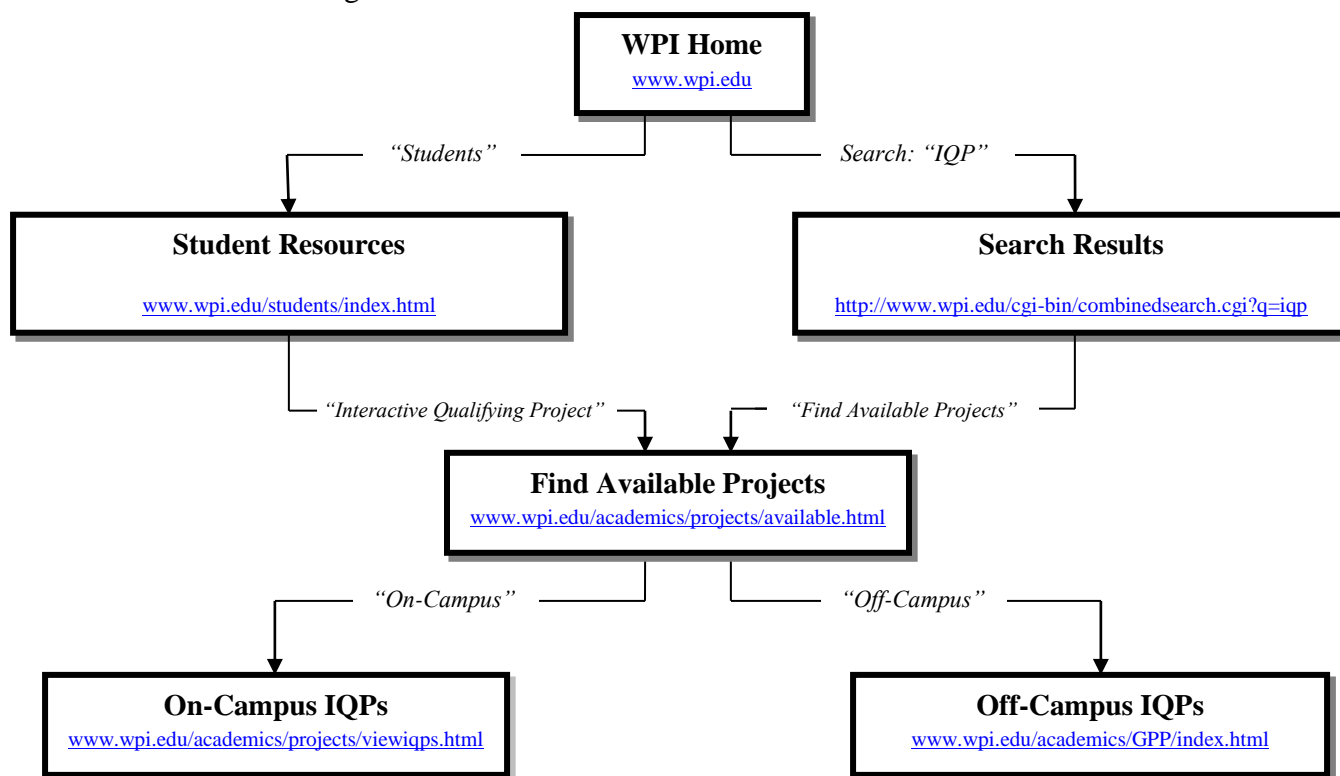
We recommend that there be an easier way for students to quickly and effectively find a project on the webpage displaying available on-campus projects. Our research showed that the thirteen divisions currently used to categorize projects are ineffective and in need of modification. Instead, there should be a search bar added to the top of the on-campus project listing webpage where students can choose from a drop-down advanced search menu with categories such as advisors, project keywords, terms offered, number of students signed up, etc. before typing in the corresponding keywords of their search.

We recommend that the IGSD update the on-campus webpage that shows the list of available projects more consistently by removing projects as soon as students have registered for them. The IGSD should allow for an administrator’s assistant or even a work study student to access the website, so that they can take registered projects off the website every term when PRJ reports come in. In addition, WPI should no longer hold the Administrator of Academic Programs responsible for project approvals for the website. We suggest that instead the Associate Dean of the IGSD be in charge of approving newly proposed projects.

5.1.2 Webpage Structure

We recommend that the IGSD modify the structure of the website to make the list of available projects more obvious on the projects programs webpage. Our findings on student attitudes towards the project programs website showed that the process of finding available on-campus IQPs once at the “Projects Program” site is not very straight forward. Students who tried to navigate the projects program website found the process confusing

and unhelpful. The following diagram represents our recommendations for a few simple changes to the WPI website’s navigational structure that could be beneficial to students. Each box indicates a different webpage, and each labeled arrow indicates the link a student clicked on to get there:



We recommend that WPI make it easier for students to locate the IQP webpage through the WPI website. According to students, it would be most beneficial to have a link to the IQP webpage located within the “Student Resources” webpage of the WPI website. The webpage link labeled “Projects Program” should be changed to “Interactive Qualifying Project” because most students seemed to miss this connection. In addition, if a student instead decides to search for the IQP by using the search bar on the WPI Home page, the first search result under suggested sites should be a link labeled “IQP” instead of “Project Programs” which brings you to the “Find Available Projects” page.

We found that once students navigated to the webpage titled “Find Available Projects”, they were unsure of how to proceed in order to find the right information regarding the IQP as a whole, the on-campus IQP, or the off-campus IQP. We therefore recommend that the IGSD change the two links under the title “IQPs” on the webpage to “on-campus” and “off-campus” links, rather than “Faculty Sponsored” and “Externally Sponsored”, and that the webpages thereafter also change titles respectively.

In order to give students information about the IQP as a whole, we suggest that also under the title “IQPs” there be an easy to understand, user-friendly informational table. Many students said they would have benefitted from having relevant IQP information located in one place instead of spread out over multiple webpages. The following four tabs should be located under the title “IQPs”:

What?	Why?	When?	Information to get you started
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Depending on which link the student clicks, different information regarding the IQP should appear:

What?	Why?	When?	Information to get you started
<p>The “What?” tab should contain information explaining the main components of the project in a student-friendly manner such as the learning outcomes, what the IQP stands for and what each letter in IQP signifies. It should also exemplify that the IQP is mainly a research and writing project, and break down the IQP into its three phases: background research/goal setting, collecting/analyzing information, and evaluating results/developing a report.</p>			

What?	Why?	When?	Information to get you started
<p>The “Why?” tab should contain information that explains why the IQP is important by listing topics such as the learning outcomes to emphasize the relevance of research, writing, and problem-solving skills to help students understand that the IQP is not just about group work. There also should be some alumni testimonies stating how the IQP has helped them in their careers as this would put the project into perspective.</p>			

What?	Why?	When?	Information to get you started
<p>The “When?” tab should provide students with a suggested timetable for finding and completing their IQP. The timetable should explain that the IQP selection process generally commences during a student’s sophomore year and that the IQP is worked on during their junior year.</p>			

What?	Why?	When?	Information to get you started
<p>Finally, the “Information to get you started” tab should contain a list of all resources of where students can get information such as the fairs, the IGSD, advisors, examples of previously completed IQPs, the IQP writing guide, etc.</p>			

5.2 Communication and Guidance

Our findings indicated that students are in need of increased communication and guidance throughout the on-campus IQP selection process. We have developed several recommendations in attempts to remedy this problem. By increasing administration, faculty, and student communication throughout the IQP selection process, WPI would help guide its students towards projects more personally interesting to them therefore resulting in more successful on-campus IQPs.

We recommend that the IGSD increase the advertisement of available resources that help with choosing an IQP. Emailing is a method of communication that WPI students and faculty frequently use. The IGSD should advertise IQP resources through emails to students and faculty by including direct links to the electronic IQP resources available. These emails should also include a description in the form of a PDF guide that describes how students can make every IQP resource useful. Emails with this type of information should have attractive subject lines such as “How to find the IQP that best fits YOU” to entice students to actually open the message.

Our research has indicated that students generally are unaware of the IQP learning outcomes; **therefore we recommend the IGSD include the IQP learning outcomes with every available IQP resource. Along with the learning outcomes, we also recommend that faculty IQP advisors include suggested background courses to help students reach them.** This will increase the chance for students to understand what an IQP entails before entering into a project. Along with the learning outcomes, the IGSD should provide a list of recommended courses that can benefit students working on any IQP. Together, the IGSD and faculty advisors can identify pertinent courses that assist students in completing successful projects. Examples include writing and reading comprehension courses. Project advisors should also make sure to reiterate the learning objectives at the beginning, and throughout each project.

We recommend that academic advisors suggest that their sophomore students start looking into IQPs for their junior year, and provide some information and useful links to help get them started. Academic advisors should also help their students plan what term(s) to do their IQP in, as this will encourage students to begin to look into topics of interest that fit their schedule.

In addition, **the IGSD should specifically motivate sophomores towards the IQP early on by sending periodic emails.** The email should include an explanation of when students usually do their IQP, information about the fair and when it is, and email addresses of people to contact for questions or concerns. In order to avoid being overlooked, the emails could have

attractive titles such as, “Have you done you IQP?”, “Have you thought about your IQP?”, and “Information for students who have not done an IQP”. To improve attendance and awareness regarding the fair, IGSD should send out multiple reminders via email, starting one month prior to the event.

Our research shows that students without IQPs in their junior year seem to be forgotten. **Therefore, we recommend that WPI, specifically the offices of the IGSD and the Registrar, reach out to juniors and seniors without projects more aggressively.** Some academic departments keep track of students who do not have an MQP and send them emails as reminders along with suggestions and people/links to look into. The IQP should have a similar set-up where students with no IQP as of A Term their junior year receive reminders that they need to select a project. WPI should also send these emails to sophomores in D-term, who have yet to register for an IQP. Staff of the Registrar’s Office or IGSD should be the ones to make lists of these students without projects and communicate necessary information to them.

Along with the lack of communication, students also mentioned the lack of early guidance as one problem with the IQP selection process. **We recommend that the Student Activities Office run programs for students to receive first hand early guidance with the IQP.** Many students at WPI are willing to help younger undergraduates as seen through campus community roles such as Community Advisors (CAs) and tutors. Therefore we recommend a **Project Advisor (PA) program** where upperclassmen are assigned freshman/sophomore groups to help them through the early steps in choosing a good project. PA groups can also serve as initial partner recruitment where students can talk about their interests and find others with similar tastes. The PA program will need an administrative body and Emily Perlow, Director of Student Activities who runs the CA program, could effectively organize a PA program.

In addition, we recommend that WPI offer an informational seminar for students where they can receive a tutorial on all the resources, PA programs, project departments, and any other data relevant to the IQP. Any volunteer with sufficient knowledge of the IQP could give this seminar such as PAs, the IGSD, or on-campus advisors.

5.3 Summary

The goal of this project was to provide WPI with straightforward, practical recommendations for the reoccurring problem areas we identified for the on-campus IQP. The analysis and interpretation of faculty interviews and student feedback of the on-campus IQP allowed us to design recommendations which we hope will help to make the entire on-campus IQP experience more student-friendly. In addition, faculty advisors stand to benefit from a

less confusing project selection process because students may be more inclined to produce high-quality reports. An IQP review similar to the ones performed in the past would best evaluate the effect these recommendations would have on the quality of the on-campus IQP reports. We look forward to seeing the effects our recommendations may have on student satisfaction with the IQP selection process, and the quality of the on-campus IQP final reports.

References

- Clark, M. H., & Schroth, C. A. (2010). Examining relationships between academic motivation and personality among college students. *Learning and Individual Differences*, 20(1), 19-24. doi:DOI: 10.1016/j.lindif.2009.10.002
- Demetry, J. (2010, October 12). Retired from Worcester Polytechnic Institute. (P. Stanley, A.J. Meldrim, & A. Morrison, Interviewers)
- DiBiasio, D. (2010, October 8). Former Assessment Coordinator of IGSD. (P. Stanley, A.J. Meldrim, & A. Morrison, Interviewers)
- DiBiasio, D. (2003). *Summary of IQP Review Results*. Worcester.
- Dorsey, M. W. (1996). A Miracle at Worcester. *WPI Journal* , 4-15.
- Freidman, T. (2010, September 11). We're No. 1(1)! *New York Times* .
- Global Perspective Program*. (n.d.). Retrieved October 5, 2010, from Worcester Polytechnic Institute: <http://www.wpi.edu/academics/GPP/Overview/index.html>
- Graham, S., & Weiner, B. (1996). Theories and principles of motivation. *Handbook of Educational Psychology*, 4, 63-84.
- Interactive Qualifying Project (IQP)*. (2010, June 15). Retrieved October 5, 2010, from Worcester Polytechnic Institute: <http://www.wpi.edu/academics/Depts/IGSD/iqp.html>
- Keil, T. H. (2010, October 4). Department Head in Physics at Worcester Polytechnic Institute. (P. Stanley, & A. Morrison, Interviewers)
- Linnenbrink, E. A., Pintrich, P. R. (2002). Motivation as an enabler for academic success. *School Psychology Review*, 31(3), 313-327.
- Mossbarger, M., & Eddington, J. (2003, April 24). Weber State University. *Methods for Motivating Employees* .
- Regan, J. A. (2003). Motivating students towards self-directed learning. *Nurse Education Today*, 23(8), 593-599.
- Rissmiller, K. (2008). *Achievement of IQP Learning Outcomes As Indicated in 2007 IQP Review of Project Completed On Campus*. Worcester: Worcester Polytechnic Institute.
- Samuelson, R. J. (2010, September 6). Why School 'Reform' Fails. *Newsweek* .
- Schacterle, L. (2010, Septemeber 30). Professor in Humanities and Arts Department at Worcester Polytechnic Institute. (P. Stanley, & A. Meldrim, Interviewers)

Seijts, G., & Crim, D. (2006). What Engages Employees the Most or, The Ten C's of Employee Engagement. *IVEY Business Journal* , 2-5.

Shoenburg, R. E. (2004). *The Value of the IQP: A Report to the interdisciplinary and Global Studies Division*. Worcester Polytechnic Institute.

Task, R. (1973). The IQP Center Story. *WPI Journal* , 10.

Taylor-Powell, E., Renner, M. (2003). *Analyzing Qualitative Data*. Retrieved November 11, 2010, from UW-Extension Program Development and Evaluation:
<http://learningstore.uwex.edu/assets/pdfs/g3658-12.pdf>

(2001). In K. Teel, & A. DeBruin-Pareki, *Making School Count: Promoting Urban Student Motivation and Success*. New York: Routledge Falmer.

The Interactive Qualifying Project (IQP). (2010, June 15). Retrieved October 5, 2010, from Worcester Polytechnic Institute-ISGD: <http://www.wpi.edu/academics/catalogs/ugrad/iqp.html>

The Operational Catalog of Worcester Polytechnic Institute. (1974). *Worcester Polytechnic Institute* , 60.

(1972). The Interactive Qualifying Project. In I. Z. The Zwiebel Committee. Worcester, MA: Worcester Polytechnic Institute.






















Appendix A: Learning Outcomes of the IQP

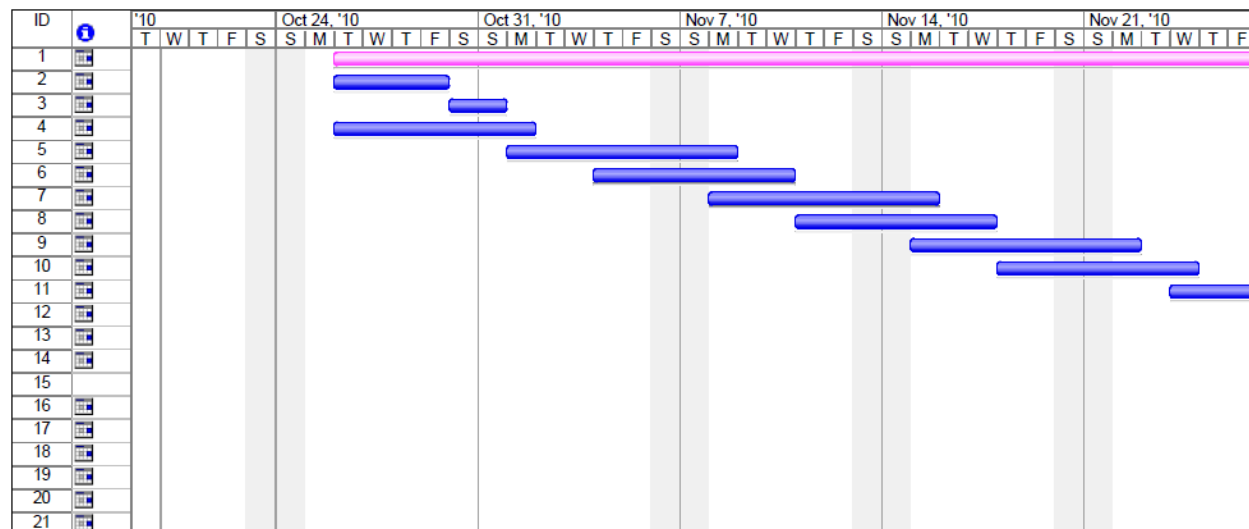
Learning Outcomes of the IQP

The WPI faculty has approved these learning outcomes for all IQPs. The numbers in parentheses denote corresponding WPI curriculum-wide undergraduate learning outcomes. Students who complete an Interactive Qualifying Project will:

- Demonstrate an understanding of the project's technical, social and humanistic context. (1, 7, 8)
- Define clear, achievable goals and objectives for the project. (6)
- Critically identify, utilize, and properly cite information sources, and integrate information from multiple sources to identify appropriate approaches to addressing the project goals (7, 10)
- Select and implement a sound approach to solving an interdisciplinary problem. (7, 10)
- Analyze and synthesize results from social, ethical, humanistic, technical or other perspectives, as appropriate. (8, 9)
- Maintain effective working relationships within the project team and with the project advisor(s), recognizing and resolving problems that may arise. (5)
- Demonstrate the ability to write clearly, critically and persuasively. (4)
- Demonstrate strong oral communication skills, using appropriate, effective visual aids. (4)
- Demonstrate an awareness of the ethical dimensions of their project work. (9)

Appendix B: B and C Term Project Timeline

		Task Name	Duration	Start	Finish
1		B Term	41 days	Tue 10/26/10	Fri 12/17/10
2		Interview Dean Grogan	4 days	Tue 10/26/10	Fri 10/29/10
3		Analyze Grogan Interview	2 days	Sat 10/30/10	Sun 10/31/10
4		Determine the three target groups	7 days	Tue 10/26/10	Mon 11/1/10
5		Interview target group 1	6 days	Mon 11/1/10	Mon 11/8/10
6		Analyze target group 1	5 days	Thu 11/4/10	Wed 11/10/10
7		Interview target group 2	6 days	Mon 11/8/10	Mon 11/15/10
8		Analyze target group 2	5 days	Thu 11/11/10	Wed 11/17/10
9		Interview target group 3	6 days	Mon 11/15/10	Mon 11/22/10
10		Analyze target group 3	5 days	Thu 11/18/10	Wed 11/24/10
11		Begin planning objective B	4 days	Wed 11/24/10	Mon 11/29/10
12		Compile On-campus IQP list and determine Professors to contact	4 days	Mon 11/29/10	Thu 12/2/10
13		Contact Professors for platform information	12 days	Thu 12/2/10	Fri 12/17/10
14		Determine alumni and contact	12 days	Thu 12/2/10	Fri 12/17/10
15					
16		C Term	37 days	Fri 1/14/11	Fri 3/4/11
17		Design Information system	7 days	Thu 1/13/11	Fri 1/21/11
18		Create online system and advertise	7 days	Fri 1/21/11	Mon 1/31/11
19		Analyze the effectiveness of controlled experiment	15 days	Tue 2/1/11	Fri 2/18/11
20		First Draft	10 days	Mon 2/7/11	Fri 2/18/11
21		Finalize Project Report	11 days	Fri 2/18/11	Fri 3/4/11



Appendix C: Sample Interview Questions for Faculty

1. How did you first get involved working with the IQP here at WPI?
2. What has been your involvement since then?
3. What was the structure of the IQP like when it first was implemented into the system?
4. How has the IQP evolved over the years? Why?
5. What is your opinion about the motivation of students here regarding the IQP? What about faculty?
6. What do you think it is about the IQP that will motivate students to do well?
7. Has faculty enthusiasm about the IQP changed over the years? If so, how?
8. Do you think the on-campus IQP needs improvements, for example more structure? How so?
9. Do you think the on-campus IQP should be more similar to the off-campus IQP? In what ways?
10. What IQP initiatives have succeeded in the past, and which have not?
11. Do you have any suggestions about how to better the IQP or our project?

Appendix D: Interview with Schachterle

- Came summer 1970 (IQP created in the spring of 1970 before he came)
- At the time the IQP was an option, it was not required by every student
- The faculty creating “The Plan” were not sure if there would be enough topics to do projects on and that faculty would not be willing to advise interdisciplinary projects
- Faculty really took to the IQP and within 3-4 years the faculty voted to make the IQP a requirement
- Schachterle felt it was a good thing that it became mandatory for students to do a project
- When the original plan was set up there would be one opportunity for students to do off-campus IQPs and that was at the Washington D.C. center, ran all four terms, with agency that sponsored and supported the topic
- Was in Humanities Dept, hired and was told that his purpose was to help implement the new program, worked with Dean Grogan, chair of search committee to hire someone to become the head of the “IGSD” at the time.... 1 year head of the program
- Did a lot of IQPs when first came, continues to advise projects
- Mid-80s was in charge and tried to create a thematic structure with 12-13 different topics and would have 2 faculty assigned to each project, one technical, one non-technical.
- Role of faculty was to be leaders of that theme
- Some projects in London, asked by Dean Grogan to work with Univ. in London because background experience, got some faculty to go and be resident advisors in London and he would foresee it from here
- 1987 decided to create the first off-campus project center
- Structurally the big change for the IQP has been with the off-campus projects, result is many students plan to do their IQP not based on one of the thematic topics (pg 16 of handbook the Divisions are still there that he and his colleagues set up), but some faculty and students don't pay much attention to it now
- Students choose their IQP now based on where they want to go, but not based on the topic...this was a big change and different structure
- Off campus IQPs were based just like the Washington model and were a one unit required prep (PQP became required) for students and faculty
- IGSD (a whole office) needed to be created to manage these off-campus sites and find faculty who would manage the different sites and needed to find housing, health services, etc.
- “Some faculty think that the students...that elect not to go off campus aren't the best students. So they may use that as a reason, or an excuse, not to advise IQP's on-campus.” They feel that WPI provides so many more resources for off-campus IQPS for both students and faculty that the on-campus IQPs can never be as good
- In his experience this is just not true.
- Schachterle advised four IQPs last year and one was a four person team that did great job, one was a one person who did a really good job, the second project was four people and it was alright, and the last four person team was a mess and the team just did not work well together at all. There was nothing he could do to motivate them to work together. The reason for the student's lack of motivation was due to personality and quality of students. The really good project was bright kids who wanted an A and they worked hard to get the A. The other bad team would like an A, but two of them let the other two do all the work and just wanted to get by doing as little

work as possible. As soon as the project was over everyone agreed that they understood what happened, and part of it was Schachterle's fault. He should have done more intervention in terms of accessing the teamwork and its problems, but whenever he tried to mention it they would get upset.

- Always thought it would get better next week...no documentation from the first weeks that they could review to see if things were improving, that way the students can't say that they weren't warned
- If he could advise it again he would give each student a written critique of a couple sentences through an email each week stating the strengths and weaknesses and a grade.
- He would suggest all advisors do the same for struggling groups and if the students want to discuss they can by coming in at office hours or whatever
- Feels there is a lack of motivation from faculty when it comes to poor quality of on-campus IQPs
- One of his colleagues used to always say, "Faculty will buy students off with a higher grade than they deserve if the project is not going well and are frustrated and don't know how to make it better... and I feel that was true of myself for this project" (referring to the bad project he advised)
- No obvious ways to improve the motivation of the faculty
- Faculty volunteer for IQPs, they are told which courses to teach and which MQPs to advise, but no one assigns faculty an IQP
- Some Dept heads tell faculty members to not advise on IQP at all, and if they want to only when they get tenure
- Schachterle originally would meet and have lunch with all new faculty members and strongly advise them to and would follow up the next year, doesn't know if that is still done
- Major change on campus since 1970 was the significantly increased expectation for research, you cannot get tenure without pretty meaningful research, most faculty nowadays want to do that for tenure and reputation, financial incentive as well, question of taking time away from research efforts in order to advise an IQP? Esp. off-campus
- Tried for years to mesh faculty research with student IQPs, no way to do it
- Faculty numbers have grown a lot over the years, but so have students
- Humanities dept and social science dept have a lot of faculty members that want to advise off campus IQPs because can relate to the sites
- Some people hired to come to campus specifically and only to advise IQPs at international centers
- Schachterle is not aware if there are on-campus issues, but the on-campus IQPs will always have one insurmountable problem.....students working full-time at a site with a sponsoring agency in the offices with the people get so much advice from people they are with ...this will never happen with the on-campus IQPs because there is not a sponsoring agency
- Faculty will come up with projects that are in particular interest to themselves, and these projects will probably not be in the best interest for student motivation, especially if the advisor is pushing them in the direction that they need to go
- Schachterle would very much resist an attempt to have some second party review topics; faculty won't tolerate the fact that their project ideas would need to be approved
- It isn't going to happen and he doesn't feel that there is any way to change it, and its better this way

- Only thing they tried was reviews on faculty *after projects* were completed to kind of critique the performance of the faculty members when advising hoping that they would not advise in that area again, but it did not really work
- IGSD's Top Nine Tips should be sent out at least once a year so advisors will have access and be pushed more to follow it (Schachterle did not even know about it, in fact he suggested there should be one and we had to tell him that one has been made)
- Deadline system would create more paperwork than necessary
- Schachterle said that we articulated a desirable project goal, but he is unsure about how we can achieve it
- "The harsh reality is we're always going to have some students at WPI who don't know why the IQP is here."
- Off-campus IQPs is the selling point for the school, not the on-campus
- Were never going to have a system where 100% of students have the motivation that were looking for
- Talk to some Dept Heads in our majors, and investigate what they do with MQPs, they make sure that declared majors have found an MQP right away because they would never want to be in a situation where someone comes to them and says they still have not found one yet
- He is not aware of any similar system that tries and ensures that every student has an IQP, not talking about all the ME majors, but everyone as a whole class
- "Does anyone go through the sophomore class in D term or the junior class of A term and try and find all the students who have no signed up for an IQP"
- Make something that goes out to students who don't have an IQP and need some attention, because some might respond very well because someone is reaching out to them
- Idea of finding students who have not found an IQP and only work with them
- Making it so that the whole student body of that year is affected in some way when it comes to the IQP will always be something we would like to achieve, but the reality is students come to WPI because most are committed to a major and after 4 years they can get a job, WPI is very successful... students not going to be as focused on the IQP
- Referring to students with writing, research and critical thinking skills "The big disconnect here, and I don't know how to overcome it, is that *we know* that employers are begging for that, but I've found it very hard to convince students that that is the case."
- "The fact of the matter is that almost 100% of the engineering programs in the United States are accredited by a professional organization that insists on the same very high standards"
- Higher someone from an ABET accredited school, you are pretty much assured that that student has the professional skills, you know the background of the student, that's a given but...
- "What makes the difference to the employer is teamwork, project management experience, critical thinking skills...but in streams of a company say we want people who can write well, and most especially speak well."
- Come to engineering school because they don't like that (referring to English related matters), say I'm no good at that, but don't realize that they are going to HAVE to do that
- Consultant company came to WPI and this tough woman said to the faculty that we look in the first two weeks to see what their teamwork, writing, and public presentation skills are...and if they are not up to our standards within the first two weeks we let them go. They have absolutely no time to train them and are not interested in training them...it made a big impact to Schachterle, but when he mentions it students are more worried about their tests, etc.

- Alumni come back and say it's absolutely true, know that need these skills for a job
- Maybe need a website with 2 or 3 recent alumni videotaped who can talk about how their IQP skills gave them a competitive edge on the job, need to drum the idea into the student heads

Appendix E: Interview with Professor Keil

- Judge projects on the basis of project reports, goal is to find out about the educational experience of the student and the report can be lousy while the educational experience can be great
- Off campus projects are confined to 7 weeks there needs to be a lot of structure, within the first two weeks you already have a draft
- Off campus projects would not work if the students did not finish their project in the 7 weeks
- The structure of the off campus IQP is what makes the reports better... can have crappy projects even though the report looks good
- Reports are designed like this because of the structure; it is not like that for the on campus IQPs
- Need to be careful judging the educational impact just from the reports
- Earlier evaluation of IQP done by Prof Keil in 1972-3 and Professor Jack Boyd, looked at all the IQP projects that summer, only look at the reports and does not reflect what it should
- Different students are different and some can write really well without a lot of pressure
- Prof Keil has had to re-write report because students are not producing great quality material
- Advised same number of IQPs on and off campus, but has not advised IQPs in last 10 years however
- Used to be involved with IQP-like projects before The Plan was even created, worked on projects over the summer at places for example like a plastics company
- WPI got grant from Sloan Foundation to do these projects
- IQP was an option and then became requirement
- Prof Keil feels the on campus IQPs could be improved through structure and deadlines, and that people have tried things like this before by offering sources at the IGSD (ex. How to write a proposal) but not used very much because every faculty member is their own person and wants to do the project their own way and won't listen to anyone who wants to make it more structured
- Prof Keil does not push students to get things completed when advising on campus because he knows that he does not just have the one term, there are three terms
- Worcester project center has students here at campus and the reports are good because they are very structured.
- Prof Keil feels that if all IQPs were done in one term the quality of the IQP would be much better because of the structure
- Washington site had little structure in the beginning and the projects were not as good, but now the projects are better because of the structure
- In order to do a real evaluation people need to look at both the report that was produced and need to interview the students and find out just how did this project work, but there has never been a study like this
- Hard to measure the learning outcomes of the projects students do
- We need to have more organization and have them all completed in one term, but that creates other problems because students will not be able to take the classes that are needed (some majors are very strict, it depends, for example in physics there is only one course that is offered twice a year) need both parts of curriculum to work
- Prof Keil feels that the course curriculum done at WPI would need to be redesigned so that students could afford to take the term off, but this would mean that for example all Chem. Eng majors would be doing the IQP at the same time and one of the strengths of the IQP is that you get to work with students that are not in your major

- Prof Keil time with the IQP has varied from time to time, wrote proposal to National Science Foundation that gave about 2 and a half million dollars to help, he was on a lot of committees and the IQP developed slowly over time, became Dept head of physics for 5 years which kept him out of the development of IQPs, did, however, go to the Washington site
- “IQP has been successful by forcing all students to do something that is not just technology or science.”
- Prof Keil sees projects both on and off campus that have no social science component to it
- Comes from un-anticipated things, projects have sponsors who change their mind at the last moment, for example some students in Costa Rica just re-wrote their report and it probably looked really good, but for the student education it was very poor, they basically had a vacation for 7 weeks
- Students who needed a re-written report were not prepared enough and some just do not work hard at their projects, more personality and experience over ability, have students that cannot work together and can’t write and misunderstand technology
- Faculty are under a lot of pressure off campus in order to make sure that the projects are completed on time, having students simply come back to campus to finish is unacceptable, they get grades that they should not
- Off campus students have prep courses/ write a proposal early really helps with the projects and the off campus structure would really help with the on-campus projects
- Sometime it is true that off-campus projects get more resources for their projects, while on campus IQPs just have the library and internet
- It would be good to have a social network so that projects could be advertised publically and students could find partners easier and faculty could find groups to work on their project, it happens somewhat now because now there are emails going around now and then, but it is not the most efficient way to make contact, system now is primitive
- Prof Keil feels that it is much more beneficial to have a student group where people do not know each other and on campus projects accomplishments are weakened because everyone just chooses their friends to work with, especially since there is no way to find partners
- Students drift into their senior year without having a clue about what they’re doing for their IQP, feels this would be part of the social network
- Been at WPI for 44 years and faculty has changed over the years in that they have to do research now
- Now there are increasingly fewer non-tenure IQP advisors (younger and more lively with a lot of new ideas), they are told not to do it, Prof Keil thinks this is unfortunate and that the on campus IQP experience would be more lively if they taught them, they just should not be overly committed but the experience would be good
- Same faculty advising IQP, no one knew really
- There are too many faculty that do not advise IQPs at all, Prof Keil is one of them, but there are other time commitments, aka being Dept Head
- Prof Keil is unsure if the faculty would go along with any change, easier to mold the students

Appendix F: Interview with Professor Demetry

- Came to WPI in 1971; became member of the Zweibel Committee -> committed to what the IQP could be and should be.
- Outside sponsorship began in 1974; mostly looking for assistance on environmental, societal problems
- No on-campus projects with outside sponsorship.
- Off-campus project centers originally idea for MQP, but filtered to IQP
- Was first advisor at an off-campus IQP site in Washington D. C. (1974)
- Strong points of off-campus: full time association with organizations who have professional staff, addressing real problems, students are away from day-to-day diversions of school work, full attention from off-campus advisors on students and project
- Students are motivated, among other factors, through their surroundings (appeal of off-campus projects)
- Treat on-campus projects like off-campus: on-campus should be full time/ 1 term with outside sponsorship; full working day at agency
- Do on-campus projects with local sponsors
- No shortage of local problems as long as you can make right connections (talk with Rob Krueger, Worcester cite director)
- Use local students as connection points – parents, affiliations, etc...
- Problem: too much faculty and staff commitment, even though this might be the only way to give structure and success to on-campus projects; increase quality
- Off-campus project center directors -> on-campus project theme directors
- create thematically categorized projects with an overall director (Facebook albums)
- It was a struggle to put some flesh on the bones of what the faculty and staff had adopted as the Interactive Project."
- "One of my first jobs was to get the faculty together in interest groups."
- "You don't have to think too far to think in terms of expanding the educational resources of the university by enormous leverage when you bring in not just the professors, but the professional staffs of [the sponsoring organization]."
- "[The on-campus project] is lacking the focus and direction of attention of the off-campus project. The on-campus project suffers as a consequence."
- "Venice is exotic, full of opportunities. Who is going to be excited about choosing a project in Shrewsbury? Not much sex appeal to Shrewsbury."
- "[Explore] projects in categories that are thematically related."
- "Organize by topic and interests rather than location."
- "There has to be a structure. The structure exists for off-campus projects. It basically is location and project center directors. But maybe if there was a topic director..."
- On-campus project over 4 terms. A term = proposal, 1/6 unit; b and c terms = heavy grunt work, 1/3 units each term; d term = writing report, 1/6 units.

Appendix G: Interview with Professor DiBiasio

- No longer the assessment coordinator, since became department head and could not do both
- National Accreditation agency, ABET “Accreditation Board of Engineering Technology”, that recognizes engineering programs and you want to have an accredited program. In the late 90’s ABET changed the way they used to do the accreditation to doing the “Outcomes assessment” meaning WPI tells them a student who graduates will have they certain abilities by showing them that through collected data
- This was new to WPI because they never had to show that their students had an understanding of engineering in a global societal context, and most departments had no idea what that meant
- There are specific sections that the ABET requires that the IQP is able to fulfill (found in DiBiasio’s reports)
- When this was added in the late 90’s and WPI and the Univ. of Arkansas were the first two universities to be reviewed under the system, therefore everyone in engineering got sucked into it pretty quickly, which was a real culture change
- Prof DiBiasio was able to learn how to show the proper evidence to accreditation and funding agencies; he learned how to show that WPI’s program is good.
- IGSD opened a position for an Assessment Coordinator, who would help develop how we present evidence to the agencies and help WPI understand what has been working on campus and what has not, Prof DiBiasio was able to get this position for about 4-5 years and for the last 5 years has not been in that position
- Used the information to find out how to improve the IQP from study to study, and if there is some cohort that is not achieving what they should be then what do you do to fix it
- The Global Program is a different experience and has developed a different process over the years. When you are dealing with external sponsors the bar is raised a lot. And if you want to return to the sponsors, then there is a commitment on the part of the university, advisors, and students. There is a desire to produce for the sponsor, along with meeting the academic standards by WPI. As this evolved, it became clear that students going away needed more preparation, which became the ID2050 and PQP. Going off-campus is a voluntary part in the system that makes it okay for the university to require the preparation.
- Off-campus students hit the ground running with this preparation before they even leave because of the academic help they get. Off-campus IQP then becomes a unit and a half, but in order for this to be done it needed more academic time.
- On –campus does not have this required preparation, which is a political issue that has been long argued. Logistically it is a nightmare because the IQPs are so different and there are so many on-campus IQPs, while off-campus projects have ID2050 tailored to the site.
- This is one big reason why the on-campus IQPs are not as strong.
- Another big reason why students on-campus do not produce the best results is because, “efforts are diluted by everything else that is going on” Prof DiBiasio
- When you go off-campus that is it, it is all you have to focus on, that dedication is what really seems to matter. The Worcester site has adopted this similar model.
- “It actually is [special], but it is looked at like nothing special” Prof DiBiasio referring to the on-campus IQPs

- “My experience is that, at least in the students that I deal with, when they hear from people who have been out working for a while, not just necessarily people who came from WPI and did an IQP, but people who have some kind of stature that the kinds of things that your trying to learn in an IQP that have to do with culture and society and technology and that interaction and teamwork and communication and problem-solving, those are what you do on the job every day and you’re going to be a step ahead if you know those when you leave here rather than have to learn it once you’re working and it doesn’t matter where you go” Prof DiBiasio.
- Have people like this come and talk, or get quotes from them to inspire students and speak to the value of what the IQP is trying to do.
- Need to figure out what speaks to people our age, for example “Service Learning”?
- Service Learning now is big at other schools and its going out in the community and doing engineering and society projects. A good quality service learning project is like an on-campus IQP, except that it is local.
- At Purdue have EPICS “Engineering Projects in Community Service” (National Program) have received a lot of recognition saying it is high-quality and deserving and received the Gordon Prize from the National Academy of Engineering and WPI has competed for that award. The award is for innovation and engineering education. Students get credit, but it is not required of every student. They have got develop to a marketable size to get people to pay attention.
- Prof DiBiasio knows that a lot of technical schools are into service and community learning, as well as sending people abroad
- Look up the projects through websites to find out about it, and look at other schools to see what types of projects they have that are similar to maybe get an idea of how they market there. Read what they are doing and look at some examples.
- Interview people from these schools about their projects, example Bill Oakes at Purdue, to see how to get interest from students who have a curriculum just as crowded as ours.
- “The other I think is just packaging in some ways. I mean I look at those Division, and I just don’t, I don’t even look at them anymore, I think they are kind of weird and maybe they worked 30 years ago, but I don’t think they work now” Prof DiBiasio.
- Referring to us improving the advertising “I think it’s great! I don’t have any recommendations specifically on how to do that because I think it actually has to come from people your age. But if you go to the website, you see the Global Program, there are lots of pictures, you see the map, and I do not know what you see when you go to the on-campus site. Nothing? Just a list of projects?” Professor DiBiasio.
- “Make a difference in yourself and in somebody else’s life by staying and doing something local, but how that is presented and put up there could really use some window dressing or whatever they call it. . . .So, the value added at the end needs to be there along with the excitement and the passion for doing something useful needs to be there as well” Prof DiBiasio.
- “If I went around my sophomore class, who is not looking to apply to the Global Program and said what’s an IQP, they can’t tell you. I bet more could tell you if I said, what’s a service learning project or community service project they’d be able to answer that, and you know what those answers are pretty close to the same” Prof. DiBiasio.
- “We should get people going I don’t know whether to apply to Puerto Rico or do this IQP here at WPI... that would be a goal.” Prof DiBiasio
- Need something visual with content for students to be able to look at, not a big list

- Professor DiBiasio has been here since 1980, early on it is clear that you need to advise some IQPs, but coming in you have no idea what an IQP is, how to advise one, how to get a topic, etc.
- Students wandered in his door excited about a project and they ended up getting an A, but it was low-quality because he didn't know what he was doing, and neither did they.
- Then he focused on MQPs because they were more in his comfort zone, and then Dean Vaz convinced him to go off-campus and had the PQP and ID2050, and that was where he really learned about it and at the Washington site where the sponsors there were really experienced
- Then he came back and it did not translate well to the on-campus IQPs, so he started doing the Worcester site, which went really good. They had sponsors, so he feels that motivated the students a bit more.
- Then, he got involved with Dept head and has since stayed away from the IQP except for the off-campus projects, because for WPI to pay for you to go away is worth it
- Prof DiBiasio tried to take a lot of what he learned off-campus and apply it to on-campus, but realized he couldn't because there are elements that apply, like good teaching including clear standards, frequent feedback, well defined goals, but the rest is hard to do it on-campus because everyone gets diverted
- It's easy to let a term go by without a lot happening, but with an MQP the timeline is forced
- Prof DiBiasio interviewed 5 faculty members (ex. Prof. Adams, Prof. Mott) who had a reputation for having student on-campus projects with good reviews. He wanted to know what it was that they were doing and found the three main components are extended time for the project (more than 1 unit needed), the structure of the project, the motivation, and faculty expertise (most do not know what they are doing)
- Showed that a high quality IQP may not be do-able by on-campus students in one unit, since they need the preparation in the beginning
- Young faculty want to do the right thing and be a part of the IQP system, but no one prepares them and in the end poor projects are produced and it is not the students fault. You could have smart students who do a poor report because the faculty member is just doing it because they want tenure.
- Can possibly pair new faculty members with experienced ones to work on a project, so that they can learn how to advise an IQP properly.
- Some faculty members will only do IQPs in their area of expertise because they know that otherwise they would be lost. When you go off-campus the advisor does not know about the project much because the sponsors and liaisons do, so it works out. It is hard getting local sponsorship.
- On-campus and off-campus reports different because they have different tasks and/or missions.
- Faculty usually screen students motivationally, not academically because it appears that there is no clear GPA differences between students going on and off-campus, this could be something you look into to see how the two compare because the data is available now
- Talk to faculty who have done a lot of on-campus projects, (ex. Prof. Adams, Prof. O'Connor, Prof. Mott)
- Talk to Marketing Department (Head Chris Ritter) to get some ideas about how they get people interested in the IQP and MQPs

Appendix H: Interview with Dean Grogan

- USA invested into engineering colleges following Sputnik
- WPI plan was out-dated
- Almost left WPI but felt could make more of a difference at WPI so stayed
- Became chairman of a curriculum committee to review freshmen and sophomore curriculum
- Invented a project program to try to solve real problems in industry where the solution was a matter of real interest. Students loved it
- Need to learn how to find new information and synthesize it
- Decided new program would be very heavy in projects. Large amount of faculty felt threatened.
- We proposed to make the IQP a degree requirement. “To graduate you must have solved a significant problem on the interface between in science and technology in one hand and social concern and human value in the other”
- Student input was very important to developing the IQP. School closed for a day to have IQP seminar.
- Wanted to learn how technology affected society
- Needed engineers who knew how to communicate with people
- Became first academic Dean. My job was to implement the new WPI plan.
- After stiff resistance from faculty, got plan going eventually.
- Started with Washington project center, was first off-campus project center. Anything in Washington had to do with politics, so you were automatically working the social aspect in any project you did.
- There is so much more at stake with off-campus projects, whereas on-campus doesn't get the same level of attention. Off-campus project students have only the project to focus on.
- It's hard to maintain incentives for advisors to advise on-campus projects
- The quality of the work depends on the quality and interest of the advisor.
- “I think we have established an expectation of off-campus projects, but the expectations of the on-campus projects are a problem.”
- “If the student newspaper or student government made noise about the quality of the on-campus IQP that would make a difference more than anything”
- “Students who complete both the MQP and IQP gain something no other students can gain: self-confidence.”
- “There should be some sort of preparation seminar saying what you should expect from your IQP would be useful.”
- “We should bring in alumni that have been out for 10 years and have them explain to students that they learned how to solved problems through the IQP, and gained the self-confidence to do so.”

Appendix I: Interview Questions to ask Juniors without IQPs

1. What is the main reason why you have not yet chosen an IQP?
2. What IQP resources are you aware of?
3. What types of resources would have helped you better choose a project?
4. How do you plan to find a partner(s)? Will you do it alone?
5. Are you looking forward to doing the IQP or would you rather take classes? Why?
6. Why do you think WPI makes the IQP a requirement?
7. Are you aware of what you are expected to gain from your IQP? If yes, what do you believe are the learning outcomes? If not, why?
8. Do you think that completing an IQP while at WPI will benefit you in any way?
9. If you were an administrator at WPI what type of changes would you make to the on-campus IQP choosing process?

Appendix J: Interview Questions to ask Juniors with IQPs

1. How did you find your IQP?
2. What resources did you use to find your IQP? (for example, the fair or the online website)
3. Would you say you were more inclined to choose your project based on strong personal interest, or as a means to satisfy your IQP requirement?
4. What is your opinion about the choosing process of finding an on-campus IQP? Do you like it?
5. Did your personal ability as a student play a role when you choose your IQP? If so, was there any indication of how difficult your IQP would be when you first choose it?
6. Are you working with any partners? If so, how did you find them? What is your opinion about the ways to find partners for the on-campus IQP?
7. Are there any further resources that could have helped you choose a project?
8. Now that you have your project are you more personally interested in it or less personally interested in it? How much effort do you put into your project on a scale of 1-10?
9. Are you aware of what you are expected to gain from your IQP? If yes, what do you believe are the learning outcomes?
10. Is your IQP what you expected it to be? Do you like your project?
11. Has your advisor made the overall goals of the IQP clear?
12. Do you feel you all have the same goals for the project in mind regarding what you want to get out of it?

Appendix K: Interview Questions to ask Sophomores who will be choosing an IQP

1. What steps, if any, have you taken towards choosing an IQP project that interests you?
2. What did/would provoke you to begin the process of choosing an IQP? If so, what were they?
3. Are you aware of the resources WPI currently offers to assist students with choosing an IQP? If yes, which ones?
4. Are you aware of what you are expected to gain from your IQP? If yes, what do you believe are the learning outcomes?
5. Are there any IQPs that currently entice your personal interest? If yes, what are they? If not, why?
6. Do you feel that completing an IQP is simply an academic requirement, or do you feel more inclined to complete a project out of personal interest?
7. If a new available resource could be created that assisted students in choosing an IQP what would you want it to be? What features would you want in this resource?
8. Would you feel that either a social network of IQP information, with high student to student or student to faculty interaction or a website database with similar facts would be helpful?

Appendix L: Qualitative Analysis of Sophomores Looking for On-campus IQPs (17 total)

1. *What steps, if any, have you taken towards choosing an IQP project that interests you?*

Themes Responded:

- None (11/17)
 - Know where to go (2/11)
 - Don't know where to go (9/11)
- Some (6/17)
 - Looked at website (3)
 - Tried to find partners (1)
 - Talked to friends (2)
 - Contacted professor (1)
 - Contacted academic advisor (2)
 - Off-campus fair (1)
 - Thought of own project (1)

COMMENT: Most sophomores have not started looking for a project, and of the ones who have, most have taken only one step to finding a project.

2. *What did/would provoke you to begin the process of choosing an IQP?*

- Did provoke-
 - Personal motivation (2/17)
 - Requirement of project (1/17)
 - Need to find partners (2/17)
- Would provoke-
 - Deadlines (6/17)
 - More direction (2/17)
 - Help finding partners (1/17)
 - Informational seminar (1/17)
 - Meetings with academic advisor (1/17)
 - Intuitive IQP fair (1/17)

COMMENT: 12 of the 17 sophomores expressed the need to be provoked to begin the process of choosing an IQP, and half of those 12 sophomores expressed the need for some system of deadlines.

3. Are you aware of the resources WPI currently offers to assist students with choosing an IQP? *If yes, which ones?*

- Yes (7/17)
 - IQP fair in spring (5)
 - Website (3)
- No (10/17)

COMMENT: More than 50% of sophomores interviewed are not aware of any IQP resources that WPI offers to them.

4. Are you aware of what you are expected to gain from your IQP? *If yes, what do you believe are the learning outcomes?*

- Yes (13/17)
 - Group work (7)
 - Real world issues (5)
 - Problem solving (3)
 - Knowledge outside major (4)
 - Knowledge inside major (2)
 - Leadership (1)
 - Society and technology (1)
 - Networking (1)
- No (4/17)

COMMENT: Of the 13 sophomores that responded yes to knowing what they are expected to gain from their IQP, only 3 responses mentioned problem solving and no responses mentioned research or writing, which are the three areas of weakness with the on-campus projects according to recent IQP reviews.

5. Are there any IQPs that currently entice your personal interest? *If yes, what are they? If not, why?*

- No (15/17)
 - Don't know of where to find (9/15)
 - Haven't looked hard enough (5/15)
 - None seem interesting (1/15)
- Yes (2/17)
 - Heard of easy one from friend (1/2)
 - In major (1/2)

COMMENT: 15 out of 17 sophomores interviewed did not have an IQP that interested them with the major reason for the former being primarily an inability to find an IQP and secondarily a lack of research. Of the 2 responses that said yes, neither expressed having found the IQP that interests them through WPI’s resources.

7. *If a new available resource could be created that assisted students in choosing an IQP what would you want it to be?*

- Online resource (15/17)
 - List of projects to search with inclusive details (12)
 - Way to find partners (2)
 - My.WPI tool (1)
 - WPI website improvement (2)
- Meet and greet professors (1/17)
- Structure of choosing process (1/17)

8. *Would you feel that either a social network of IQP information or a website database with mirrored facts would be helpful? Is there one you feel would be more effective than the other?*

- Social network (3/17)
- Website database (14/17)

Further Analysis:

Responses to question #3, in which students were asked what resources WPI offers that they are aware of, was related to responses from question #5, in which students were asked if they had found any projects that interested them.

		<i>#5: Currently interested in any projects?</i>				
		Yes(2/17)		No(15/17)		
		Heard about it from a friend (1)	Heard about it from Professor (1)	Don’t know where to find them (9/15)	Haven’t looked yet (5/15)	None seem interesting (1/15)
<i>#3: Aware of Resources?</i>	Yes (7/17)	(1)	(1)	(4)	(1)	-
	No (10/17)	-	-	(5)	(4)	(1)

COMMENT: 7 out of 17 sophomores interviewed expressed knowing at least one of the resources WPI offers. Of those 7 sophomores 4 did not know where to find a project, and 1 hadn’t started looking yet. Finally, the remaining 2 of those 7 sophomores had found a project

that interested them but did not use any of the resources WPI offers to find their project of interest.

Appendix M: Qualitative Analysis of Juniors without IQPs (10 total)

1. *What is the main reason why you have not yet chosen an IQP?*

Themes Responded

- Focus on classes (1/10)
- No hard deadline (2/10)
- Poor online resource (2/10)
- Off-campus intentions (2/10)
 - Rejected (1/2)
 - Missed deadline (1/2)
- Looking for (2/10)
 - Professors [ignored] (1/2)
 - Partners (1/2)
- Lazy (1/10)

Comment: No particular trend describing why these juniors have no project leading to the general conclusion that these actual students lacked considerable motivation.

2. *What IQP resources are you aware of?*

- Aware of (8/10)
 - Advisor (3)
 - IQP fair (3)
 - Helpful? (0/3)
 - Website (5)
 - Helpful? (0/5)
 - IGSD (2)
 - Helpful? (1/2)
- Not aware of any resources (2/10)

Comment: Students are for the most part aware of the available resources at this point, but found these resources generally unhelpful.

3. *What types resources of would have helped you better choose a project?*

- Better guidance/feedback (5/10)
 - Major advisors (1/5)
 - Project advisors (4/5)
 - Better advertisement of project (1)
 - Update project information to website (1)
 - Email students back (2)
- Online Resource containing (5/10)
 - Available partners (1/5)
 - Specific project information (3/5)
 - Project open/close distinction (1/5)

- Social network (1/5)

Comment: Specific project resources should be improved; more accessible, accurate and timely project information. More than half these students requested an online resource containing detailed project information.

5. *Are you looking forward to doing the IQP or do you see it as a requirement? Why?*

- Looking forward to (6/10)
 - Independent work (1/6)
- Requirement (4/10)
 - Prefer classes (1/4)

Comment: More than half the students are looking forward to the project and one third see it as strictly a requirement.

6. *Why do you think WPI makes the IQP a requirement?*

- Experience outside major field (1/10)
- Real world applications (2/10)
- Work on social issues (1/10)
- Gain research/writing experience (1/10)
- **Group work (5/10)**

Comment: Students *think* they know why the IQP is a requirement, however only one student stated an actual purpose.

7. *Are you aware of what you are expected to gain from your IQP? If yes, what do you believe are the learning outcomes? If not, why?*

- Aware [or think they are] (6/10)
 - Group Work (3/6)
 - Communication (1/3)
 - Experience outside major field (1/6)
 - Real life skills (2/6)
 - Professionalism (1/2)
 - Writing skills (1/2)
- Not aware (3/10)
- Break from regular classes (1/10)

Comment: Again, students think they are aware of the IQP learning outcomes, but are inaccurate.

8. *Do you think that completing an IQP while at WPI will benefit you in any way?*

- Yes (8/10)
 - Expands student knowledge (1/8)

- No (2/10)
 - No different from other group work (1/2)

Comment: Students generally feel the IQP will be useful.

10. *If you were an administrator at WPI what type of changes would you make to the on-campus IQP choosing process?*

- New easily accessible resource (3/10)
 - All inclusive (1/3)
 - Online (1/3)
- Screening process (1/10)
- Improve project advertising (4/10)
 - Emails (2/4)
 - Hard copies on campus (1/4)
 - Increase faculty enthusiasm (1/4)
- Increase structure (2/10)

Comment: It is clear that these students wish to make many improvements, hinting that the system can use some improvements. All of these themes are potential recommendations.

Appendix N: Qualitative Analysis of Juniors with IQPs (20 total)

1. *How did you find your IQP?*

Themes Responded:

- Students (8/20)
 - Friends(7/8)
 - Not Friends(1/8)
- IQP Fair(2/20)
- Website(6/20)
- Faculty(4/20)
 - Academic Advisor(1/4)
 - Professor(3/4)

2. *What resources did you use to find your IQP? (for example, the fair or the online website)*

- Website(12/20)
 - Expressed confusion with use(5/12)
- IQP Fair(2/20)
- IGSD(1/20)
- Professor(4/20)
- Students(4/20)
 - Friends(3/4)
 - Not Friends(1/4)

COMMENT: 2 Juniors with IQPs didn't even know the website existed

4. *What is your opinion about the choosing process of finding an on-campus IQP? Do you like it?*

- Had a Good Experience(4/20)
- Had a Bad Experience(16/20)
 - Thought there was a lack of(13/16):
 - Guidance(9)
 - Deadlines(1)
 - Stature(6)
 - Organization(9)
 - Advertisement(9)
 - Felt Rushed(3/16)

6. *Are you working with any partners? If so, how did you find them? What is your opinion about the ways to find partners for the on-campus IQP?*

- Students(19/20)
 - Found Through Friends(12/20)
 - Found the Experience Positive (2/12)
 - Found the Experience Negative(10/12)
 - Found Not Through Friends(6/20)
 - Found the Experience Positive(3/6)
 - Found the Experience Negative(3/6)
 - Found Through Advisors(2/20)
 - Had a Positive Experience(1/2)
 - Had a Negative Experience(1/2)
- Has no partners(1/20)

7. *Are there any further resources that could have helped you choose a project?*

- Online Type Resource(13/20)
 - A way to find partners(3)
 - Via a Social Forum(3)
 - A way to find a project(10)
 - Via an online database(10)
 - Via an Email(2)
 - A way to find an advisor(2)
 - Via an online database(2)
- Offline Type Resource(7/20)
 - Via an Improved IQP fair(3)
 - Via a Deadline system(3)
 - Via a Seminar(1)
 - Via Advisor help(2)

8. *Now that you have your project are you more personally interested in it or less personally interested in it? How much effort do you put into your project on a scale of 1-10?*

1	2	3	4	5	6	7	8	9	10
		(2)	(1)		(1)	(8)	(5)	(1)	(2)

- Average:7.05
- Limitations: It is difficult to be sure if students were honest in their answers or if they changed their answers in order to make themselves look like harder workers.

9. *Are you aware of what you are expected to gain from your IQP? If yes, what do you believe are the learning outcomes?*

- No(6/20)
- Yes(14/20), it has to do with:
 - The intersection between technology and society(5)
 - Developing group skills(5)
 - Solving real life problems(5)
 - Developing organizational skills(2)
 - Developing writing skills(1)
 - Learning how to take the initiative(1)
 - Developing presentation skills(1)
 - Developing communication skills(1)
 - Developing research skills(1)

COMMENT: Out of the students interviewed who are currently doing their IQP, 30% do not know what the learning outcomes are. Of the people that said “yes”, the vast majority did not acknowledge the research, writing, and problem solving components of the learning outcomes – which also happen to be the areas with the most deficiency according to recent IQP reviews.

10. *Is your IQP what you expected it to be? Do you like your project?*

This question was related directly to question #4 in which students were asked whether or not they liked the choosing process of the IQP.

	Liked project, is what expected	Liked Project, is not what expected	Disliked Project, is what expected	Disliked project, is not what expected
Liked choosing process (from #4)	(2/20)	(1/20)	-	(1/20)
Disliked choosing process (from #4)	(3/20)	(6/20)	-	(7/20)

- Reasons not what expected:
 - Excess writing(4)
 - Excess researching(4)
 - More focused on paper than tangible product(3)
 - High intensity(3)
 - Group members(1)

- Advisor issues(3)

11. Has your advisor made the overall goals of the IQP clear?

	Good advisor experience	Bad advisor experience
Advisor communicates well	(11/20)	(2/20)
Advisor does not communicate well	-	(7/20)

12. Do you feel you all have the same goals for the project in mind regarding what you want to get out of it?

This question was directly related to part of question #6 in which students were asked whether or not they did their IQP with a friend.

	Did with friends(10/20)	Did not do with friends(10/20)
Partners agreed on goals	(2/20)	(8/20)
Partners did not agree on goals	(8/20)	(2/20)

COMMENT: 50% of students interviewed did their IQP with friends, and the other 50% did it with people they did not know. Of the 50% that did it with their friends, 80% of the students interviewed *did not* agree with their partners on goals, whereas of the 50% of students who did not do it with their friends, 80% of the students interviewed *did* agree with their partners on goals.

Appendix O: Quantitative Analysis of Sophomores Looking for On-campus IQPs (17 total)

6. *Do you feel that completing an IQP is simply an academic requirement, or do you feel more inclined to complete a project out of personal interest?*

Themes Responded:

- Academic requirement (5/17)
- Personal interest (7/17)
 - Unaware of any resources (4)
 - Aware of fair only (1)
 - Aware of website only (1)
 - Aware of website and fair (1)
- Requirement, but wants a personally interesting project (5/17)
 - Unaware of any resources (2)
 - Aware of fair only (2)
 - Aware of fair and website (1)

COMMENT: From the data and sophomore responses it appears that 12 of the 17 sophomores are looking for a project of personal interest. This may require time and searching through several projects, but these sophomores are not aware of all the resources to find a project. Therefore, there needs to be better advertising early on in the year.

Appendix P: Quantitative Analysis of Juniors without IQPs (10 total)

4. *How do you plan to find a partner(s)? Will you do it alone?*

Themes Responded:

- Through Rissmiller- references of other students without projects (1/10)
- Friends (5/10)
- No idea (2/10)
- Working alone- don't know anyone (1/10)
- Working alone- preference (1/10)

COMMENT: From this information alone, it appears that these juniors who waited awhile to find a project would benefit from a resource that lists everyone who is still in need of a project.

9. *Would you rather take extra classes than do an IQP?*

- Yes (3/10)
- No (7/10)

COMMENT: Of the 10 interviewed juniors who still have not found an IQP, 7 agree that they would prefer the IQP over extra classes. This shows they have interest in the project, but have had issues finding one.

Appendix Q: Quantitative Analysis of Juniors with IQPs (20 total)

3. *Would you say you were more inclined to choose your project based on strong personal interest, or as a means to satisfy your IQP requirement?*

Themes Responded:

- Strong personal interest (13/20)
 - Likes project (10/20)
 - Does not like project (3/20)
- Satisfy requirement (7/20)
 - Likes project (3/20)
 - Does not like project (4/20)

COMMENT: Of the 13 juniors who choose their project out of interest, 10 ended up liking their project, while of the 7 who choose theirs just as a means to satisfy the requirement, 4 ended up not liking their project. It appears that if we can create a way for students to find personally interesting projects, then most could end up liking their projects.

5. *Did your personal ability as a student play a role when you choose your IQP? If so, was there any indication of how difficult your IQP would be when you first choose it?*

- Yes (3/20)
 - Yes, choose easy project (1/20)
 - Yes, difficult so did not choose (2/20)
- No (17/20)
 - Difficulty level does not matter (5/20)
 - Wanted something of interest (9/20)
 - Wanted something in major (3/20)

COMMENT: The above evidence clearly shows that these juniors are willing to work on projects that may be difficult, and are not necessarily taking the easy way out, but would rather find something on interest to them.

Appendix R: ABET Criteria

Criterion 3. Program Outcomes

Engineering programs must demonstrate that their students attain the following outcomes:

- a) an ability to apply knowledge of mathematics, science, and engineering
- b) an ability to design and conduct experiments, as well as to analyze and interpret data
- c) an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
- d) an ability to function on multidisciplinary teams
- e) an ability to identify, formulate, and solve engineering problems
- f) an understanding of professional and ethical responsibility
- g) an ability to communicate effectively
- h) the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
- i) a recognition of the need for, and an ability to engage in life-long learning
- j) a knowledge of contemporary issues
- k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.