

Learner Centered Education Grant 2003 Final Report

Project Title: An Online Professional Development Program for Problem-Based Instruction

Project Director: Barry Leshowitz
Associate Professor
Department of Psychology
College of Liberal Arts and Sciences
Arizona State University
Tempe, AZ 85287
(480) 965-4687
Leshowitz@asu.edu

Co-Principal Investigator
Wihelmina Savenye
Associate Professor
Department of Psychology in Education
College of Education
Arizona State University

A. Summary

In this project we developed, demonstrated, and evaluated a totally online, Web-based program of faculty development aimed at enabling college instructors and teachers to create and implement problem-based learning (PBL) in their classrooms. The online, synchronous (live) version of the workshop was presented in a weeklong event in the summer of 2003. The principal and co-principal investigators met online on the workshop's Web site with a diverse group of about 15 ASU and local community-college faculty. In spring, 2004, we conducted and evaluated an asynchronous, self-paced version of the workshop for a group of professional teachers and students in two separate studies. Both the live and self-paced workshops consisted of three phases of faculty development: skill building in PBL, lesson-preparation and assessment. Evaluations of these workshops revealed strong support for the PBL model of instruction in the college classroom.

B. Background

Incorporating elements of the three phases of faculty development, the program's workshops consisted of six modules:

1. Introduction to PBL: theory and practice
2. Exemplars using PBL techniques
3. Problem based analysis across the disciplines
4. Students assignments and extension activities
5. Interactivity; collaborating with participants in preparing lesson plans
6. Instructor's guide to models in PBL.

In the faculty development workshops the participants:

- Reviewed and discussed background reading materials;
- Interacted with other participants by posting messages on the site's discussion board and by engaging in real-time *text-chats* with other participants and instructors (in the online workshop);
- Developed problematic situations for their classes that provided the basis for classroom lessons;
- Participated in a capstone activity in which each participant developed a lesson plan;
- Evaluated their own progress in mastering the principles of problem-based instruction;
- Assessed the instructional workshop in PBL.

C. Accomplishments

Below are presented a brief description of the project's accomplishments.

- 1) Lessons in PBL. We have developed, demonstrated and evaluated an online faculty development program in PBL for presentation in either a live, or self-paced (anytime-anywhere) formats. The workshops documentation consists of a series of learning models or lesson plans. Lesson plans include (a) a rationale, an explanation of why each lesson is included; (b) goals, the kinds of abilities the student should develop; (c) objectives, specifications of the activities the students can probably accomplish upon completion of the lesson; (d) classroom procedures, a detailed plan for conducting each lesson; (e) scripts, dialogues for encouraging independent thinking in students; (f) instructions for managing cooperative learning units; and (g) instruments for evaluating learning outcomes.
- 2) A Primer in PBL. To assist faculty participants in their development of problem-based instruction, we have prepared an information packet that allows instructors to conceptualize their own approaches to integrating various elements of PBL with their lessons. This primer includes sections on facilitating in students such critical thinking skills as formulating questions, critical listening, integrating diverse issues, and creating new ways of examining course content.
- 3) Evaluation. In order to assess the effectiveness of the faculty development program in problem-based instruction, we have developed a hands-on module that enables instructors to assess the effectiveness of their problem-based instruction.

Additionally, we have developed a new survey instrument that assesses participants' perceptions of the PBL instructional model.

4) Dissemination. Collaborating with the ASU Office of Faculty Development, we offered online, a one-week workshop to ASU faculty and community college faculty. (This workshop was publicized throughout the state of Arizona.) Additionally, the principal investigator collaborated with his co-principal investigator in the College of Education on an evaluation study of teachers from the Phoenix metropolitan area. Future dissemination efforts will be directed toward preparing written publications and oral presentations for colleagues on campus and at national meetings. All of the materials have been made available on the principal investigator's Web site.

D. Evaluation

Two studies were conducted to assess quantitatively the program in problem-based learning. In the first study, we assessed the effectiveness of a college-level, instructional program in problem-based learning using an exercise developed for this evaluation. In the second study, using a survey instrument based on the National Survey of Student Engagement, we assessed the degree to which students and teachers knowledgeable in PBL believed that the PBL model would be advantageous in enhancing the academic experience of students in college.

The summary tables below present the data for the two studies. Table entries include the size of the mean rating, standard deviation, and percentage change. For teachers, the results provide an indication of the participants' intention to develop PBL lessons for their classrooms. For students, these findings indicate the degree to which students perceive the problem-based learning facilitates their college experience. For the first study, we present pre-post changes in the students' problem solving scores. These change scores provide a measure of the cognitive development of several critical higher-order thinking skills of students enrolled in a college class that incorporated PBL instructional methods. In the second study, the change scores reflect the difference between the participants' perception of PBL and traditional-classroom instruction.

We use the size-of-effect as our principal measure of the effectiveness of PBL instruction. The size of effect is a measure of the difference between the groups (that is, PBL versus traditional-classroom instruction) that is not affected by the number of respondents used in the comparison. The size of effect is used throughout this discussion as a measure of the benefits to learning of employing the PBL model in the college classroom. As a measure of the effect size, most investigators assume that an effect size of 0.5 is large, 0.3 is moderate, and 0.1 is small (Cohen, J, 1988, *Statistical power analysis for the behavioral sciences* (2nd ed.). New Jersey: Lawrence Erlbaum.).

Study 1: Evaluation of Instruction in Problem Based Learning

The first study sought to measure the changes in the problem solving abilities of 26 students enrolled that occurred over the course of time in the Principal Investigator's campus-based and online sections of *Effective Thinking in Psychology* (PGS 304). This course was highly interactive and problem based. For this study, we developed an instrument for evaluating the students' ability to conduct a problem-based analysis of a complex and highly emotional issue. Students were asked to address the various

problems that resulted from the attack on the World Trade Center on 9/11. For example, in this interactive exercise the participants were asked to prepare a statement for the President describing several possible courses of action he might take in addressing the problems faced immediately after the attack. Additionally, they were asked in their role as advisor to the President to present any information or evidence that bears on selecting one particular course of action? (See survey instrument at http://www.public.asu.edu/~leshowit/problembased_assignment.doc.)

The responses of the participants were assessed by judges on a three-point scale on how well the answers reflected problem-solving strategies, how well they conveyed or communicated the student's proposed solution path, and whether or not there was substantial content included in the analysis.

The findings in the summary table indicate that the students showed significant improvement in the use of terminology, in application of PBL concepts, in fashioning and in supporting in evidence viable solution paths that reflect the use of problem-solving principles. The size of effect was large, exceeding 1.5. Additionally, students were better able to develop a concept or idea after having learned a more effective problem-based process with which to do so. The increase in the scores provides strong support for the conclusion that in a semester long course, it is possible to develop in students an understanding of problem solving and other related strategies of rational thinking. This understanding of evidence-based reasoning within a problem-based context also tended to check overly emotional responses that often would interfere with effective thinking.

PROBLEM BASED LEARNING SOLUTIONS						
		(9/11 Document)				
	TOTAL POINTS POSSIBLE 48			TOTAL POINTS POSSIBLE 6		
Face to Face Class						
Student #	Pre-course Grade	SD	Post-course Grade	SD	% Change	
1	18		42		133%	
2	19		40		111%	
3	21		23		10%	
4	17		25		47%	
5	16		13		-19%	
6	21		18		-14%	
7	15		34		127%	
8	21		23		10%	
9	24		38		58%	
10	16		22		38%	
11	15		35		133%	
12	21		27		29%	
13	21		27		29%	
Subtotals, Group A	245	2.88	367	8.88	50%	
Averages, Group A	18.85		28.23			
Size of Effect Group A	1.59					

Online Class

14	24		43		79%
15	36		45		25%
16	32		41		28%
17	26		30		15%
18	24		38		58%
19	20		27		35%
20	18		21		17%
21	21		22		5%
22	30		37		23%
23	28		45		61%
24	16		36		125%
25	17		30		76%
26	20		24		20%
Subtotal, Group B	312	6.15	439	8.63	41%
Averages, Group B	24.00		33.77		
Size of Effect Group B	1.32				
Totals	557		806		45%
Averages	21.42		31.00		
Size of Effect	1.46				

Study 2: Measurement of Student and Teacher Perceptions of PBL

Two samples of participants were evaluated in this study. Fifteen professional teachers in a graduate course in educational technology in the ASU College of Education comprised the first sample. Twenty-one students enrolled in the principal investigator’s class in Effective Thinking in Psychology comprised the second sample. The Effective Thinking course incorporated many elements of problem-based instruction.

To familiarize the teachers with the PBL model of instruction, the teachers were asked to complete an online workshop on PBL (described earlier). This self-paced, online workshop presented the theoretical principles of the PBL model as well as its application in the classroom. (The reader may access this online workshop, which was developed for this project, at <http://atlas.asu.edu/adduser.cfm>. Additionally, the teachers completed a second online exercise that provided direct instruction in applying a PBL analysis to a common problem faced in college: binge drinking and over-partying. (This tutorial, entitled “Effective Thinking,” may be viewed at <http://atlas.asu.edu/adduser.cfm>.) Following completion of the two online exercises, the participants completed a survey (described below) that compared the learning experience afforded by problem-based learning with the learning experience in the traditional college classroom setting. We believe that these perceptions of the participants are closely related to their “intentions” to adopt PBL in their classrooms. Due to time constraints of the project, we were unable to follow up and gather actual rates for adoption of PBL techniques.

Student perceptions of PBL instruction were evaluated in a separate study. At the outset of the PI's course in Effective Thinking, students evaluated their overall learning experience in traditional college classes using the same survey (completed by the teachers). At the end of the semester, students were asked to evaluate their PBL experience in the Effective Thinking course using the survey instrument.

In order to evaluate the teachers' and students' impressions of PBL that they had experienced either in the online workshop or in the formal classroom setting, we adapted a survey instrument developed by the National Survey on Student Engagement (NSSE) materials <http://www.indiana.edu/~nsse/>. Developed at Indiana University, this instrument has been used extensively in evaluations of the college experience of students at more than 200 four-year colleges and universities. The instrument assesses participation rate and experiences in selected areas of academic growth and personal development in college. According to the NSSE project, students who are learning in environments that support practices of higher order thinking, including problem solving, show higher levels of learning and report a significantly better overall educational experience than students at institutions that do not support these learning experiences.

For purposes of the study, we modified the NSSE instrument so that it was appropriate for gauging the effect PBL instruction had on the various dimensions of the academic experience in college. Participants rated how frequently they experienced such events as "thinking critically and analytically" in their PBL classroom and traditional classrooms using a 5-point scale (with 5 corresponding to "very often"). We hypothesized that, compared with the learning experienced in the traditional college classroom, students and teachers who had participated in the PBL learning intervention would report more positive learning events.

Items on the survey were slotted into five benchmarks of the academic experience: 1) higher-order thinking; 2) course procedures; 3) communication skills; 4) course expectations and 5) others (or miscellaneous items). The findings summarized below indicate that on three principal benchmarks of the academic experience college—higher-order thinking, communication skills, and course expectations—both the teachers and students expressed uniformly strong support for the problem-based classroom relative to traditional classroom. According to the participants surveyed in this study, the goals of the PBL classroom, specifically problem identification, information analysis, and decision-making, were achieved. A detailed analysis of these survey findings is presented next.

Evaluation of Problem Based Learning and Traditional Classroom Instruction on Five Benchmarks of the College Experience

1. Higher-Order Thinking

The first section of the survey assessed the development of higher-order thinking in PBL and traditional settings. Most educators would agree that higher-order thinking skills are valuable in every aspect of academic and personal life and that their development is a primary goal of higher education. It can be seen in the table below that both the teachers and students reported that the problem-based classroom is superior in developing these essential aspects of cognitive learning. The size of effect for this section was a very strong 0.80.

No.	Question: Students	PBL	SD	Other	SD	% Change	Size of Effect
	Question: Teachers	PBL	SD	Other	SD	% Change	Size of Effect
1	Thinking critically and analytically	4.27	1.10	3.60	0.74	19%	0.73
2	Solving complex real-world problems	4.20	1.15	3.20	1.15	31%	0.87
3	Work on a paper or project that requires integrating ideas or information from various sources	4.40	0.91	3.53	0.83	25%	1.00
4	Put together ideas or concepts from different courses when completing assignments or during class discussions	4.00	1.13	2.87	1.13	39%	1.00
5	Have serious conversations with other students who are different in terms of other religious beliefs, political opinions, or personal values	3.79	1.46	3.40	1.12	11%	0.30
6	Analyze the basic elements of an idea, experience, or theory, such as examining a particular case or situation in depth and considering its components	4.53	0.64	3.73	0.80	21%	1.11
7	Synthesizing and organizing ideas, information, or experiences into new, more complex interpretations and relationships	4.20	1.15	3.60	0.83	17%	0.61
8	Making judgments about the value of information, arguments, or methods such as examining how others gathered and interpreted data and assessing the soundness of their conclusions	4.33	0.90	3.53	0.64	23%	1.04
9	Applying theories or concepts to practical problems or in new situations	4.47	0.83	3.40	0.74	31%	1.36
10	Acquiring job or work-related knowledge and skills	3.67	1.05	3.53	0.99	4%	0.14
11	Analyzing quantitative problems	3.93	1.33	3.33	1.05	18%	0.50
12	Acquiring a broad general knowledge	4.27	0.96	3.67	0.82	16%	0.67
13	Learning effectively on your own	3.67	1.45	3.33	1.23	10%	0.25
	Mean	4.13	1.08	3.44	0.93	20%	0.74

1	Thinking critically and analytically	4.95	1.08	3.33	1.14	49%	1.46
2	Solving complex real-world problems	4.62	1.18	3.19	1.05	45%	1.28
3	Work on a paper or project that requires integrating ideas or information from various sources	4.75	1.49	3.62	1.10	31%	0.87
4	Put together ideas or concepts from different courses when completing assignments or during class discussions	3.65	1.46	3.38	1.15	8%	0.21
5	Have serious conversations with other students who are different in terms of other religious beliefs, political opinions, or personal values	4.05	1.62	3.81	1.22	6%	0.17
6	Analyze the basic elements of an idea, experience, or theory, such as examining a particular case or situation in depth and considering its components	4.76	1.14	3.50	1.30	36%	1.03
7	Synthesizing and organizing ideas, information, or experiences into new, more complex interpretations and relationships	4.76	1.14	3.43	1.12	39%	1.18
8	Making judgments about the value of information, arguments, or methods such as examining how others gathered and interpreted data and assessing the soundness of their conclusions	4.76	1.14	3.24	1.31	47%	1.24
9	Applying theories or concepts to practical problems or in new situations	4.86	1.14	3.33	1.05	46%	1.40
10	Acquiring job or work-related knowledge and skills	4.19	1.31	3.67	1.14	14%	0.42
11	Analyzing quantitative problems	4.43	1.23	3.43	1.08	29%	0.87
12	Acquiring a broad general knowledge	4.40	1.54	3.95	1.33	11%	0.31
13	Learning effectively on your own	4.19	1.35	3.19	1.05	31%	0.83
	Mean	4.49	1.29	3.47	1.16	30%	0.87

2. Course Procedures

Participants did not report that course procedures in the two types of learning environment were very different. The modest effect size of effect for the teachers indicates that the respondents did not perceive that classroom procedures differ for problem-based and traditional classrooms. However, the students, having experienced the problem-based approach for a semester, perceived clear differences between PBL and traditional classrooms in the amount of active and collaborative learning. They reported that they encountered more active learning methods in the PBL classroom than in the traditional classroom. Over the last decade, research on active learning indicates that the learning process is enhanced significantly when students are engaged in their learning. Additionally, students engaged in their learning report a better overall educational experience than students in the traditional lecture-based classroom.

No.	Question: Teachers	PBL	SD	Other	SD	% Change	Size of Effect
14	Number of assigned textbooks, books, or book-length pack of course reading	3.21	1.51	3.57	1.29	-10%	(0.26)
15	Number of written papers or reports of greater than 5 pages	2.71	1.41	2.93	1.22	-8%	(0.17)
16	Number of written papers or reports of fewer than 5 pages	2.64	1.36	2.86	1.29	-8%	(0.17)
17	Discuss grades or assignments with the instructor	3.67	1.29	3.73	1.10		(0.05)
18	Using computing and information technology	4.00	1.67	3.43	1.32	17%	0.38
19	Working effectively with others	4.13	0.92	3.6	0.99	15%	0.55
20	Work with classmates outside of class to prepare class assignments	3.67	0.90	3.07	1.10	20%	0.60
21	Tutor or teach other students (paid or voluntary)	3.5	1.28	2.79	1.35	25%	0.54
22	Discuss ideas from the readings or classes with the instructor outside of class	3.50	1.33	2.93	1.03	19%	0.48
23	Receive prompt feedback from the instructor on academic performance (written or oral)	3.64	1.4	3.27	0.88	11%	0.32
24	Come to class with readings or assignments completed (item has been reverse coded)	2.07	1.03	2.27	0.88	-9%	(0.21)
25	Emphasis on spending significant times on studying and doing well	3.40	1.18	4.00	0.85	-15%	(0.59)
26	Emphasis on providing support needed to succeed in class	3.93	1.16	3.53	1.06	11%	0.36
27	Work with the instructor on activities other than coursework (committees, orientation, student life activities, etc.)	3.07	1.30	2.53	1.13	21%	0.44
	Mean	3.37	1.27	3.18	1.11	7%	0.16

No.	Question: Students	PBL	SD	Other	SD	% Change	Size of Effect
14	Number of assigned textbooks, books, or book-length pack of course reading	2.72	1.66	3.43	1.08	-21%	(0.52)
15	Number of written papers or reports of greater than 5 pages	3.15	1.36	3.14	0.10	0%	0.01
16	Number of written papers or reports of fewer than 5 pages	4.86	1.22	3.62	1.10	34%	1.07
17	Discuss grades or assignments with the instructor	4.10	1.34	3.38	1.11		0.59
18	Using computing and information technology	4.71	1.14	3.29	1.13	43%	1.25
19	Working effectively with others	3.95	1.53	3.24	1.06	22%	0.55
20	Work with classmates outside of class to prepare class assignments	2.35	1.18	2.80	1.26	-16%	(0.37)
21	Tutor or teach other students (paid or voluntary)	2.65	1.79	2.33	1.40	14%	0.20
22	Discuss ideas from the readings or classes with the instructor outside of class	3.50	1.50	3.05	1.33	15%	0.32
23	Receive prompt feedback from the instructor on academic performance (written or oral)	4.19	1.31	3.52	1.14	19%	0.55
24	Come to class with readings or assignments completed (item has been reverse coded)	2.65	0.94	2.24	0.95	18%	0.43
25	Emphasis on spending significant times on studying and doing well	4.40	1.45	3.90	1.41	13%	0.35
26	Emphasis on providing support needed to succeed in class	4.48	1.24	3.62	1.06	24%	0.75
27	Work with the instructor on activities other than coursework (committees, orientation, student life activities, etc.)	2.44	1.20	2.38	1.20	3%	0.05
	Mean	3.58	1.35	3.14	1.09	13%	0.37

3. Communication Skills

The participants reported that communication skills were enhanced by their experiences in the PBL classroom relative to what they had experienced in the traditional classroom. (The average size of effect was 0.65.) The participants reported that the PBL classroom provided students with the ability to try new ways to write, speak, listen and learn. As a result, they were able to incorporate larger amounts of information and perspectives in class discussions and assignments.

No.	Question: Teachers	PBL	SD	Other	SD	% Change	Size of Effect
28	Makes a class presentation	3.93	1.1	3.33	0.82	18%	0.63
29	Work with other students on projects during class	4.00	1.00	3.2	1.15	25%	0.74
30	Use e-mail to communicate with instructor	4.13	1.13	3.33	1.18	24%	0.69
31	Uses an electronic medium (list-serve, chat group, Internet, etc.) to discuss or complete an assignment	4.33	0.82	2.87	0.92	51%	1.68
32	Writing clearly and effectively	3.87	0.99	3.60	0.74	8%	0.31
33	Speaking clearly and effectively	3.73	1.03	3.53	0.99	6%	0.20
34	Ask questions in class or contribute to class discussions	4.53	0.74	3.50	1.03	29%	1.16
35	Include diverse perspectives (different races, religions, genders, political beliefs, etc.) in class discussions or writing assignments	4.20	0.77	3.20	1.01	31%	1.12
36	Discuss ideas from the readings or classes with others outside of class(students, family members, coworkers, etc.)	3.79	1.46	3.07	0.96	23%	0.60
37	Have serious conversations with other students of a different race or ethnicity	4.00	0.76	3.33	1.23	20%	0.67
	Mean	4.05	0.98	3.30	1.00	24%	0.78

No.	Question: Students	ET	SD	Other	SD	% Change	Size of Effect
28	Makes a class presentation	3.56	1.69	2.90	1.22	23%	0.45
29	Work with other students on projects during class	3.50	1.56	3.35	1.17	4%	0.11
30	Use e-mail to communicate with instructor	4.67	1.22	3.62	1.06	29%	0.92
31	Uses an electronic medium (list-serve, chat group, Internet, etc.) to discuss or complete an assignment	4.81	1.14	3.16	1.32	52%	1.34
32	Writing clearly and effectively	4.38	1.40	3.86	1.09	13%	0.42
33	Speaking clearly and effectively	3.63	1.58	3.40	1.31	7%	0.16
34	Ask questions in class or contribute to class discussions	4.52	1.17	3.19	1.13	42%	1.16
35	Include diverse perspectives (different races, religions, genders, political beliefs, etc.) in class discussions or writing assignments	4.29	1.27	3.76	1.10	14%	0.45
36	Discuss ideas from the readings or classes with others outside of class(students, family members, coworkers, etc.)	4.05	1.50	3.57	1.33	13%	0.34
37	Have serious conversations with other students of a different race or ethnicity	3.50	1.65	3.38	1.27	4%	0.08
	Mean	4.09	1.42	3.42	1.20	20%	0.54

4. Course Expectations

Post-secondary institutions wishing to meet their responsibility of making available a first-rate academic experience must set high expectations for their students. Challenging all students to do their best work happened more often in the PBL classroom than in the traditional class as evidenced by a size of effect of greater than .5. Importantly, we also found that the perceived impact of the PBL classroom extended beyond the academic experience. We note that the participants rated PBL more highly in helping the student cope with non-academic activities such as work and family.

No.	Question: Teachers	PBL	SD	Other	SD	% Change	Size of Effect
38	Work hard in an effort to meet the instructor's standards or expectations	4.00	1.53	4.13	0.92	-3%	(0.11)
39	Challenging the students to their best work	4.4	0.83	3.53	0.99	25%	0.96
40	Understanding yourself	3.4	1.5	3.07	1.28	11%	0.24
41	Memorizing facts ideas or methods from the course and readings so that the students can repeat them in pretty much the same form (item has been reverse coded)	2.6	0.99	1.20	0.94	117%	1.45
42	Classroom relationship with other students	3.93	1.39	3.60	0.83	9%	0.30
43	Classroom relationship with the instructor	3.87	1.46	3.47	1.25	12%	0.30
44	Classroom relationship with the teaching assistant	3.67	1.54	3.2	1.32	15%	0.33
45	Emphasis on helping one cope with non-academic responsibilities (work, family, etc.)	3.13	1.6	2.40	0.99	30%	0.56
46	Emphasis on providing the support needed to thrive in social situations	3.20	1.37	2.87	0.92	11%	0.29
47	Emphasis on understanding people of other racial or ethnic backgrounds	3.4	1.45	3.13	1.3	9%	0.20
48	Developing a personal code of values and ethics	3.27	1.1	3.07	1.1	7%	0.18
	Mean	3.53	1.34	3.06	1.08	22%	0.43

No.	Question: Teachers	PBL	SD	Other	SD	% Change	Size of Effect
38	Work hard in an effort to meet the instructor's standards or expectations	4.52	1.36	4.14	1.25	9%	0.29
39	Challenging the students to their best work	4.38	1.18	3.95	1.15	11%	0.37
40	Understanding yourself	4.24	1.21	3.33	1.10	27%	0.79
41	Memorizing facts ideas or methods from the course and readings so that the students can repeat them in pretty much the same form (item has been reverse coded)	2.42	1.15	0.90	1.19	169%	1.30
42	Classroom relationship with other students	4.45	1.5	3.80	1.37	17%	0.45
43	Classroom relationship with the instructor	4.52	1.46	3.95	1.10	14%	0.45
44	Classroom relationship with the teaching assistant	4.75	1.55	3.15	1.42	51%	1.08
45	Emphasis on helping one cope with non-academic responsibilities (work, family, etc.)	3.60	1.64	3.00	1.35	20%	0.40
46	Emphasis on providing the support needed to thrive in social situations	3.80	1.53	3.00	1.04	27%	0.62
47	Emphasis on understanding people of other racial or ethnic backgrounds	3.62	1.41	3.19	1.17	13%	0.33
48	Developing a personal code of values and ethics	4.10	1.27	3.24	1.06	27%	0.74
	Mean	4.04	1.39	3.24	1.20	0.35	0.62

5. Other (Miscellaneous)

In the group of items listed as “other,” participants assessed the contributions of the PBL and traditional classrooms to various areas of non-classroom activities during the college years. One of the highlights of this category was the response to questions that asked respondents to rate how well the PBL classroom encouraged students to participate in an independent self directed study. With an effect size of .65 for item 55 (and other related items on the survey), we have indication that students would be able to use the skills learned in the PBL classroom for addressing life events in areas remote from the classroom.

No.	Question: Teachers	PBL	SD	Other	SD	% Change	Size of Effect
49	Participate in a community based project	3.67	0.9	2.53	1.13	45%	1.12
50	Talk about career plans with instructor	3.5	1.22	3	1.07	17%	0.44
51	Practicum, internship, field experience, co-op experience or clinical assignment	3.53	1.46	2.87	1.13	23%	0.51
52	Community service or volunteer work	3.47	1.25	2.87	1.3	21%	0.47
53	Participate in a learning community or some other formal program where groups of students take two or more classes together	3.13	1.36	2.73	0.96	15%	0.34
54	Work on a research project with a faculty member outside of course	3.07	1.28	2.8	0.56	10%	0.29
55	Independent study or self designed study	3.73	1.33	3.00	0.76	24%	0.70
56	Culminating senior experience (comprehensive exam, capstone course, thesis, project)	3.13	1.68	3.33	1.29	-6%	(0.13)
57	Emphasis on attending campus events and activities (special speakers, cultural performances, athletic events, etc.) outside of class	2.8	1.57	2.53	1.13	11%	0.20
58	Emphasis on voting in local, state, or nation elections	2.57	1.68	2.29	1.46	12%	0.18
59	Contributing to the welfare of your community	3.00	1.70	2.40	1.30	25%	0.40
	Mean	3.24	1.40	2.76	1.10	18%	0.41

No.	Question: Students	ET	SD	Other	SD	% Change	Size of Effect
49	Participate in a community based project	2.33	1.41	2.72	1.38	-14%	(0.28)
50	Talk about career plans with instructor	3.38	1.41	2.95	1.25	15%	0.32
51	Practicum, internship, field experience, co-op experience or clinical assignment	3.11	1.67	3.00	1.21	4%	0.08
52	Community service or volunteer work	2.47	1.28	2.74	1.26	-10%	(0.21)
53	Participate in a learning community or some other formal program where groups of students take two or more classes together	2.60	1.33	2.47	1.04	5%	0.11
54	Work on a research project with a faculty member outside of course	2.78	1.58	2.74	1.22	1%	0.03
55	Independent study or self designed study	3.26	1.62	2.67	1.01	22%	0.45
56	Culminating senior experience (comprehensive exam, capstone course, thesis, project)	3.10	1.44	2.60	1.14	19%	0.39
57	Emphasis on attending campus events and activities (special speakers, cultural performances, athletic events, etc.) outside of class	2.44	1.20	2.63	1.12	-7%	(0.16)
58	Emphasis on voting in local, state, or nation elections	2.61	1.49	2.32	1.07	13%	0.23
59	Contributing to the welfare of your community	3.15	1.28	3.05	1.07	3%	0.09
	Mean	2.84	1.43	2.72	1.16	0.05	0.09

E. Budget

The final progress report has been submitted by Ed Radwin, Office Research/ Sponsored Projects.