

Twenty years down under: Documenting the history and assessing the impacts of WPI's Melbourne Project Center



Abstract

This project documented the history and assessed the outcomes of WPI's Melbourne Project Center, focusing on student, sponsor, and community impacts. It produced an organized database of past projects, coded by sponsor types, themes, and deliverables; an archive of reports and photos; and promotional materials for recruiting MPC sponsors and students. We developed instruments to survey 410 MPC alumni and interview 17 previous sponsors, finding that the MPC has run 163 projects over 18 years involving 37 sponsors and 572 students. The biggest impacts were on student academic and social development and changes in sponsor procedures and processes. Given this data, we provided recommendations for future impact assessments.

Team Members

Andrew Callahan
Sotirios Filippou
Killian Henson
Lucas Zuccolo

Advisors

Professor Lorraine Higgins
Professor Erin Ottmar

Sponsor

Melbourne Project Center



B term

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Documenting and assessing the Melbourne Project Center impacts

A traditional style of teaching, known as “chalk and talk,” has long been used as a didactic method of educating students across all disciplines. The approach most commonly involves an instructor who lectures at an audience of students. Scholars have identified a large number of problems with this approach; most notably, they have observed that the style promotes a dependent, “tell me how” mindset in the student where he or she relies on the professor to articulate the information needed to solve a given problem. Additionally, in recent years, universities have recognized that the chalk and talk approach is not particularly effective at engaging students in the classroom¹.

To address the issues with chalk and talk, many educational institutions, such as Worcester Polytechnic Institute (WPI), have moved toward constructivist “learning by doing” approaches to education. The inspiration behind these approaches is constructivist theory, which posits that individuals construct knowledge and meaning through the experiences they have². In recent years, universities have found that constructivist approaches tend to raise student test performances and facilitate student integration into the professional world, particularly in math and science education, than traditional didactic methods of teaching³.

Integrating project work into the WPI curriculum

One hallmark of WPI’s constructivist, “learning by doing” approach is its required, 3rd year Interactive Qualifying Project (IQP). In this project, students, in collaboration with a sponsoring organization, address an open-ended, global problem emphasizing the connection among science, technology and society (STS). If students undertake an IQP off campus, they spend 14 weeks working on the project, seven weeks in a preparatory course and the remaining seven on-site with the sponsor. A broad outline of the 14-week process is illustrated in Figure 1.

While the IQP operates over a relatively short period of time, formal assessments and anecdotal feedback have suggested that it benefits students’

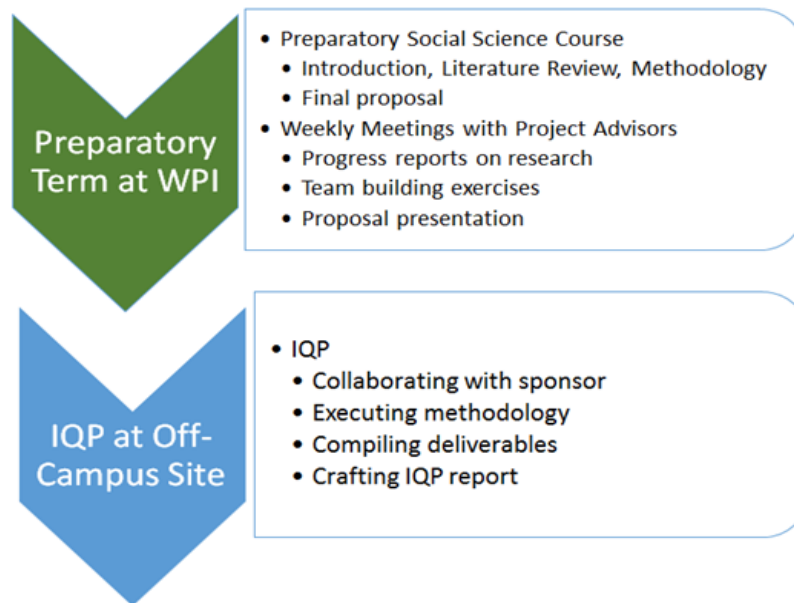


Figure 1. Broad outline of the 14-week IQP process

academic, cultural, personal, and professional growth.⁴ In fact, WPI has received national recognition for its program, named as the most popular study abroad program of 2016 by the Princeton Review⁵.

The Melbourne Project Center

The Melbourne Project Center (MPC) is one of WPI’s 23 international IQP sites. In operation since 1998, it has been the site for a multitude of projects on a variety of topics involving dozens of community sponsors. Students have tackled issues involving fire safety, science education, and environmental sustainability, among many others. The MPC icon is illustrated in Figure 2.

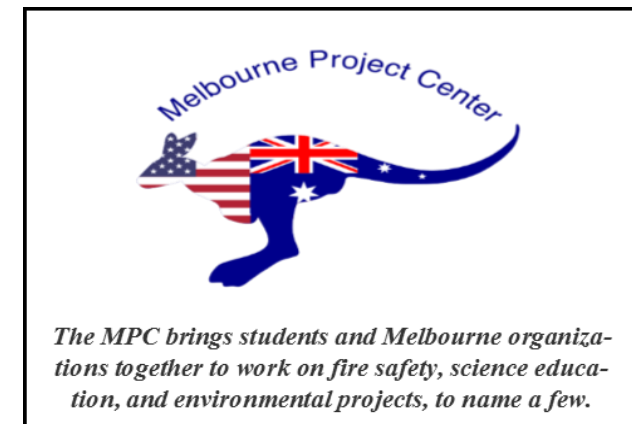


Figure 2. MPC icon and blow up quotation

Those involved in the MPC projects over the years believe that not only students, but the sponsoring organizations and the communities that they serve have benefitted from the project experience and from deliverables crafted by WPI students –from brochures and studies to websites and widgets. The problem, however, is that evidence of impact has been primarily anecdotal, and the MPC has not systematically investigated these impacts. Compounding this problem, the students’ written project reports, which document

information pertinent to the MPC's history and outcomes, have not been organized into a user-friendly database or website, which would be a logical starting place for assessment and a timely deliverable for the Center's upcoming 20th anniversary.

This is not a problem exclusive to the Melbourne Project Center. On a university-wide scale, WPI has conducted limited systematic assessments of the impacts on student alumni; only a few site-specific assessments have been done, such as those performed on behalf of the London⁶ and Switzerland⁷ project centers. Additionally, apart from one, 2014 survey of alumni, assessment of student impacts has mostly focused on an important but narrow set of academic learning outcomes rather than on broader, long-term impacts that projects might have on students professionally and personally. Moreover, WPI has few systematic ways to assess impacts on sponsors and on the communities in which students work. The need to execute more extensive assessment was highlighted in a report by the recent Project Impacts Initiative⁴, a WPI committee formed to further the university's five-year Strategic Plan. The current assessment methods that WPI utilizes to evaluate broad, long-term IQP impacts must be improved and expanded, and site-specific data must be collected.

Objective of the current project

Given the assessment needs described above, our project team concerned itself with documenting the history and assessing impacts and achievements of Melbourne IQPs on students, sponsors, and the greater Melbourne community since 1998. Our goal was for our work to be used by others to better understand and evaluate the benefits of WPI's unique, constructivist approach to learning, to make improvements to the MPC, and to promote the Center to future sponsors and participants, a process that could be expanded to the university's other project centers as well. To accomplish this, our objectives were to determine the number and types of projects over the years and

organize project material in an accessible manner; to develop instruments to assess specific impact constructs; and to use some of the materials gathered to design promotional materials for sponsor and student recruitment (Figure 3).

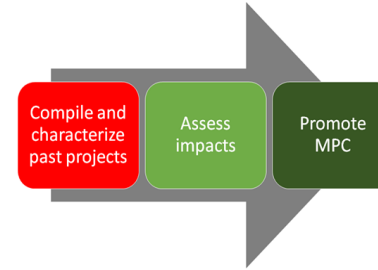


Figure 3. Broad overview of project objectives

Setting the framework for a comprehensive, innovative impacts assessment

Our goal of analyzing the impacts of the MPC's work is situated in the context of the IQP program and project-based learning at WPI.

The WPI Plan: Reimagining engineering education

WPI, one of the first private technological universities in the United States, underwent a wholesale revision of its curriculum during the late 1960s. At the time, students had been demonstrating less engagement in their studies, presumably due to the chalk and talk teaching styles exercised by professors¹. University enrollments were declining, and the school found itself in troubled waters. This decline in interest threatened WPI's survival as an institution; experienced faculty proposed a way to address the problem, however. They developed the 1970 WPI Plan (Figure 4), which integrated more hands-on learning in the university's curriculum⁸.

The WPI Plan drew from the school motto, "Theory and Practice." It sought to address the limitations of traditional, classroom-based learning by adding hands-on, experiential learning components, what we know of today as project based and problem based learning. The WPI Plan required that students complete an Interactive Qualifying Project (IQP) their junior year that addresses a problem emphasizing the connection among science, technology and society (STS) and a Major Qualifying Project (MQP) their senior year that emphasizes a problem within the students' fields of study.



Figure 4. WPI Plan committee

History of the Interactive Qualifying Project

WPI introduced the IQP as part of the WPI Plan in the early 1970s. It allowed students to develop high quality professional reports and exposed them to the open-ended nature of real-world problems⁸. The motivator behind it was recent research indicating potential of experiential learning over traditional didactic methods, particularly for STEM (Science, Technology, Engineering, and Mathematics) fields³. Its 1970 implementation stemmed from the STS movement, which critiqued approaches that emphasized engineering concepts without addressing broader social, environmental, and ethical issues. Developments like nuclear weapons and power made it clear that technology can have adverse impacts, and that engineers needed to consider the consequences and contexts in which their work will be used. The IQP sought to address this very issue.

The IQP program was soon expanded to allow for

off-campus projects. WPI's Interdisciplinary and Global Studies Division (IGSD) established the Global Projects Program (GPP) beginning with the Washington D.C. Project Center in 1974, and then expanded internationally and integrated a study abroad component with the London Project Center in 1987. In the four and a half decades since the IQP was initiated, WPI has established 23 IQP sites in 21 countries, in addition to eight domestic centers within the United States. The rapid growth of the GPP enrollments demonstrates the desirability of adding a study abroad component to the program; besides offering students the opportunity to travel to exciting new places, international sites integrate intercultural experience, affording students opportunities for personal growth and preparation for the workplace. In theory, it enhances their open-mindedness and flexibility, making them more capable in any field they end up pursuing, a consequence of incorporating many of these constructivist educational approaches.

Benefits of four constructive teaching methods

Problem-based learning presents students with an open-ended question or problem — one with many possible answers — and encourages them to work towards a solution with the tools at their disposal⁹. Problem-based learning allows students to develop knowledge themselves, while guided by the problem presented, as well to gain a better understanding of concepts by actively implementing them⁹. As Cindy Hmelo-Silver of the Department of Educational Psychology of Rutgers University explains, students improve both their understanding of the underlying material and their general thinking strategies, learning how to critically evaluate information to address the assigned problem¹⁰. In this approach, students are required to devise their own solutions to an open-ended problem; teachers facilitate and guide the learning process, but are not the primary communicators of

information¹⁰. The tasks that students work toward solving are often completed over a set period and culminate in a solution that students must justify.

Project-based learning emphasizes broad, hands-on projects that take lessons beyond just theory on paper. Projects require students to coordinate multiple tasks over time. They stress teamwork and communication skills by having multiple students set goals and collaborate, brainstorm ideas, and implement and test physical solutions, often justifying their approaches orally and in writing. The students develop and manage their own tasks; the teacher may serve as a facilitator, potential client or other audience¹¹. Students learn to expand their skillset, developing abilities that transfer to professional work situations. Complex projects in the community — especially those with social and technological dimensions — also require interdisciplinary and intercultural communication, and therefore have the potential to expand viewpoints.

Service learning, as the Vanderbilt University Center of Teaching describes it, is an educational method that assigns community service as a way to achieve classroom learning objectives, to enhance individual growth, and to benefit the common good¹². Examples may include working with a political campaign to learn about stakeholders and balancing interests, assisting senior citizens to learn about assistive technologies and geriatrics, serving as a mentor to learn about education and child development, and preparing a community garden to learn about horticulture and managements. The National Service Learning Clearinghouse defines three positive attributes of this approach; it “enrich[es] the learning experience, teach [es] civic responsibility, and strengthen[s] communities.”¹² Students engaged in effective service learning grow in multiple dimensions. Compared to traditional, didactic education, they experience a positive impact on comprehension of complexity and ambiguity; they develop a well-rounded sense of personal efficacy and the ability to collaborate in groups; and they have reduced tendencies to stereotype and a stronger relationship with their institutions¹².

The **study abroad** approach allows students to travel internationally to pursue their education at a university or other institution in a different country. Most commonly students are away from home for a term, semester, or a complete academic year. According to the International Education of Students (IES) Abroad, study abroad education is impactful because it exposes students to an unfamiliar environment where they must create a norm for themselves to adapt effectively to the changes they are introduced to¹³. As a result, students learn to experience education as a way of life by immersing themselves into a culture that is well outside of their comfort zone. Aside from personal growth, students experience interculturalism. They establish a more sophisticated and open-minded way of perceiving the world. The majority of students who return from a study abroad experience translate their meaningful development to interactions they encounter with people from different cultures¹³.

The Interactive Qualifying Project today

WPI combines elements from each of the constructivist approaches in its Interactive Qualifying Project (IQP).

As described by the current WPI Course Catalog, “the IQP challenges students to address a problem that lies at the intersection of science or technology with society,” working in interdisciplinary teams of three or four to develop solutions to real world problems¹⁴. Today, the IQP brings students together to work directly with sponsoring organizations and local communities to help address their needs; the idea is that students achieve greater personal growth and civic responsibility than they would working on purely technical projects. As such, the IQP is comprised of a culmination of the four constructivist approaches mentioned previously, as illustrated in Table 1.

Table 1. The IQP program draws on four constructivist methods

	Project-Based Learning	Problem Based Learning	Service Learning	Study Abroad
Learning Goals	<ul style="list-style-type: none"> • Manage multiple tasks • Function effectively on a team • Communicate with real audiences • Create new, relevant solutions 	<ul style="list-style-type: none"> • Improve understanding of underlying material • Improved general thinking strategies 	<ul style="list-style-type: none"> • Educate via community service • Enhance individual growth • Enhance personal efficacy 	<ul style="list-style-type: none"> • Improved open-mindedness • Intercultural development • Experience learning as a way of life
Application to the IQP	Hands-on group work	Open-ended problem	Community-based nature	Immersion into an unfamiliar culture

History of the MPC

The Melbourne Project Center, founded in 1998, provides WPI students with the opportunity to complete their IQP in Melbourne, Australia, in association with a variety of local sponsoring organizations, such as the Commonwealth Scientific and Industrial Research Organisation (CSIRO), the Australian Bureau of Statistics (ABS), the Metropolitan Fire Brigade (MFB), and CERES Community Environment Park, to name just a few. As a well-developed urban center, Melbourne experiences many challenges, such as public education and community development (Figure 5), similar to cities elsewhere. It also experiences global issues, such as climate change, and consequences that are unique to Australia, such as bushfires. This allows the MPC to address a variety of global themes in a local context.

The MPC traces its origins back to when Professors Jonathan Barnett and Matthew Ward sent a "bootstrap team" to Melbourne in 1998 to investigate the potential for a project center in that location. Barnett's interest in Melbourne stemmed from a sabbatical he did with CSIRO where he worked in a full-



Figure 5. D Term 2016 IQP students working with youth

scale fire protection engineering (FPE) burn lab. The bootstrap team identified options for housing, potential sponsors, and project opportunities.

One year later, Barnett advised about 15 students completing their IQPs and MQPs in Melbourne. Because most of Barnett and Ward's initial contacts were in the FPE field, projects in the early years were often fire-focused. Ward stepped down as co-director in 2004, and was replaced by Professor Holly Ault, who in 2007 took over sole directorship until 2016, when Professors Lorraine Higgins and Stephen McCauley assumed the directorship. The center initially ran projects one term a year on site, starting with only five projects a year; by 2008, WPI was sending students on site twice a year (currently in the March to May (D) term and the October to December (B) term). Today, typically around 24 students are assigned to six or seven different projects in each of these terms, and they are supervised by two faculty advisors.

Over the past 18 years, students have cooperated with government agencies, nonprofits, and private enterprises to complete projects focusing on various issues — fire safety, educational programs, the environment, arts preservation, and disability services. This provides for a wealth of experiences and outcomes, but we have little formal assessment of these effects.

WPI's impact assessment tools

A major goal of WPI's current Strategic Plan is to improve and expand the IQP and GPP. To do this, WPI must assess the impacts that the IQP has had on students, sponsors, and local communities. There are a variety of expected impacts, some of which link back to the original Plan, but others that we hear about anecdotally from our alumni and community collaborators. However, WPI's assessment tools to date have not comprehensively addressed these impacts, especially at specific centers. Table 2 summarizes expected impacts and current tools to assess them; those in red, however, are not done systematically across all project sites.

Table 2. Summary of current impact assessments by impact group and construct

	Expected Impacts	Existing Tools
Students	• Improvements in the academic learning outcomes established for the IQP	• Student Report on IQP Learning and Advising • Biennial Review of IQP Reports • ID 2050 / PQP Grading
	• Effect on their professional skills	• 2014 Alumni Survey (Vaz & Quinn) • Self / team evaluations
	• Personal growth	• 2014 Alumni Survey (Vaz & Quinn) • Post-project reflective activities
	• Expanded worldviews and cultural competency	• 2014 Alumni Survey (Vaz & Quinn) • Post-project reflective activities
Sponsors	• Production of useful deliverables	• IGSD sponsor survey administered upon project completion
	• Changes in programs and procedures	• Informal feedback from students, sponsors, advisors
	• Increases in funding	• Informal feedback from students, sponsors, advisors
	• Training or re-energizing staff	• Informal feedback from students, sponsors, advisors
	• Catalyzation of new relationships	• Informal feedback from students, sponsors, advisors
Communities	• Systemic changes	• Identified by center directors and advisors anecdotally though continued engagement
	• Production of physical resources	• Project reports • IGSD sponsor survey administered upon project completion
	• Promotion of community awareness, participation, agency	• Informal communication with community members

Impacts on students

The four impacts WPI expects the IQP to have on students are: 1) improvements in the academic learning outcomes established for the IQP (Figure 6); 2) effects on their professional skills; 3) personal growth; and 4) expanded worldviews and cultural competency.

Seeing as the academic learning outcomes are explicitly defined, they have been the most well-documented impact. Professors' grading in the preparatory term is primarily based on the development of these skills. The post-project Student Report on IQP Learning & Advising asks students to self-report on progress in these areas, and biennial reviews involve a host of WPI faculty analyzing students' written reports from across project sites to blindly rate the extent to which they show evidence of these outcomes. These assessments have been fairly consistent in

documenting students' improvements in areas; students who complete the IQP on campus and who do not take the preparatory course have been shown to underperform in these areas as compared to students who complete the off campus experience¹⁵. This data is not organized by project center, however.

Development of professional skills is another potential impact on students. One of the major ideas behind the program is giving students experience working with an organization to help them cultivate skills that could be integral to their career, such as interviewing and networking, meeting deadlines and managing a workload, and team dynamics. Students at some sites complete relevant self-team evaluations at several points in the project. However, these are used formatively, to coach students through difficulties, and little systematic analysis has been done on these team evaluations. The 2014 Alumni Survey, sent to all alumni who participated in on- or off-campus projects

Nine Academic Learning Outcomes from the WPI Course Catalog

1. Demonstrate understanding of project's technical/social/humanistic context
2. Define clear, achievable goals and objectives
3. Identify, use, and properly cite information from multiple sources to frame the project
4. Implement a sound methodology for solving an interdisciplinary problem
5. Analyze and synthesize results from social, ethical, humanistic, technical or other perspectives
6. Maintain effective working relationships with team and advisor(s), recognizing and resolving problems
7. Demonstrate ability to write clearly, critically, persuasively
8. Demonstrate strong oral communication, using effective visual aids
9. Demonstrate awareness of ethical dimensions of project work

Figure 6. IQP academic learning outcomes as listed in the 2014 WPI Course Catalog¹⁴

(IQP, MQP, Humanities & Arts) in the past few decades, included questions such as "To what extent did your formal project experience enhance your ability to succeed in business or industry?" The survey provided some evidence that alumni feel the IQP experience contributed to their professional maturation, and employers often comment on the value of the IQP experience, but further understanding of this connection is needed, and continued, systematic data collection is recommended⁴. It is also interesting that there is currently no data collected from the sponsors themselves on the students' academic or professional skills and improvements, even though they directly supervise student work.

In terms of personal growth, the experience of undertaking and completing a large, team-oriented project in a different culture, far from home, for two months, can potentially shape individual's personal values, beliefs, or ways of thinking. Similarly,

students' worldviews and cultural competency skills can potentially be expanded by interacting with diverse populations wildly different from their relatively sheltered university community.

The IGSD is working on administering a short re-entry survey for students returning from Project Centers and encouraging advisors to organize post-project activities where non-academic impacts like these can be discussed. In addition, the 2014 Alumni Survey asked alumni how their project experience contributed to "enriching your life in ways that were not necessarily academic or work-related" or "helping you develop a stronger personal character". This provided compelling data on the powerful long-term impacts of these projects. Students completing at least one project off-campus were more positively impacted personally and in their worldviews than those who remained on campus. Reflective activities have anecdotally supported this; students often share stories about how the projects affect them. This evidence is largely anecdotal, and neither the Alumni Survey nor the reflective activities are administered systematically or regularly.

Impacts on sponsors

Impacts related to sponsors are less thoroughly explored. The most visible evidence of impact lies in project deliverables — the recommendations, new processes, built structures, or technological tools students create for the organization — but there are many less explicit effects that projects have the potential to produce. Working with a group of international engineering students can often re-energize staff and volunteers, improve sponsor image, and provide opportunities for management training of junior staff. Many IQPs are motivated by the sponsor's lack of time and resources to address secondary projects, and the students' work leads to increased funding or expansion of existing efforts. To measure such impacts, The IGSD administers a brief online sponsor survey following completion of the projects⁴. It inquires about subjects such as sponsor satisfaction ("How

satisfied is your organization with WPI's oversight of its student projects program?") and results ("How likely is your organization to make use of the results of the students work?"). Sponsors often indicate they are happy about the projects, even when the results are more nebulous and are not directly put to use. The main reason for discontinuation of projects is often simple logistical difficulties or lack of communication due to sponsor relocation, changes in sponsor or project center leadership, etc. Most of the impacts on sponsors, however, do not manifest until weeks, months, or years after the projects' end. The survey fails to capture these, as it is not only administered directly after project completion but is also limited in scope, too focused on short-term sponsor retention ("What is the most important factor in deciding whether to sponsor a project?"). Although students, sponsors, and advisors sometimes share stories of project impacts on sponsors, these are not directly solicited. In addition, it can be difficult to directly correlate what are seen as outcomes to projects which may have influenced them; often times the projects either build upon existing work or serve as the starting point for further development, complementing the sponsor's own efforts.

Impacts on local communities

This problem is further compounded when assessing impacts on the larger communities. Some tangible, physical results, such as the construction of a community garden or tool used by others beyond the sponsoring organization, may be easy to identify, but less visible impacts — e.g. improving museum visitor experience, raising public awareness about the conservation of local rivers, or influencing local policy towards safer construction practices — are difficult to assess systematically due to their scope⁴. Additionally, since one of the major motivators behind collecting these stories and data is marketing and publicity, negative effects are often under-reported, which harms our efforts to understand and ameliorate them.

Current faculty recommendations

In light of these gaps in existing assessment methods, the ad hoc Project Impacts Initiative Committee composed recommendations to better track, analyze, and communicate impacts associated with student projects. Golding et al. recommended the generation of an annual impact report by the IGSD in which the impacts of the projects completed at all the project centers in the previous academic year would be analyzed⁴. They proposed each project center create a website, which would assist in archiving students' work and impacts⁴.

They also recommend adding additional questions on personal impacts to the Student Report on IQP Learning & Advising survey ("What do you believe has been the most significant impact of the project experience on your growth and development?"), though care must be taken to avoid overlap with the IGSD's planned re-entry survey (to be administered to alumni returning from off-campus projects)⁴. Alumni surveys and interviews (generated by the impact assessment IQPs they recommend performing every five years at each project center) would help determine long-term effects⁴.

In terms of sponsors and community impacts, the report suggested that students' final submission to the WPI site should be expanded beyond the written report and include ancillary materials — links to project websites, e-portfolios, reflective essays, project artifacts, presentations, team recognition, media coverage — allowing it to capture a range of potential impacts⁴. An adjustment of the present sponsors' survey, asking "How will your organization make use of students' work?" and "Were there negative or unintended consequences of the project?", would acquire more extensive information⁴. These would be complemented by interviews with sponsors and community members through the five-year assessment IQPs⁴. Lastly, they suggest the creation of an "integrated data management system" to archive and organize all of these materials⁴.

Our project was thus part of WPI's long-term

objective to better organize and analyze data on project impacts, focusing specifically on the MPC; the methods we used however may serve as a prototype for future impacts assessments at other Centers.

Shedding light on the MPC: Our process

The main objectives of our project were to: determine the number and types of projects over the years and organize project materials in an accessible manner, develop instruments to assess specific impacts, and design promotional materials for sponsor and student recruitment.

Objective 1: Methods for organizing project materials

Our first objective was to compile project materials in an acceptable manner. We followed the following steps to accomplish this.

- **Obtained MPC project records (1999 - 2016).** A research and instruction librarian at the Gordon Library requested these on our behalf from the Systems and Collections Department. Records listed project titles and dates, authors, sponsor and advisor names. They also included an abstract for each project and a link to the complete report. We found entries for 154 projects. However, some information was missing for particular projects, there were no project listings from C 2009, and 8 listings were incorrect (duplicates or projects done at other sites). As a result, we were able to compile 146 MPC complete entries.
- **Corrected omissions and errors in the records.** We contacted previous directors to fill in missing information; when specifics were not available, we were at least able to estimate the number of projects and students in terms with no records.

Our updated Excel file allowed us to tabulate the total number of projects and sponsors, the number of sponsor liaisons who had worked with students, and the number of students involved over the years.

- **Created a database of project report files.** We generated folders organized by year and term, and populated them with PDFs of relevant reports. Most were available on the WPI Gordon Library website. All reports were renamed in this format: YEAR_TERM_SPONSOR.pdf (ex. 2009_D_CSIRO.pdf).
- **Collected and organized project images.** We sought to acquire photos from past project reports, project advisors, and a survey sent to alumni, culling for action shots and images relevant to project themes. Additionally, we took photographs and video clips as we interviewed sponsors, traveled to previous IQP sites, and shadowed the B16 teams working at their sites. We organized media in files by sponsor name, labeling themes and years in the filename so that it would be searchable by theme or year. The media were uploaded onto a Google Photos account. These materials

Table 3. IQP coding categories for project reports

Sponsor Types	Themes	Deliverables
<ul style="list-style-type: none"> • Non-profit organization/ Non-governmental organization • Private enterprise • Government 	<ul style="list-style-type: none"> • Education • Environment • Energy Resources • Healthcare • Social and Human Services • Arts/Culture/Historical Preservation • Animal Conservation and Welfare • Organizational Process Improvement • Urban Planning and Transportation Infrastructure • Policy and Law • Public Safety 	<ul style="list-style-type: none"> • Training or Educational Materials • Promotional Materials and Events • New Procedures and Processes • Information Repositories, Databases, Websites • Computer Programs or Apps • Built Structures or Products • Designs for Built Structures or Products • New Collaborations and Partnerships • Research Study and Recommendations

can be used for a future website or for publicity.

- **Coded reports by theme, sponsor type, and deliverables** (Table 3). Reading over the abstracts, we extracted common categories for sponsors, themes and deliverables, then two of us and our advisor independently used the categories to code 10 projects. Abstracts that were not specific enough required us to look at the longer report. Initially, our inter-rater agreement was only about 50%. To help resolve this problem, we discussed disagreements and re-coded together, better defining the categories. The full definitions of these categories can be found in Supplemental Materials Section B. We repeated this process until we reached 73% agreement. At that point, two of us coded the rest independently, conferring when we had questions. Coding allowed us to determine the most common type of sponsors and identify the most common themes and deliverables at MPC. Although we were interested in coding for the type of stakeholders that each project intended to have an impact on, this was only mentioned explicitly in less than 80% of the abstracts. We therefore did not code for it but developed a list of impact groups mentioned.

Objective 2: Methods for assessing project impacts on MPC students, sponsors, and local communities

Our second objective was to assess the project impacts on MPC students, sponsors and local communities.

Students

- **Designed an alumni survey using Qualtrics**, including questions relevant to academic learning outcomes, worldviews and cultural competency, personal growth and values, and professional skills.
- **Academic learning outcomes** questions asked that they rate on a Likert scale the extent of their improvement in each target area (Figure 7). If they chose “A great deal” or “A lot” for any of the skills, they were asked to explain which aspects of the project helped them develop their reported skills. This allowed us to understand which teaching interventions are most useful, and it provided quotations for promotional materials.
- **Worldviews and cultural competency** questions (Figure 8) were adapted from the 2014 Alumni Survey¹⁵. Similar to the assessment of academic learning outcomes, if they chose “A lot” or “A great deal” they were asked an open-ended question allowing them to expand appropriately.
- **Personal growth and values** questions asked “To what extent did your project affect you personally?” If they chose any of the Likert options except for “Not at all,” then they were prompted to answer a close-ended question that provided options on what aspect of their project influenced this personal growth. Based on their selection, we asked that they expand further (Figure 9).
- **Professional skills** questions were open-ended (Figure 10) to allow MPC students to expand on this reported improvement. If they first indicated

To what extent did your project experience enhance your abilities in these areas?

	Not at all	A little	A moderate amount	A lot	A great deal	Not sure/Not applicable
Professional written communication	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Professional oral communication	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Professional visual communication	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Working on a team	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Leading others	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Defining achievable project goals and objectives	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Managing time and tasks for a complex project	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Conducting research using multiple information sources	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Critically analyzing and evaluating information	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Generating new ideas and thinking creatively	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Figure 7. Academic learning outcomes evaluated in Q10 of the MPC Alumni Survey

that the experience had continued to influence them in their professional careers, we then inquired which skill or growth benefitted them the most in their professional life.

- **The survey was distributed to 410 project alumni** and remained open for two weeks, with an automated email reminder sent each week. We provided an incentive raffle for gift cards. See Supplemental Materials Section C for the complete MPC Alumni Survey.
- **Performed a statistical analysis** of the close-ended, single response questions. We used Qualtrics and SPSS Statistics to gather this data, which allowed us to report concrete responses. The specific analyses used to assess this information, such as a factor analysis to determine the number and types of constructs measured in our survey, are addressed in the results section of our report.
- **Coded responses and pulled quotes from the open-ended questions.** We coded based on trends in responses, and when we were unable to find

To what extent did your project experience change your awareness of or attitudes about the following?

	Not at all	A little	A moderate amount	A lot	A great deal	Not sure/Not applicable
Connections between society and technology	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Global issues	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Ethical responsibilities and impact on others	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Cultural differences and ways of interacting	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The interdisciplinary nature of complex problems	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Figure 8. Worldviews and cultural competency evaluated in Q12 of the MPC Alumni Survey

To what extent did your project affect you personally?

Not at all A little A moderate amount A lot A great deal Not sure

How may your project experience have changed you on a personal level?

Influenced my self confidence

Stimulated new interests

Motivated personal changes in my lifestyle or attitude

Impacted my personal goals

New and/or lasting friendships

Other:

What about your projected affected you personally in that way?

Figure 9. Personal growth and values evaluated in Q14-Q16 of the MPC Alumni Survey

If you reported growth in any of the skills or viewpoints described, how much did this growth benefit you in your professional work after graduation?

Not at all A little A moderate amount A lot A great deal Not sure/not applicable

What improved skill or personal growth from the project aided you professionally? How did that help you in your career?

Figure 10. Professional skills evaluated in Q17 and Q18 of the MPC Alumni Survey

trends or commonalities we instead pulled quotes to be used for documentation. See Supplemental Materials Section D for the MPC Alumni Survey coding categories.

Sponsors

- **Prepared an interview script for staff from the sponsoring organizations who worked directly with MPC students.** Our goal was to complete 15-20 interviews with staff from the 37 sponsoring organizations. We sought evidence of 5 impact constructs: production of useful deliverables; changes in programs and procedures; increases in funding; training or re-energizing staff; and the catalyzation of new relationships. We used open-ended questions that solicited anecdotes and examples about these particular impacts. Our questions also asked for their recommendations regarding improvements. The sponsor interview script can be found in Supplemental Materials Section E.
- **Interview questions 3-5 were designed to solicit information about the 5 impacts addressed previously** (Figure 11). Question 3 focused on obtaining information about a specific impact and the others allowed us to gather further details about this impact.

3. What were some of the most notable or memorable projects in terms of their outcomes and specific impacts on your organization?

4. Do you know of any data or publications that have documented this impact?

5. Why has/did your organization find it useful to continue sponsoring projects for the MPC? What are the benefits?

Figure 11. Sponsor impacts interview questions

- **Questions 11 and 12 were used to gather recommendations for improvements to the MPC** (Figure 12). These questions solicited information about negative or unintended consequences that occurred during the projects and subsequent recommendations.

11. Were there any negative or unintended consequences of the project?

12. What aspects of your project experience could WPI work on to help the quality of future projects?

Figure 12. Sponsor recommendations interview questions

- **Executed the interviews.** During the interviews, one member of the team asked the scripted questions while the other took notes and either video or audio recorded the process.
- **Looked for common responses** related to the specific impacts mentioned previously and for impacts we did not target. We also looked for common suggestions about improving the IQP program and then recorded all responses, compiling a definitive list about what the sponsors said on the whole. This allowed us to see trends in the responses.
- **We also developed but did not have time to implement** a more systematic approach of gathering sponsor quantitative data on impacts: a sponsor survey. The questions use a Likert scale asking the respondent to rate the extent to which they agree or disagree with items such as: making extensive use of student results and recommendations, seeing notable project impacts, etc. See Supplemental Materials Section F for the complete sponsor survey.
- **Finally, we emailed 29 past MPC advisors to ask them if they knew of any specific sponsor (and**

community) impacts (Figure 13). 11 responded directly in the email; we sorted through their responses to gather useful anecdotes about project impacts and noted any unexpected ones as well.

Communities

- **Recorded responses from alumni survey, sponsor interviews, and advisor interviews pertaining to community impacts—this included mention of impact constructs** such as systemic changes, production of physical resources used beyond the sponsoring organization, and information indicating whether and how projects changed community attitudes and awareness or participation in the issues relevant to the project.
- **Generated alumni survey questions 19 - 22** (Figure 14) to gather data on all three impact constructs.

To what degree do you feel your project had an impact — on either your sponsor, on other organizations or businesses, or on members of the community?

None at all A little A moderate amount A lot A great deal

○ ○ ○ ○ ○

To your knowledge, which of the following groups were affected by your project? Check all that apply.

Sponsoring organization

Other organizations or businesses beyond the sponsor

General public/members of larger community

Specific demographic

None of these groups

What specific demographic was that (e.g. 10-17 year old girls, people with visual disabilities, farmers in the state of Victoria)?

Can you elaborate on the specific impacts your project had, or any changes that came about as a result of your project?

Figure 14. Community impacts alumni survey questions

- **Used sponsor interview questions 8 and 9** to assess the three community impact constructs (Figure 15).

Dear Professor X,

We are an IQP group investigating the impacts of the Melbourne Project Center over the past 18 years. We are currently in Melbourne working with Professor Lorraine D. Higgins. As part of our effort, we are contacting past project advisors to help us track the impacts the projects may have had on the students, sponsors and the communities in which students worked. We would greatly appreciate if you would take a few minutes to answer the following questions; the information we gather will help us to improve the program and student experience. It will also provide materials for our 20th anniversary celebration in two years. We would appreciate any information you can provide us, preferably before November 25th.

1. Which of the projects you advised were the most memorable to you and why?
2. Are you aware of any projects conducted at the Melbourne Project Center that had a significant impact on the project alumni, sponsors or local communities involved? If so, please elaborate.
3. Do you know if there are any publications, news coverage, or examples that showcase the impact of the Melbourne Project Center? If so, could you please direct us to them?
4. Do you have any media related to the Melbourne Project Center that you could share with us? We are mainly looking for action shots that demonstrate students' work.

Figure 13. Email sent to past project advisors

- *The more specific sponsor survey* instrument we designed also included three questions to assess the specifics of community impacts. Again, it was not distributed but will likely be adapted for future use.

8. Are you aware of other MPC projects have had on the community your organization serves? How so?
9. Do you know of any members of the community you think we should interview about the impacts the projects have had?

Figure 15. Community impacts interview questions

In summary, Table 4 (page 11) illustrates the impact constructs we investigated for each of these groups and the associated questions that we used for assessment. Supplemental Materials Sections C, E, and F contain the complete alumni survey, sponsor interview script, and sponsor survey, respectively. The sponsor survey column is grey because this instrument was not distributed during our project.

Objective 3: Methods for designing promotional materials for the MPC

The type of assessment data and records we developed will be useful for improvement of the program. But this information will also be useful for external audiences—to describe our program more accurately and promote it to students and sponsors. Thus, our third and final objective was to design

promotional materials for sponsor and student recruitment. These are the steps we took to accomplish this.

- **Developed an MPC icon for easy visual identification of the Center.** This icon would be imprinted on a promotional brochure to highlight and promote instant public recognition of the project center. It was designed as a vector graphic in Inkscape to facilitate future modification and resizing (see Introduction Chapter for complete design).
- **Created a list of historical events and milestones in the MPC's history.** Interviews with previous directors and information from our survey and interviews provided content for a visual timeline reflecting important historical milestones. This graphic can be used in the future for a website or for other promotional materials.
- **Produced a database of testimonials.** We compiled a list of quoted material pulled from the alumni survey and sponsor interview responses. This material was used to showcase the impact of the MPC on its stakeholders, as they described it (see Supplemental Materials Section G).
- **Generated a sponsor map.** We generated several sponsor maps using Google Maps and edited them for clarity and aesthetics using GIMP.
- **Designed visuals to be used in a brochure.** Using our most notable impact data, anecdotes, and quotations gathered from the MPC alumni survey and sponsor and advisor interviews, we generated visuals for promotional use using Microsoft Publisher, found in Supplemental Materials Section H. These materials are intended for a brochure and were also used to design an infographic to advocate for the MPC to the general public. These infographics may also be beneficial for a future website page to facilitate recruiting new sponsors and project participants.
- **Composed a recruitment brochure.** We compiled select parts of our testimonials and infographics, and together with the icon and the timeline, designed a brochure in Microsoft Publisher. This

Table 4. Targeted impacts for each group and the corresponding survey and interview questions used to obtain data on them

Impact Group	Constructs	Alumni Survey	Interview Script	Sponsor Survey
Students	Academic Learning Outcomes	Q10, Q11		
	Professional Skills	Q10, Q17, Q18		
	Personal Growth and Values	Q14 - Q16		
	World Views and Cultural Competency	Q12, Q13		
Sponsors	Production of useful deliverables		Q3 - Q5	Q6 - Q8
	Changes in programs and procedures		Q3 - Q5	Q6 - Q8
	Increases in funding		Q3 - Q5	Q6, Q11, Q16, Q17
	Training or re-energizing of staff		Q3 - Q5	Q6 - Q8
	Catalyzation of new relationships		Q3 - Q5	Q9, Q11, Q16, Q18, Q19
Communities	Systemic changes	Q19 - Q22	Q8, Q9	Q8, Q10
	Production of physical resources	Q19 - Q22	Q8, Q9	Q6, Q8
	Promotion of community awareness, participation, agency	Q19 - Q22	Q8, Q9	Q8, Q10

Analyzing the past, changing the future

We collected a wealth of useful information using the processes described.

MPC by the numbers

There were two components to our first objective: creating a projects database and collecting project-related media.

Projects database

The first was compiling a database of past project reports, and the second was compiling project media that can later be used in promotional material. Creating the database allowed us to determine the total number of projects completed at the MPC (through B Term 2016), as well as the number of students and sponsors who participated. We acquired 146 MPC reports from the library archives, one additional report from D Term 2016, and six reports from this term, totaling 153 available IQPs. An estimated 10 reports were missing (based on trends associated with the typical

number per year and term). Thus, we estimated that 163 projects have been completed since 1999.* Following a similar process, the number of students was estimated at 572 (Table 5).

We were also able to identify the number of organizations that have sponsored our projects, their location, and whether they were governmental organizations, non-profit organizations (NPO) / non-

Table 5. Number of projects and students from D Term 1999 - B Term 2016

Estimated Number of Projects	163
Available Reports	153
Missing Reports	10
Number of Students in the Database	539
Estimated Number of Students	572

governmental organizations (NGO), or private enterprises (Table 6). We determined that the majority of projects have been sponsored by government and non-profits, with few businesses participating as sponsors.

Table 6. Number of projects per sponsor type

Type of Sponsor	Number of Projects
NPO/NGO	71 (48%)
Governmental Organization	69 (47%)
Private Enterprise	7 (5%)

We also determined the themes of past projects by coding the abstracts of the reports. The most common theme was education, followed by projects related to public safety (often fire-related), organizational process improvement, environment, social and human services, energy resources, and others (Table 7).

The final coding category was the type of deliverables produced. Initially, most projects were studies, producing data and recommendations almost exclusively, but over the years, other deliverables became more prevalent, such as training and educational materials, new processes or procedures, information repositories, databases, websites, and designs for built structures or products. However, research studies remain the most common deliverable, followed by training or

*Terms with no or missing recorded reports: D 2005, C 2009, D 2016. cursory investigation indicated some of these were withheld for confidentiality reasons. The total to date is 163 projects including the six recent projects from B 2016).

brochure condensed many of the important findings and information about the MPC to be used in recruiting potential sponsors. See Supplemental Materials Section I for the complete brochure design.

Table 7. Number of projects per theme

Theme	Number of Projects
Education	60 (41%)
Public Safety	42 (29%)
Organizational Process Improvement	39 (27%)
Environment	23 (16%)
Social and Human Services	22 (15%)
Energy Resources	14 (10%)
Urban Planning and Transportation Infrastructure	10 (7%)
Arts/Culture/Historical Preservation	6 (4%)
Animal Conservation and Welfare	2 (1%)
Healthcare	2 (1%)

educational materials. Table 8 contains the complete list of deliverables that have been produced by MPC projects.

Table 8. Number of projects per deliverable

Deliverable	Number of Projects
Research Study and Recommendations	104 (71%)
Training or Educational Materials	33 (23%)
New Procedures and Processes	26 (18%)
Information Repositories, Databases, Websites	11 (8%)
Promotional Materials and Events	7 (5%)
Computer Programs or Apps	5 (3%)
Designs for Built Structures or Products	4 (3%)
New Collaborations and Partnerships	3 (2%)
Built Structures or Products	2 (1%)

Using this data, we created an Excel Sheet describing all available past projects (Figure 16). It

contains: project title; term; year; coding categories; abstract; sponsor; URL for the project report; authors and their majors; and advisors and their departments.

Additionally, PDFs of reports from 2006 - 2016 were acquired from the WPI library website and organized into folders by year and term (Figure 17). Project reports from 1999 - 2005 are only accessible through devices connected to the WPI network, and thus could not be retrieved.

Project-related media

The second segment of objective one was to compile media from past and present projects that can be used for promoting the MPC. We received 13 photos and a set of albums from our MPC Alumni Survey and another set of albums from a previous advisor. We were unable to compile a substantial amount of media from past projects; many photos there and from our survey were not thematic action shots needed for promotional material. Additionally, images pulled from report PDFs were not high quality.

Finally, we captured footage of B Term 2016 IQP teams and uploaded all sponsor interview audio and video footage as well as B-roll footage of the city to a Google Photos account (Figure 18).

MPC by the stories

Our second objective was to assess the impacts of the MPC on students, sponsors, and communities.

IQP Year	Transcript title	Title from Inquis	Sponsor Type	Theme	Deliverables	Impact Group	Abstract	Sponsor
2016	Enhancing Museum Victoria Visitor Journey	Enhancing Museum Victoria Visitor Journey	N	OPT	RSR, NP	Museum Victoria	Museum Victoria, one of the largest and most prominent museum organizations in Melbourne, Australia, aims to utilize communications to improve the visitor journey. By collecting information through interviews and surveys, our team assessed the effectiveness of the Inauguration Museum Mahalingoq Toaq App and the Scienceworks Visitor Map. Furthermore, our team understood and interpreted the culture of the organizations found on Melbourne Museum Jurassic World: The Exhibition Facebook Event page. Through this project, our team developed recommendations to improve Museum Victoria's current communications and delivered assessment tools to allow Museum Victoria to evaluate future communications.	Museum Victoria
2016	Promoting Cultural and Environmental Awareness at CERES	Developing an Exhibit to Promote Cultural and Environmental Awareness in CERES's Cultural Village	N	ENV, ACH, ED	DES, BLD	CERES Victoria	Environmental issues are becoming increasingly important on the global scale, yet are often only considered as local or national issues. The goal of this project, sponsored by CERES Community Environment Park, was to promote environmental and cross-cultural awareness through the creation of an interactive exhibit for the CERES Indonesian cultural village. Information on Indonesian environmental issues was gained through surveying the general public and roundtable discussions with Indonesian university students. An interactive, faculty-created exhibit, focused on land issues, was then prototyped and tested. Finally, a series of recommendations for the completion of the Indonesian exhibit, as well as the future development of the CERES cultural village, were created.	CERES Community Environment P
2016	Resources to Prevent Violence Against Women in Broadmeadows	Preventing Violence Against Women -- Training Resources to Empower the Broadmeadows Community	N	ED, SOC	TR, PRO	Broadmeadows Community	Violence against women is a pressing issue in the Broadmeadows community. The main social determinants of violence against women are rigid gender roles and stereotypes, unequal gender relations, and violence-supportive attitudes. These determinants	Bachia Graduate Community Ce

Figure 16. Screenshot of the Excel sheet of past project information

Name	Owner	Last modified
2015_B_ZOOVIC.pdf	Sotirios Filippou	Oct 28, 2016
2015_B_MV.pdf	Sotirios Filippou	Oct 28, 2016
2015_B_MEFL.pdf	Sotirios Filippou	Oct 28, 2016
2015_B_CSIRO.pdf	Sotirios Filippou	Oct 28, 2016
2015_B_CERES.pdf	Sotirios Filippou	Oct 28, 2016

Figure 17. Screenshot of project reports database

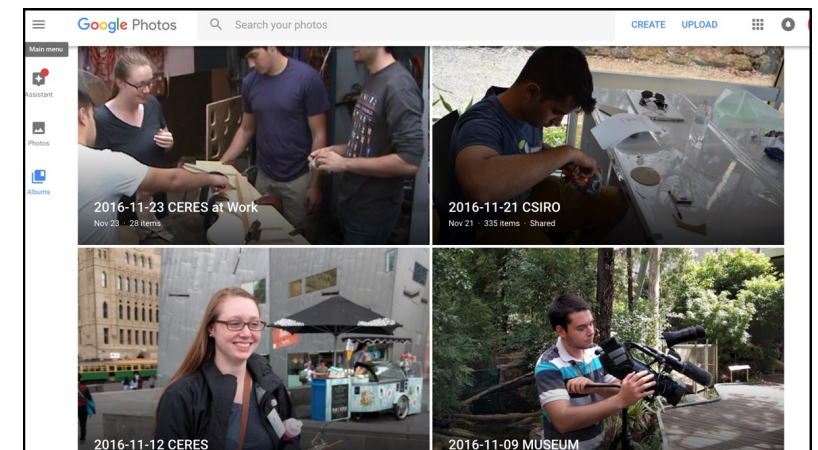


Figure 18. Screenshot of the Google photos account

Impact on students

We emailed our MPC Alumni Survey to 410 project alumni and received a total of 209 responses within the two-week timeframe, a 51% response rate. Students responded very well in terms of recommending the MPC, with 73% strongly recommending it and no responses advising against it. We obtained responses from at least 3 project alumni every year between the years of 1999 and 2016, with the most responses, 24, in 2013. As a result, we believe that our survey was effectively representative of the projects through the years.

Confirming student impact constructs

We hypothesized there would be four distinct student impacts: academic, personal, cultural, and professional growth. The exploratory factor analysis that we used to determine the number and types of constructs measured in our survey (involving close-ended questions 10, 12, and 15) did reveal four total impact constructs (see Supplemental Materials Section K for analysis). However, professional skills seemed to overlap heavily with academic outcomes, and the factor analysis indicated a very distinct social construct that emerged in questions about academic skill development and personal growth, which we did not expect. Table 9 illustrates a comparison of our hypothesized impacts with the measured impacts in our Likert questions.

Table 9. Predicted and measured impact constructs

Predicted Student Impact Constructs	Final Student Impact Constructs
Academic Learning Outcomes	Academic Learning Outcomes
Worldviews and Cultural Competency	Worldviews and Cultural Competency
Personal Growth	Personal Growth
Professional Skills	Interpersonal Communication and Teamwork

Although our factor analysis indicated that professional skills overlapped with academic learning outcomes, we included a more qualitative question to allow respondents to better expand on the sort of

professional impact the IQP had, post-project. We conducted a content analysis of these responses (more detail in Table 11 under *impacts on professional work*). In effect, all of our intended or hypothesized student impact constructs were measured, but the factor analysis of our survey indicated an additional social construct. Thus, we would expect a future survey to be adapted in a way that concretely assesses the social component of the IQP.

Impact on academic learning outcomes

We found that MPC students reported substantial growth in every targeted area of academic skills. In fact, in every area except for professional visual communication, at least 50% of alumni reported that their abilities in each academic skill were enhanced “a lot” or “a great deal” as a result of the IQP experience (Figure 19).

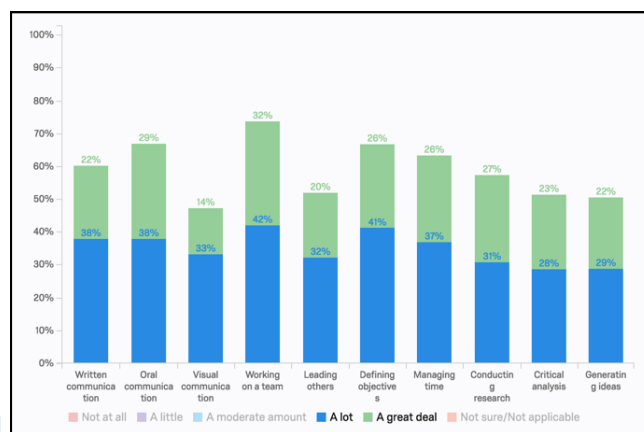


Figure 19. Percentages of MPC students who reported enhanced academic skills

MPC alumni were also asked to elaborate on which aspects of the project experience have helped them develop these skills. There were 134 responses, and twelve factors were reported. Table 10 notes how often each of these factors were mentioned. The most common factors were team collaboration and

presentations: being required to cooperate with new people for a long period of time helped them work better in a team environment, and the frequent and formal presentations resulted in developing skills such as professional oral and visual communication. This further highlights the need to examine the social factors of the IQP learning experience more closely. Figure 20 illustrates two quotations from the open-ended portion that exemplify this.

Table 10. Factors influencing academic skills

IQP Factors	Percentage of Coded Responses
Collaboration	37%
Presentations	33%
Project Management	21%
Writing	20%
Use of Research Tools	19%
Professional Setting/Contact	16%
Working with Diverse People	13%
Difficult People	10%
Pressure and Deadlines	10%
Leadership	8%
Critical Advisor	7%
Preparatory Term	7%

“The entire structure of the IQP develops each area, from having rigid deadlines of a fast moving and in depth project, to constant informal and formal communication meetings and presentations.” — **Hannah Gallagher, B Term 2014**

“Throughout the project, there were numerous times where we had to develop a presentation of what we had found and present it to both our peers, advisor and sponsors. This certainly helped develop skills in oral and written communication, teamwork, and thinking creatively.” — **Sarah Brockway, C Term 2013**

Figure 20. Quotations from academic open-ended responses that highlight social factors

Impact on personal growth

Alumni were asked to report to what extent their project influenced them on a personal level. 87% reported that they were influenced at least a moderate amount (Figure 21).

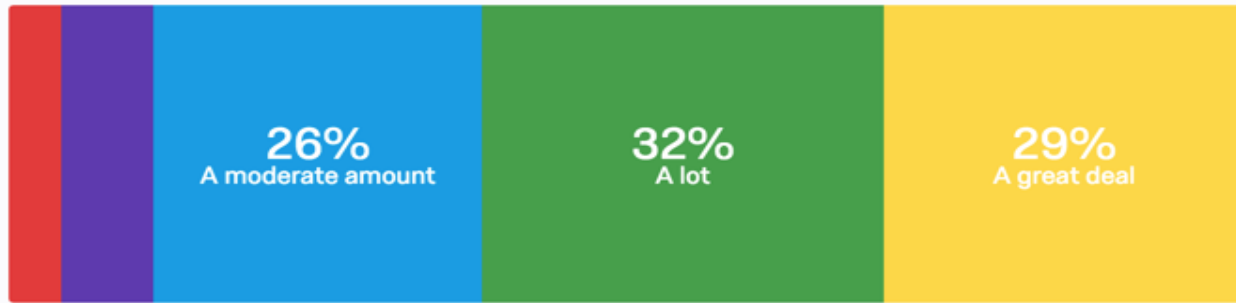


Figure 21. Percentages of MPC students who reported enhanced personal growth

This suggests that the Melbourne IQP experience stimulates more than just academic learning growth. We learned through the follow-up open ended question that it also affects them personally, in terms of self-confidence, new interests, or even new and lasting friendships.

Through the follow-up question, we noted that a lot of the anecdotes about personal growth (Figure 22) mentioned development of social skills. Although we chose not to code these responses due to their inconsistency, we gathered a complete listing of the students' most notable responses (refer to Supplemental Materials Section G).

“All of my interactions, both with people in Australia and my WPI peers, changed who I am as a person forever. The friends I made and the social skills I learned have benefitted me in ways I probably can't express. Essentially, I learned more about communication and social interaction on that trip than at any other time in my life to that point.” — **D Term 2007, MPC Alum**

“I can say that some of the best memories of my life have been on those two trips. Working on these projects influenced my self confidence about working in the business world and motivated me to set personal goals such as getting an internship.” — **C Term 2005, MPC Alum**

Figure 22. Notable responses on personal growth

Impact on worldviews and cultural competency

Our assessment of impacts on worldviews and cultural competency suggested that students were affected to a great degree by their IQP experience (Figure 23). In particular, more than 59% of the

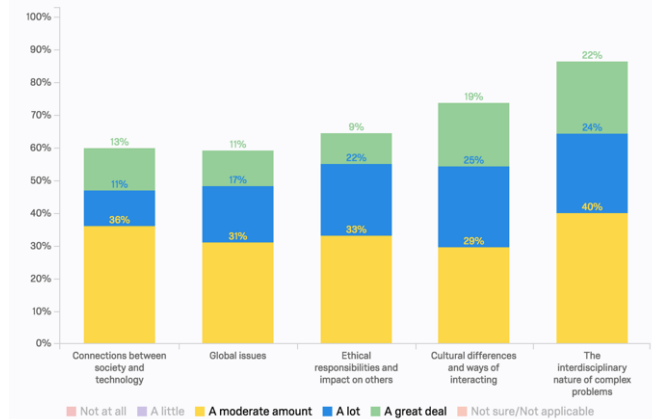


Figure 23. Percentages of MPC students who reported influence on worldviews and cultural competency

students reported that they were influenced at least “a moderate amount” in all of the targeted categories.

As with personal growth, we asked respondents to elaborate on this change in worldviews. Some notable responses are presented in Figure 24. Again, we chose not to code these responses due to the inconsistency in general categories.

Impact on professional work

Alumni were asked if the skills or viewpoints they developed during their IQP experience were useful in their professional careers. 50% of the respondents

answered that the developed skills benefited them a lot or a great deal at work (Figure 25). This shows longer-term effects of skill development that may translate directly into the professional world, an

“Getting out of the United States bubble was certainly the best part of the project - it really helped bring to light that the world is bigger than just the US. I am truly grateful for my first opportunity for exposure to other cultures - I haven't stopped traveling around/learning about/experiencing the world since!” — **D Term 2000, MPC Alum**

“The experience of spending 2 months living and working in a foreign country really broadened my understanding of the world and its different cultures. Working every day in an interdisciplinary team helped 22 me learn how to collaborate with people of differing backgrounds and areas of expertise.” — **D Term 2013, MPC Alum**

Figure 24. Notable responses on worldviews and cultural competency



Figure 25. Percentages of MPC students who reported impact on professional work

impact that has been difficult to capture in other assessments of the IQP.

They were also asked to elaborate on what factors or aspects of the IQP process had aided them professionally and how specifically they had helped in their careers, an important inquiry considering many of the respondents graduated years ago. Since nearly all respondents only answered which skill aided them professionally, we were able to code these responses, and then convert them to quantitative data (Table 11). Collaboration (34%) was most commonly given as the main factor affecting their work; alumni reported that they were able to work effectively in a group and with people having different opinions and views than theirs as professionals. Interpersonal communication, presentations, and writing were also popular responses.

Summary of student impacts

By averaging the mean Likert scores of all questions linked to student constructs, we determined that the largest impacts of the MPC IQP experience (Figure 26) were on personal growth (M=3.75), and then on academic learning outcomes (M=3.71). Interestingly, the questions determined from our data analysis to be part of the newly discovered social construct (Supplemental Materials Section K) were originally

Table 11. Skills that aided alumni in the professional world

Skill	Percentage of Coded Responses
Collaboration	34%
Communication Skills	24%
Presentations	20%
Confidence Increase	16%
Writing	15%
Diversity	15%
Project Management	10%
Professional Setting	9%
Job Interviews	6%
Research	6%
Relocating abroad	5%
Leadership	5%
Difficult People	4%
Overcoming a Fear	2%
Developing Relationships	2%

intended to assess personal growth and academic learning outcomes. For example, personal growth-based questions regarding increases in self-confidence and academic learning questions regarding enhanced oral communication were found to be key indicators of the social component. This demonstrates that, while the social component of the IQP was not explicitly

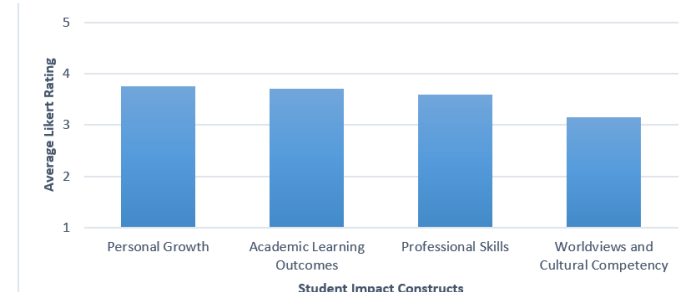


Figure 26. Average amount of growth reported in each area we investigated (1 = Not at all, 3 = A moderate amount, 5 = A great deal)

intended to be measured as a separate construct, it did appear within the two most impactful constructs we *had* intended to measure. Therefore, the social component of the IQP, through association, is highly impactful. However, on the whole, alumni reported at least moderate growth in all four constructs we originally intended to measure.

Impact on sponsors

Impact data on sponsors was gathered in the form of anecdotes taken from interviews of 17 project liaisons at 12 sponsoring organizations. Notes and video or audio recordings of the interviews were reviewed for recurring themes, which are discussed below. Notable stories and testimony, in the form of quotations and organized by project liaison, can be found in the Sponsor Testimonials section of Supplementary Materials Section G.

Production of useful deliverables

The most direct and visible impact that sponsors mentioned was the usefulness of the project deliverables students produced; as outlined in Table 8, these most often took the form of research studies and recommendations, but also ranged from things like educational materials to material designs. We found that nearly all of the interviewed sponsors used the

products in some way. For example, Julie Harris of the Metropolitan Fire Brigade (MFB) asserted that “I haven’t done one study that I haven’t had [the] purpose to use it for,” elaborating that student research was often integral to guiding the organization’s efforts in the field. Paul Murfitt, who worked with WPI during his time as CEO of the Moreland Energy Foundation, Ltd. (MEFL), commented that the deliverables continue to be useful long after the project’s completion: “Up until a couple months ago, we were still using [the research done by an IQP group on community outreach methods] in our program design [...] Some of the background work and some of the survey work that was done by the groups [are still useful to us].”

Changes in programs and procedures

Many of the IQP studies, in addition to producing research and data to guide future decisions, also provided sponsors with specific recommendations for changes in their operations. Neil Bibby of the Emergency Services Foundation asserted that of the fifteen or twenty recommendations produced by many reports, at least a few would often be acted on immediately, with more kept in consideration. Geoff Kaandorp of the MFB mentioned that “as a result of those findings from [one IQP] study, MFB has changed its approach to how we try to mitigate fire risk in the community.” In particular, they’ve moved away from traditional methods such as pamphlet distribution, that the IQP indicated had limited effectiveness in reaching key risk demographics, and worked more with local groups to get accurate assessments of potential fire risks and help implement safety measures. MEFL’s Jason Cox shared a similar experience, wherein one of the projects provided updated methods they could use for community outreach — changing from their standard practice of using aging land-line surveys to the use of social media and networking with local community organizations. He even cited data supporting the increased effectiveness of these methods.

Expanding the organizations’ resources

While direct budget changes were not mentioned by any of the interviewees, a lot of emphasis was put on how cost-effective sponsoring WPI projects was. Arup’s Peter Johnson asserted that “for a small investment, you’re going to get a lot of valuable information from a group of students working intensely on a project for a relatively short period of time.” Furthermore, the projects allow organizations to tackle side projects they normally wouldn’t have the resources for. Carly Siebentritt of CSIRO explained that “the joy of you guys [the student IQP teams] is that you can focus on an activity, or a task, or an evaluation that we tend not to have the time or the resources to actually do ourselves. It’s the wish list of things you want to do, but don’t necessarily have the time or the resources to do.” Carolyn Meehan of Museums Victoria echoes this benefit: “A lot of the projects that we have done with your students are observational studies, which are very time consuming, and you need to spend a lot of time. Having three or four people coming for a short period of time, enabled [it] to be done in a concise way, and that was very beneficial to our organization.”

Training or re-energizing staff

Responses regarding the impact on staff were varied. Some found it valuable to use the IQP teams to give their staff the ability to pursue and supervise a project they otherwise wouldn’t; speaking of Arup’s engineering staff, Johnson explained that “You [the IQP teams] can come along, and under their direction, they’ve got the ideas, you’ve got the brains and the time. It works and you get stuff done. [...] It’s a good model that works for a lot of organizations.” Siebentritt agreed that for CSIRO, “it’s nice for [the staff’s] outlook to have different bodies wandering around the room and playing and bringing a different perspective;” but in terms of managing the team, “depending on the group, and how well the group

works, occasionally the supervision levels are higher than anticipated, which takes times from other projects.” She mentioned how it depends on the functionality and work ethic of the particular student group, which might vary. “It’s the [problem with] groups you need to speak to every day [if] they are not talking to each other, and it’s not working so well.” AFAC’s Rob Llewellyn voiced similar concerns; when explaining their decrease in sponsorship over the years, he discussed burnout as a major factor. The mixed reactions emphasized that a lot of the experiences were heavily dependent on the particular group’s dynamics and the advisors’ management of the projects. In addition, stress can emerge when expectations conflict; Kaandorp made note that “there’s often a little bit of tension between your course requirements and what we actually want... The students are getting pushed two ways,” a sentiment echoed by Siebentritt: “Sometimes, there is a balancing act between the report you need to produce, and the physical results.”

Catalyzing new relationships

Due to the compact nature of the IQPs, it is difficult for them to reach beyond the sponsoring organization and its immediate affiliates. The student self-reporting in our survey listed only around 20% of projects as having an impact on organizations outside the sponsor (a number close to our own estimate of 21% based on project abstracts). As such, the main networking aspect of the projects is actually connecting back to WPI itself; as described by Johnson, the projects “give you links to a great university and students who are bright and capable.” He further commented on the usefulness of the final presentations for sponsors to be exposed to each other and their projects; Cox mentioned being particularly impressed by the ingenious methodology of some of the projects whose presentations he saw.

Sponsor Recommendations

Over half of the sponsors provided important recommendations for the MPC. Some recommended that we help students produce more accessible reports, and suggested something more condensed than the typical IQP report. One recommended that the sponsors should have more of a say in how students are evaluated for final IQP grades, as they see a different side of the students than the advisor during work hours.

Many of the sponsors indicated that their main reason for the decision to sponsor subsequent projects is the dedication and competence of the IQP teams, whose work often spoke for itself in terms of quality. Rarely was the discontinuation of projects due to dissatisfaction; Siebentritt asserted the occasional decision not to sponsor an IQP certain terms is more often than not simply due to no suitable project being currently available. Johnson explained that their project sponsorship dropped off due to his movement to a different position within the company and subsequent loss of communication. “We haven’t been approached in five, maybe ten years about whether we want to take any students. I think because we didn’t for a few years people probably said, ‘oh well, we’ll give up on them and look somewhere else.’ [...] I probably just fell out of the loop in a way and so the connections sort of fell away.” Talking more broadly about many of the early partnerships he aided in establishing, he commented that “some of those relationships have persisted and others have kind of fallen by the wayside.” Johnson recommended better and continued communication with past and present sponsors.

The main suggestions for project improvement concerned the preparatory term; sponsors suggested that better, more frequent communication between students and sponsors in the months prior to arriving in Australia would allow teams to be more productive in their literature review, particularly in terms of localizing the problem in the context of Melbourne and Victoria, as well as ensuring students and advisors develop appropriate objectives by the time they arrive in

Melbourne. Greater efficacy of that process would reduce time in Melbourne spent on restructuring students’ approach because they pursued dead ends.

An oft-cited problem between the preparatory term and the IQP is miscommunication between the sponsor and group. Rob Llewellyn of AFAC explains this well and provides a recommendation. “I don’t think a lot of sponsors realize that they need to be involved in the pre-work. The pre-work is critical. [...] I think emphasizing that to the sponsors, getting the research question right, what are you trying to answer. I don’t think sponsors realize that that all needs to be done before the students arrive. [...] I reckon you need almost a set of procedures written up for the sponsors.” Having the sponsors and students on more of the same page would help to clear up communication and expectation issues. Having a set of procedures (such as monthly Skype conversations or periodic progress reports and troubleshooting emails) would help to bring this about.

Some sponsors noted that more communication between advisors and sponsors about project objectives would help mitigate tension that sometimes emerges in student groups. Through talking with students and sponsors we have found all three often have their own ideas for the project and are not on the same page. This can affect morale and work. Gearing joint advisor-sponsor meetings toward remedying this could improve team efficiency and reduce the stress levels.

One of the sponsor’s recommendations is already being realized. Banksia Gardens’ Jaime de Loma-Osorio Ricon explained that “it is very hard for the organization to understand what WPI does. At the moment, there is nothing that can give an organization a really good snapshot of what WPI does... This is why [this project on assessing MPC work and developing promotional materials] is really important.” This work will provide a clearer understanding of WPI for sponsors. This assessment, archiving and promotional work should expand to other project centers, so that it can benefit the entire Global Projects Program.

Impact on local communities

Our assessment of community impacts was, as expected, not particularly systematic or quantitative. Many of the impacts we collected were stories about particular projects. The MFB in particular pushes the project reports to be widely distributed and used: Julie Harris affirmed “They’ve been used in the Coroners Court of Victoria; they’ve been cited in the press; they’ve been cited in international journals; they’ve been cited in international publications” (see Supplemental Materials Section J for examples). She further explained that “the first [hoarding study conducted by WPI students] was the world’s first study of hoarding in fire incidents in the world.” Llewellyn confirmed its impact; “[The hoarding project] helped focus Australia on the hoarding issue, and we still have it, but we are able to manage it much better now.” An MPC Alum from D Term 2011 shared a similar experience regarding his project on the design of fire-safe, sustainable buildings, which was published in FPA Australia’s quarterly magazine: “The goal was to get the conversation started about this complex issue and to eventually get both the fire safety community and the sustainable building authorities to collaborate together to create buildings which exemplify the best of both worlds.”

Many of the education-related projects also aimed to have a wider community impact; two MPC alumni highlighted examples. An Australian Bureau of Statistics project in D Term 2009 aimed to better prepare elementary school teachers in teaching statistics: “By creating professional development for the teachers and making the subject easier for them to teach, we were impacting [students’ learning of statistics].” A project completed in B Term 2015 with Banksia Gardens used their research to recommend “a program for young children to learn about healthy relationships to hopefully make them more aware and to minimize future relationship violence. If we start teaching young it could potentially have a huge impact on generations to come.” This program was, in fact, created the

Melbourne Project Center

MPC by the Numbers

Since 1998

572 Students have completed

163 Projects for

37 Sponsors

Yearly Student Enrollment Growth

Most Common Project Themes

- Education
- Public Safety
- Organizational Process Improvement
- Positions
- Social and Human Services
- Energy Resources
- Urban Planning and Transportation
- Art/Culture/Historical Preservation
- Healthcare
- Animal Conservation and Welfare

Project Timeframes

August	September	October	November	December
A-Term			B-Term	
January	February	March	April	May
C-Term		D-Term		

Students study the issues in a 7-week preparatory term in the USA.

Students complete on-site work in Melbourne, working with sponsors for 7 weeks.

Each project culminates in a written report, community presentation, and additional project deliverables.

Impacts

100% of projects have a direct impact on sponsoring organizations

WPI projects with CSIRO have produced four educational activities for science enrichment programs with youth across Australia.

69% of projects reach specific community stakeholders. For example: schools, people with disabilities, and local home owners

Sponsors report that student deliverables are useful: research studies, training and promotional materials, new databases and apps, and more.

"There wouldn't be a project that I know of where at least one of the recommendations wasn't taken up."
- Neil Bibby (ESF)

"Expanding from a CSIRO internal project, the company I interned for over the summer is using my IQP report to develop and evaluate their new educational program."
- Steve Laudage (D Term 2016)

21% of projects reach organizations beyond the sponsor

- 98%** of MPC Alum reported that their project experience helped develop their professional writing skills
- 73%** reported that their project experience significantly enhanced their teamwork skills
- 68%** reported that their project experience greatly enhanced their cultural awareness
- 58%** reported that their project experience had a significant positive impact on their professional work
- 53%** reported that their experience stimulated new interests
- 38%** reported that their experience motivated personal changes in their lifestyle or attitude
- 29%** reported that their experience had an impact on their personal goals

Our Students

Christine Schondek
Chemical Engineering '18

Christine is a WPI Presidential Scholar. For her project, she worked with the Moreland Energy Foundation to create outreach materials for a campaign to transition homeowners to a sustainable, all-electric home. Christine's team surveyed over 950 local homeowners, illuminating their perceptions on the economic and technical barriers to all-electric conversion.

"Working closely with a great group of people at MEFL has provided me with the opportunity to understand the challenges of expanding a customer-centric product while being able to explore opportunities that have broadened my educational background. I have enjoyed working in a group setting and have refined my time management skills throughout this project."

Guilherme Motta Baracchini
Civil Engineering '18

A WPI international student from Brazil, Guilherme worked with CERES Community Environment Park, researching climate change in Australia and Africa and designing an educational exhibit to raise public awareness about these issues.

"Conducting public surveys and building the actual exhibit was really fun. The displays on conflict minerals and water scarcity will really help people see climate change as a global issue."

Figure 28. MPC Sponsor Brochure

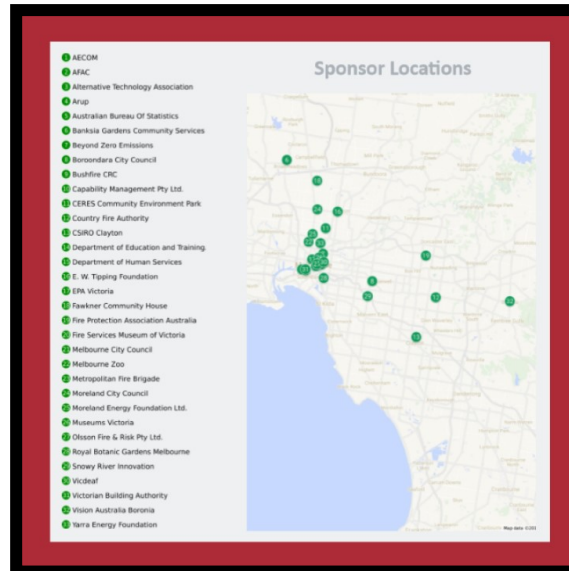


Figure 29. MPC Infographic

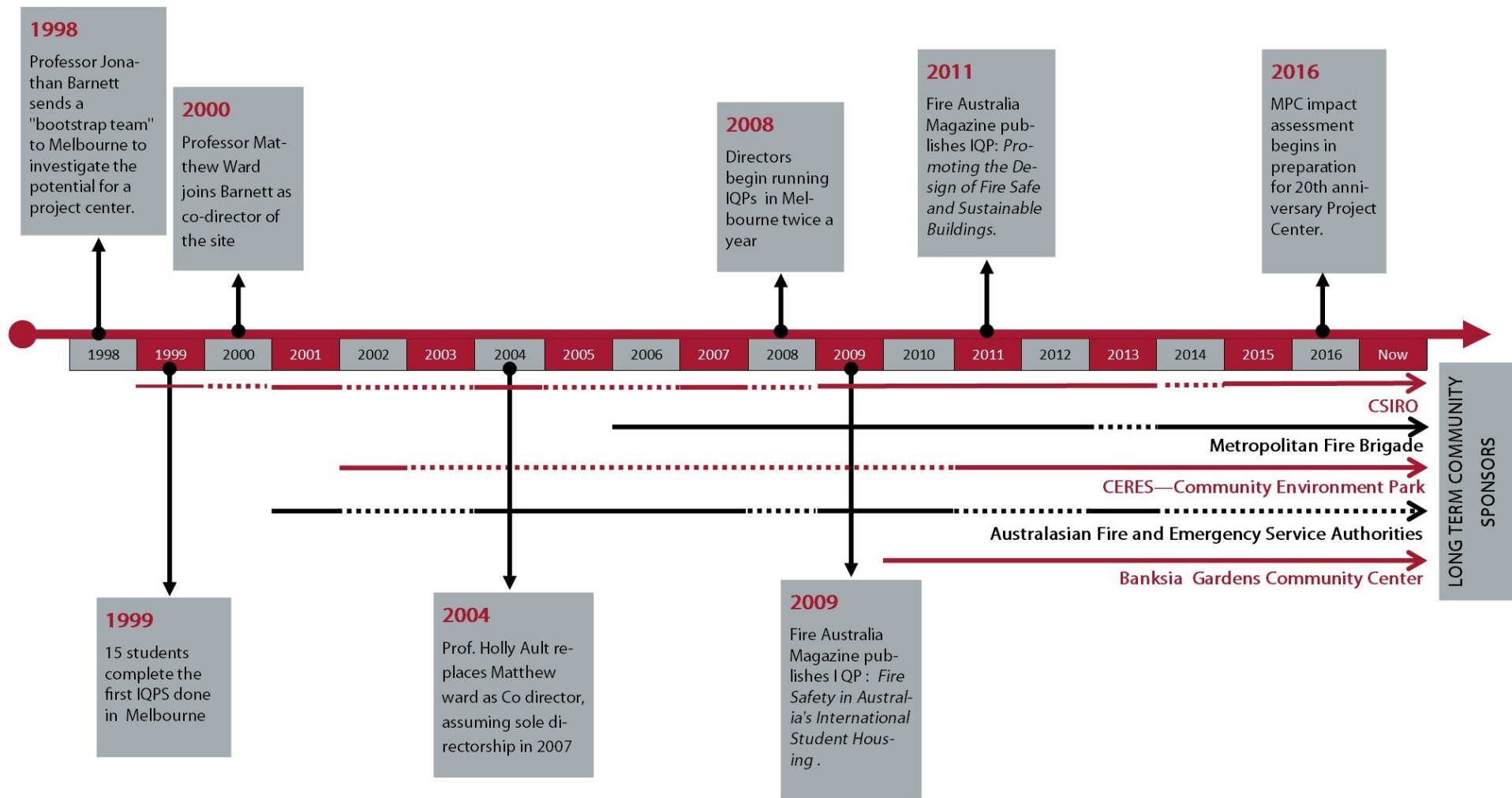


Figure 30. MPC Timeline

Conclusions and recommendations

This project has allowed us to identify important components and effects of the MPC that require attention. As such, we have drawn several conclusions and have recommended different ways to address them.

Archiving process

Our database work resulted in a much more accessible and comprehensive way to search through the MPC's past projects, as well as statistics that quantitatively characterize the project work done in the MPC's 18 years. We made further **recommendations to the archiving process.**

- Improve accuracy and completeness of data entered into the library database, especially title, project center, student names, date and term.
- Include in database: sponsor and liaison (not presently required), all students' names, date and term on report (not only when it was added to the database).
- Add projects to database within one term of completion, and if there is an issue with disclosure of information, then include a placeholder with all available information so that people can know who to ask if they need to acquire information on the report. This way data and statistics on numbers of projects and students would be accurate.
- Code the reports each term, after project completion (theme, deliverables, impact group, sponsor type). This will reduce time and work for later impact assessments, as well as allow students and faculty to search across themes and other project centers, increasing accessibility of past project reports as research resources.
- Require and collect project-related media from students while working on the projects.
- Video and action shots of teams should be

compiled into a database or a new MPC website gallery, so that it is in one place and can be used by future teams.

- Since abstracts are the easiest description for coding, advisors should ensure students write complete abstracts that define the purpose of the project, the methods used, significant results, and deliverables.
- Title page should also include liaison name (staff person at sponsoring organization).

Student impacts

Our survey and subsequent data analysis yielded interesting insights. Conclusions were drawn from our **student impact assessment.**

- The IQP was a very impactful experience for most students who completed their projects at the MPC. Over 50% reported a lot or a great deal of improvement in academic and professional skills as well as personal growth, and over 60% reported the project at least moderately impacted their worldviews.
- According to students, the biggest impact of the projects was on their development of social and professional skills, such as learning to collaborate with others in difficult and diverse situations, develop and perform professional presentations to mixed audiences, and utilize a varied array of research tools.
- Although we included social skills like teamwork and collaboration in our analysis, we hadn't originally viewed the social factors as culminating into one construct on their own. We expected that these social factors would be related to academic and personal growth, and thus grouped them within those constructs accordingly. However, what we found through our factor analysis is that the students perceived these skills as very distinct and perhaps the most important ones of all. Therefore, social growth is an important aspect of the projects and take away from the Melbourne IQP

experience.

- Interestingly, the experience sometimes had more long term impacts on the trajectory of students' work and life choices — some students ended up returning to Australia for work after graduation as a result of their IQP and others found future spouse(s) and friendships during their project experience.
- We did not perform a content analysis on the open-ended questions related to personal growth, cultural competency, and specific impacts because we found a large amount of inconsistency in responses. Instead, we compiled these responses as testimonials rather than quantifying them through coding.
- In light of the usefulness of the data collected, we recommend project centers (or the IGSD as a whole) collect student data regularly, such as every five years.

Sponsor impacts

Interviews with sponsors allowed us to attain a better understanding of the way projects affect their organizations. Conclusions were drawn from our **sponsor impact assessment.**

- On the whole, sponsors gave us generally positive assessments of the students and the deliverables they created for them, and the majority expressed a desire to keep working with WPI in the future.
- Sponsors find the investment to be well worth it, primarily because the students are driven and intelligent, and are able to conduct research and complete work that the organization normally wouldn't have the time or resources to pursue.
- Deliverables produced by student teams are usually perceived as useful and valuable to the organizations; longer written reports are preferred by sponsors who ask specifically for formal studies, while organizations whose projects are more hands-on and design oriented mostly reported that

longer reports were not as useful or readable and can compete with students' time for finalizing other deliverables. A few suggested the shorter, more visual booklets may help by making the reports more accessible, but appear to require about the same amount of time, doing little to alleviate the latter issue.

- On a similar note, an important underlying foundation of the IQP is that the writing process is critical to the evolving thinking and planning of the project; students and sponsors, however, sometimes view these as distinct activities. This disconnect in perceptions is often a point of frustration for faculty; clearly communicating this idea to students and sponsors, showing how writing and the project process are linked, and focusing on teaching students multitasking may help to alleviate tensions on all sides.
- The presentations are generally well received as a summary of the project work, particularly to those in other organizations or otherwise uninvolved in the project.
- Some sponsors desired more communication with students and advisors in the preparatory term, to better focus efforts and ensure the proposal work lines up with the sponsor's objectives.
- Some sponsors mentioned that WPI stopped contacting them. To make sure that they communicate with all of them, center directors may want to create a rotating list of sponsors, such that a different set sponsors are approached every year and none of them fall through the cracks for many consecutive years. Additionally, rotating them could be beneficial to avoid sponsor burnout.
- We recommend the implementation of new tools to document impacts a while after the close of every project. One possibility is to have the site coordinator follow up with each sponsor two years after project completion, then compile a database of records on their noted impacts.

Community impacts

Information compiled about communities was entirely anecdotal by nature, but we made a notable effort in attempting to gather these impacts and effects. Conclusions were drawn from our **community impact assessment**.

- Students responded more than expected in our alumni survey, and provided us with useful information that we otherwise would have not obtained. Future efforts could follow similar methods, but investigate with more depth, such as follow-up interviews with students who indicated they had stories to share.
- Sponsors also provided us with insight and useful impact data about the communities that they serve. Major impacts included improving the public's education and awareness about key topics or bettering public safety policies through research and analysis, outcomes that take a few years to really be implemented and begin to produce noticeable differences. Since sponsors are continuously involved in the communities in a way the students are not, maintaining avenues of communication with them would provide better data collection for long-term impacts.

Future project teams

Based on our efforts and findings, we put together some recommendations for **future project teams**.

- Utilize and add to our compiled materials to further the MPC Anniversary Project
- Acquire PDFs of missing project reports from 1999 until 2005 and add them to the database. This must be done while on campus.
- Implement updated project database onto website.
- Use compiled photo and video footage to create a video for promotional and recruitment purposes.
- Further develop the MPC historical timeline through further impact assessment research.

- Complete interviews of more sponsors.
- Develop distribution platform for MPC Sponsor Survey.

Through our research, we affirm that the MPC has a rich and worthwhile history to explore. Though piecing together the Center's historical timeline is not the simplest process, the resources are there to gather more information. The road does not end here. In 2018, the Center will be 20 years old; the findings and deliverables produced here, including the promotional materials, can be the basis of a celebration and showcase at that point.

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- All sponsor interviewees: Thank you for providing us with useful insight about the history and impacts of the MPC on your organizations and the communities that they serve. The success of our project relied heavily on this material, and your words and feedback helped immensely.
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responses; your feedback was invaluable to our project.

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Supplemental Materials for this project (raw data, research instruments, additional project references, and outcomes) can be found at <http://www.wpi.edu/E-project-db/E-project-search/search>, using key words from the project title.

