



Interdisciplinary and Global Studies Division

**To:** Interdisciplinary and Global Studies Division

**From:** D. DiBiasio

**Subject:** Summary of Worcester Community Project Center and On-Campus IQP Review Activity

**Date:** July 25, 2003

### Summary

The last several summer IQP reviews confirmed a growing quality gap between on-campus IQPs and reports generated from global program projects. The IGSD recently initiated efforts to understand the problem and reduce the gap. The Worcester Community Project Center (WCPC) was created, in part, to make the global IQP model available to students and advisors who could not leave Worcester. This report summarizes assessment activities conducted over the last two years aimed at understanding effects of the WCPC and the on-campus IQP experience. Activities included two review cycles of WCPC reports and the results of an investigation to understand alternate models of high quality IQPs.

The major results from these assessment activities are:

1. The first WCPC review cycle identified weaknesses in WCPC projects. Improvements were implemented. The second review cycle showed that WCPC IQP reports were of good quality compared to multi-term on-campus reports.

*Recommendation: We should maintain current WCPC structures and processes and continue to promote center opportunities among our students.*

2. It appears that good multi-term on-campus IQPs can be described by a somewhat different model than that for off-campus IQPs. Characteristics of good multi-term on-campus projects include topics close to advisor's expertise that are generally not task-oriented, and time for student intellectual growth (typically longer than three terms). Students' academic quality and external sponsorship were not issues.

*Recommendation: We should develop a plan to effectively export the elements of high quality on-campus IQPs to the WPI community.*

Details of these recent assessment activities are described below.

## **First WCPC Review: 2001**

**Background:** One incentive behind WCPC creation was that it models the off-campus structure and process. This includes a required ID/SS 2050 preparation, a structured PQP, and concentration of the IQP into one term. Since off-campus project reports consistently outrank on-campus reports, we would expect the same for the WCPC if the structure was a significant contributing factor to quality. We conducted the first WCPC review in 2001.

**Methodology:** We used the same review process and form used in recent full summer reviews (details are in DDB memo of 4/19/01 available from [dibiasio@wpi.edu](mailto:dibiasio@wpi.edu)). One reviewer was used---Kent Rissmiller (KR). He is an experienced on/off campus advisor and an experienced reviewer. He read five WCPC reports and compared them to a control group. The control group of five projects was chosen by DiBiasio from multi-term on-campus projects completed in the previous two years in the city of Worcester and with similar topics to the WCPC projects. There was a mix of co-advisors and some co-advisors were in both control and analysis groups.

**Reproducibility:** Two control projects were previously reviewed in an all-campus review by different reviewers. From a total of 62 ratings done by KR, 92% were the same or one point different (5 point scale) than the other reviewers. Although not statistically significant, this at least indicated that we had some consistency in the review process.

**Results:** Major results are summarized in Table 1. The 5-point scale is 1=poor, 3=acceptable, and 5=excellent (except where noted). The results show that the WCPC reports were generally the same or poorer in quality than the on-campus control group. Neither group was ranked very highly. Few of the ABET items ranked acceptable for either group. And, compared to on-campus reports evaluated in the last full summer review, the WCPC did not indicate improvement (see Table 3 below).

These results were not very encouraging, indicating that either the off-campus model was not transferable or that model implementation was a problem. I have included some quotes from Kent's review that are helpful in understanding the evaluation.

- “Overall, these two sets of projects are comparable”.
- “In terms of literature and background, it is difficult to say that either group is superior”.
- “Arguably, the best case studies and best survey research was conducted by students working on-campus without the benefit of ID 2050”.
- “The greatest weakness in these projects as a whole was the selection of an appropriate research design and execution of a methodology that would yield high quality data and support good conclusions”.
- “For some projects in both groups, poorly executed research methods resulted in weak data and poorly supported conclusions”.

“Finally, whether on-campus or at the WCPC, I think the thing that really separates the good from the poor projects is the incorporation of an appropriate research design and methodology that can guide the students' work and be reasonably well executed. Perhaps stating that is a tautology, but it is meaningful nonetheless. It means that we must focus students' attention on

methods questions early in their preparation (with or without ID/SS 2050), and when students enroll in ID/SS 2050, the instructor must ensure that each project group completes the course with a viable research method in hand. Advisors who are unfamiliar with social research would do well to learn by co-advising or by observing and learning with the students in a section of ID/SS 2050.”

**Table 1: Summary Results from 2001 WCPC Review**

Item	Review Form Item	ABET Criterion Item	Average Rating	
			WCPC	Comparison
<b>Overall Report Quality</b>	8.		1.8	3.0
<b>Writing and Presentation Quality</b>	7.	3g	2.0	3.2
<b>Balance and Achievement of IQP Goals<sup>a</sup></b>	6(a,b)			
Balance of technological and societal concerns (rating of 3 = balanced)	a		2.2	2.6
IQP educational goals (total possible = 7)	b		3.8	4.4
<b>ABET Items</b>				
Multidisciplinary teams	9.	3d	3.0	2.8
Lifelong learning	10.	3i	3.0	3.0
Impact of engineering in global/societal context	11(a,b)	3h		
-impact of engineering on society	a		1.0	0.8
-exposure to global issues	b		0.8	1.0
Contemporary issues	12.	3j	2.6	2.6
Professional and ethical responsibility	13(a,b)	3f		
-handling proprietary information, etc.	a		2.4	2.6
-social responsibility of engineers	b		1.0	1.4

Continuous improvement actions by IGSD: The IGSD had already identified problems with the WCPC prior to completion of this review. Issues and perceived problems with ID/SS 2050 (part-time instructor) were addressed. The WCPC was expanded to a multi-term center and a director with full-time commitments in the IGSD was appointed. Efforts to coordinate and standardize ID/SS 2050 with other off-campus centers were also in progress.

**Second WCPC Review: 2002**

Background: In AY 01-02 the WCPC operated for three terms so a larger sample of reports was available. Review goals were essentially the same as 2001 but with the addition that improved ID/SS 2050 and center management should have positive effects on WCPC report quality.

Method: This review employed two reviewers: one new (Denise Nicoletti); and a second experienced reviewer (KR). An informal evaluation calibration between them was conducted. Our goal was to double-review every report. Fourteen projects from three terms were reviewed. Eleven were double-read and only three received a single review (KR). We did not use a control group, but one could use either the control group from 2001 or the on-campus cohort from the last full review as appropriate comparison groups.

Results: Table 2 displays the summary results. First note that reviewer consistency is fairly good with close agreement in several of the more important items. Second, there is a clear increase in quality in many items compared to 2001. With the exception of “exposure to global issues”

**Table 2: Summary Results 2002 WCPC Evaluation**

Item	Review Form Item	ABET Criterion Item	Average Rating	
			Reviewer 1	Reviewer 2
<b>Overall Report Quality</b>	8.		3.4	3.6
<b>Writing and Presentation Quality</b>	7.	3g	3.2	3.7
<b>Balance and Achievement of IQP Goals<sup>a</sup></b>	6(a,b)			
Balance of technological and societal Concerns (rating of 3 = balanced)	a		2.1	2.8
IQP educational goals (total possible = 7)	b		4.6	3.1
<b>ABET Items</b>				
Multidisciplinary teams	9.	3d	3.7	3.6
Lifelong learning	10.	3i	3.7	3.7
Impact of engineering in global/societal context	11(a,b)	3h		
-impact of engineering on society	a		2.2	3.8
-exposure to global issues	b		2.0	1.8
Contemporary issues	12.	3j	3.4	4.5
Professional and ethical responsibility	13(a,b)	3f		
-handling proprietary information, etc.	a		3.2	2.6
-social responsibility of engineers	b		2.8	2.8

(clearly not applicable here) most ABET items are acceptable. Reviewer 1 rated only one report less than acceptable and had seven rated at 4 for overall quality. Reviewer 2 rated two reports less than acceptable but also rated four reports at 4 and three at 5 for overall quality.

For comparison, I included the summary results from the last full IQP review as Table 3. The 2002 WCPC reports compare quite favorably, particularly to the on-campus cohort. They also compare well against the Boston/DC cohort. Overall the results are very encouraging and validate the positive steps taken by the IGSD to improve the WCPC.

**Table 3. Comparison of On-Campus and Off-Campus Results from 2001 Full Review**  
 ("out US" includes Puerto Rico; "in US" represents Boston and Washington)

Item	Review Form Item	ABET Item	On-Campus (projects=119, students=244)		Off-Campus (out US) (projects=65, students=202)		Off-Campus (in US) (projects=12, students=38)	
			Average Rating	# Reports below acceptable	Average Rating	# Reports below acceptable	Average Rating	# Reports below acceptable
<b>Overall Report Quality</b>	8.		2.98	35	4.21	2	4.08	0
<b>Writing and Presentation Quality</b>	7.	3g	2.94	37	4.08	3	4.00	1
<b>Balance and Achievement of IQP Goals</b>	6(a,b)							
balance of technology/societal concerns (3 = balanced)	a		2.82	18	2.94	6	2.58	2
IQP educational goals (7 total)	b		3.20	-	3.63	-	3.83	-
<b>ABET Items</b>								
Multidisciplinary teams	9.	3d	2.96	38	4.07	5	4.42	0
Lifelong learning	10.	3i	3.10	30	4.08	3	4.42	0
Impact of engineering in global/societal context	11(a,b)	3h						
-impact of engr on society	a		2.47	55	3.42	13	2.92	4
-exposure to global issues	b		1.36	87	4.09	3	1.00	10
Contemporary issues	12.	3j	3.08	27	3.65	8	3.83	0
Professional and ethical resp.	13(a,b)	3f						
-handling proprietary info, etc.	a		2.42	51	3.19	19	3.33	5
-social responsibility of engr	b		2.19	61	2.81	21	2.67	4

### On-Campus IQP Quality Improvement

Background: Concurrent with the reviews described above, we initiated an effort to understand on-campus IQP quality. The most recent summer review (2002) showed that twenty-nine percent of on-campus reports were rated unacceptable, indicating that many of our students have a less-than-desirable IQP academic experience. Each year the gap between on and off-campus report quality has grown. Our first step was to answer the question: What makes for a good on-campus IQP?

Methodology: To identify characteristics of good on-campus IQPs, I interviewed five faculty with reputations for consistently good on-campus IQP advising. I examined some previous years' summer IQP review data looking for advisors whose students' reports frequently appeared with good or better overall ratings. I also wanted people who had not been off-campus. Hence, whatever process they used would have evolved independently of the global program. If common structures emerged that resulted in good IQP reports regardless of location, then that would validate attempts to continue cloning the off-campus system to on-campus. However, if good on-campus processes were different, then identifying differences would be important. That information could be used in a systematic program to improve the on-campus IQP experience.

I identified five interviewees: David Adams, Judy Miller, Wes Mott, Jack O'Connor, and Tom Shannon. Since the scope of this investigation was limited I did not interview another potentially valuable group: faculty with off-campus experience who had demonstrated good on-campus advising. Each person was interviewed for 1-1½ hours and I took notes during each interview. General topic areas were:

- *Project topic*: how chosen, developed, and advertised
- *Students*: how recruited and selected; possible prerequisites
- *Process*: all aspects of advising—time management, motivation, feedback, evaluation instruments, unique structures or tools, hours/week expected, enforcement of standards, etc.

Methodological problems included: using the student report as the sole criteria for classifying good advising; I am not an experienced interviewer; I have no special training in interview techniques; and interviews were not taped and transcribed.

Results: After completing all interviews and reviewing my notes some interesting common themes emerged. These are described below.

#### *Project Topics*

1. The interviewees advise only in their area of expertise. Without exception these faculty felt uncomfortable advising projects whose topics were not directly related to their scholarly expertise. They prefer topics that engage ethical, social, and policy issues within their individual areas.
2. Sponsorship is not necessary nor the rule. Most of their projects are not externally sponsored and they do not aggressively pursue sponsorship.

#### *Students*

3. Student quality is not an issue and they don't filter for quality. Although each may advertise topics differently, none set up a selection or review process for interested students. Although student self-selection is apparent, these advisors do not turn away interested students with undesirable academic records. There were no academic prerequisites.

#### *Advising Process*

4. They employ many of the elements that characterize effective classroom teaching. Although each may use different specific structures, in general a list of characteristics of good classroom teaching would describe their advising: frequent and specific feedback (on written work and on team progress); clearly explicated evaluation standards; high performance criteria; frequent student-faculty contact; required progress reports; evolving responsibility and ownership of the project to the students; setting and enforcing deadlines; and respect for diverse talents and ways of learning. Integration of advisor/student discussions into evaluation and as a learning tool varies among advisors. However, writing is ultimately the prime vehicle for student communication of learning and progress. The types, frequency, and intensity of writing varied among the advisors.

Principles of good project advising are also used. These include requiring extensive background research, identification and use of appropriate methodologies, and a required written proposal.

5. Their projects usually cannot be done in 1 unit (3 terms at 1/3 unit each). This would be hard to prove quantitatively, but I got a strong sense that the projects typically take more than one unit, or more than three terms. There are many reasons for this but generally the trend exceeded one unit because of additional work performed either at the start or the end of the project.
6. Their projects cannot, in general, be completed full-time in a single term. This wasn't true for all projects and all advisors. And, this characteristic emerged in different ways. However, for most projects, regardless of advisor, time for intellectual growth, maturity of understanding, and analytical depth was needed. One might classify these projects as being more conceptually oriented and less task oriented.

Summary: I was struck by the common themes that emerged despite some differences in advising process and structure used by each interviewee. The results suggest that an alternate model exists for on-campus IQP advising that is different from that used off-campus. There is probably at least one other on-campus model (that used by experienced on/off-campus advisors) but I did not interview that cohort for reasons stated earlier.

The alternate model described here, like off-campus projects, indicates that good IQPs require more than one unit of work and that advisors pay attention to well-known principles of good teaching and project management. However, unlike off-campus projects, the model emphasizes advisor-based expertise and that sponsorship is not necessary. Perhaps these are linked---if the advisor is the area expert then liaison-based expertise from a sponsor is not necessary.

Item 6 implies that deeper, cognitive development issues are really important----that the simple cloning of successful off-campus structures will not necessarily work in different contexts. This doesn't necessarily mean that task-oriented projects (arguably predominant off-campus) won't work on-campus. It may mean that maintaining student interest, motivation, and long-term intellectual growth throughout a successful multi-term project is best done with the type of projects described by the interviewees.

### **Where do we go from here?**

- WCPC: Maintain recently implemented improvements (full-time ID/SS 2050 instructors and center director) and continue operation as currently structured.

- On-Campus IQP Quality: Currently only 36% of the projects done on-campus were rated better than acceptable (it's 86% for off-campus). To correct this imbalance the IGSD should develop a plan to effectively export the "lessons learned" from the interviews to the WPI community, particularly to newer faculty interested in IQP advising. The IGSD should also identify other ways to assist faculty in advising quality IQPs, for example by assisting in formulating good IQPs or by introducing techniques for improving students' research techniques, methodologies, or report writing.