



Center for the Integration of  
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***Longitudinal Study  
of the Impact of the UW-Madison Delta Program  
in Research, Teaching, and Learning:***

***Findings from Year 1 Data***

*by  
Susan Millar & Jana Bouwma-Gearhart*

*with assistance from  
Shihmei Barger, Paul Dillenburg, & Leah Kolb*

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***The National Science Foundation***

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Center for the Integration of Research, Teaching, and Learning (CIRTL)  
University of Wisconsin–Madison  
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Michigan State University

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# I. Introduction<sup>1</sup>

Note: This report is intended for readers already familiar with the CIRTL<sup>2</sup> and Delta programs and the work of the CIRTL Evaluation and Research Team (ERT). Hence, context on these programs is not provided.

## A. Overview of the study

In fall 2004, the UW-Madison group of the CIRTL Evaluation and Research team initiated a longitudinal study of the impact of the UW-Madison Delta Program in Research, Teaching, and Learning (“Delta program” or “Delta”) on doctoral students (“docs”) and postdoctoral researchers (“postdocs”). This study seeks to track doctoral students and postdocs who have and have not participated in Delta through their time on campus and into the job market. It is designed to provide answers to research questions such as:

- How, if at all, has the Delta program resulted in change in science, technology, mathematics and engineering (STEM) docs/postdocs’ conceptions of and beliefs about teaching/outreach? and
- What, if any, influences has Delta had on STEM docs/postdocs’ post-doctoral job placement and subsequent teaching/outreach roles?

The study uses two types of data-gathering methods: intensive interviews of a small longitudinal cohort, and cross-sectional surveys to gather less intensive information from a large number of STEM docs/postdocs. The intensive component is gathering data via open-ended structured interviews from a longitudinal sample of 70 UW-Madison docs/postdocs in the STEM disciplines. As CIRTL funding ends as of December 2007, we will only be able to follow the first cohort for 3 years, and the second for 2 years.<sup>2</sup> The cross-sectional component used questionnaires toward the end of 2005 to gather data from a large random sample of UW-Madison STEM docs, and all STEM postdocs. Questions similar to those included in the 2005 questionnaire will be asked on the second administration in 2007 of the Delta Census Survey.

This report provides preliminary findings primarily on our first interviews with our first cohort of 30 individuals. It also presents a small portion of the findings from the cross-sectional survey. A full report on the survey study appears separately (Barger,

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<sup>1</sup> The design of the Longitudinal Study was developed by the UW-Madison ERT, with leadership from Susan Millar and Norman Webb, and participation by Jana Bouwma-Gearhart, Paul Dillenberg (who left UW-Madison in spring 2005), Shihmei Barger (who joined the ERT in summer 2005), Matthew Clifford, and Mark Connolly. The team received valuable input from Deanna Byrnes, and many of the Delta team leaders. Susan Millar and Jana Bowuma-Gearhart conducted most of the interviews, analyzed the interviews, and wrote this report. Paul Dillenberg conducted a few of the interviews. Shihmei Barger provided the data from the Cross-Sectional survey that is presented in the report. Leah Kolb assisted in the data gathering and initial analysis work. Matt Clifford, Christine Pfund, and Mark Connolly provided valuable feedback on a draft of this report.

<sup>2</sup> We plan to seek additional funding from NSF in order to collect data on these cohorts for 7 and 6 years, respectively.

forthcoming). A second feedback report, presenting findings from the spring 2006 interviews, will be provided in fall 2006. The final report, provided at the end of 2007, will synthesize data across the two components and the three years of this study.

## **B. Study Design**

### **1. Intensive Component**

#### **a. Data Gathering and Analysis**

A longitudinal study of the impact of Delta on graduate students and postdocs has been a key element of the Evaluation and Research Team's plan since the inception of CIRTL (January 2003). We initiated this study in fall 2004, as by then a sufficiently large number of people had begun to participate in Delta activities, and had been added to the Delta Participant Database. Study planning and design began with individual meetings with 12 Delta Team leaders (representing all the teams), during which we obtained input on research questions they hoped the study would investigate and on other aspects of the study design. We incorporated many ideas and preferences stated by the team leaders while developing the interview protocol for the intensive part of the study. We shared successive versions of this protocol with a few team leaders, Christine Pfund (Delta Program Director), and Robert Mathieu (CIRTL PI).

The final interview protocol for Delta participants (see Appendix A) is organized into the following main topics:

- *Background.* This section seeks detailed information on academic and professional development experience and future plans.
- *Motivation for participation in Delta.*
- *Impact of Delta.* The first part of this section begins with open-ended questions about impact. We asked these first to ensure that interviewee responses are organized according to the terms and experiences they consider most important. In the second part, we specifically ask about topics pertaining to the Delta "pillars" (known within Delta as "Teaching-as-Research," "Learning-through-Diversity," and "Learning Communities,")<sup>3</sup> thus "leading" the interviewee but also obtaining information that interviewees might not have thought to provide in the more open-ended section. (Note that in the interviews we did not introduce the terms "Teaching-as-Research" and "Learning-through-Diversity," and did not provide the Delta definition of "Learning Communities.")
- *Outcomes pertaining to future roles as educators.*
- *Specific outcomes for others.*
- *Survey items.* This section ends with a short survey that includes 12 items from the ERT Census Survey that were designed to elicit attitudes and beliefs about the

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<sup>3</sup> Appendix B provides definitions of these terms, copied from the Delta website. Throughout this document, we use the capitalized version of the term "learning community" (which is used in common parlance) only when specifically referring to the Delta definition of this term, or when presenting quoted material in which Delta participants appear to be directly referring to the Delta definition of this term.

Delta pillars. Interviewees were asked to complete the survey and then to explain their responses to 6 of the items, chosen to represent each pillar.

- *Recommendations for Delta.*

The interviews with team leaders also helped shape the design of the cross-sectional surveys (one for graduate students, and one for postdoctoral researchers). Many questions on this survey are drawn directly from the Census Survey (Dillenburg, 2005, Dillenburg & Connolly, 2005). In turn, the 12 survey items used in the interview protocol are drawn from the cross-sectional questionnaire, thus providing common measures across these different studies.

### *On the Nature of Open-ended Interview Methods*

Particular strengths and weaknesses characterize findings derived from open-ended interviews versus those obtained from forced-choice questionnaires. One of the advantages of open-ended interview questions is that respondents must decide which points to address, and then elaborate on these points in their own terms. By contrast, responses to forced-choice questions are far more likely to be an artifact of the researcher's questions, and may provide a less reliable understanding of the respondents' experience. A disadvantage of open-ended questions, however, is that findings may be understated. For example, in response to the question, "Has participation in Delta activities resulted in any outcomes that you value beyond the kinds of learning that you just described?" an interviewee may mention their teaching philosophy and proceed to explain how developing her teaching philosophy statement was a turning point in terms of her excitement and confidence as she prepared to apply for faculty positions. She may not think to mention that a "publication in an education journal" also was an outcome of her participation. In analysis, only "teaching philosophy" will be counted as this participant's outcome beyond "kinds of learning." By contrast, had she been presented with a list of options in a closed-ended questionnaire, she might have said yes to both the teaching philosophy and publication option. In this case, the researchers would get "yes" to more items in a list, but would know far less about the meaning and value that any of the items in the list have for the respondents.

### **b. Sample design**

*Selection factors.* We are using the following as the primary factors for selecting the interviewees for the intensive true longitudinal sample:

1. "Point in career" of initial participation with Delta. We chose this criterion as a sampling attribute to assess whether the point in doctoral career when a person first in participates in Delta is a factor that significantly impacts outcomes for graduate students. Thus we selected graduate students by three points in their careers (a, b, and c, below). Postdocs comprise a fourth "point in career" category:

- a. early-career: individuals in their first or second year of doctoral study who became engaged with Delta 1 or 2 years before the first interview;

- b. mid-career: doctoral students who have passed their “preliminaries” or the equivalent but not yet begun their dissertation work who first engaged with Delta 1 or 2 years before the first interview;
  - c. late-career: dissertators who expect to complete their Ph.D. within one year and who first engaged with Delta 1 or 2 years before the first interview;
  - d. postdocs: postdocs who first engaged with Delta 1 or 2 years before the first interview.
2. Delta “dosage.” We chose this as a sampling attribute in order to assess whether the amount of participation in Delta (“dosage”) is a factor that significantly impacts outcomes for participants. We chose for our “no dosage” comparison group only late career dissertators who expect to complete their Ph.D. in spring of the year of the first interview and postdocs who are leaving for a new position the year after the first interview. (Our assumption is that there is little chance these individuals will be “contaminated” by Delta participation.)

In addition to the above two factors, we are taking into account the following factors that prior research indicates may confound the impact of a particular professional development program,<sup>4</sup> and in order to ensure diversity in the sample. These factors, listed in priority of consideration in sample selection, are:

- 3. Field of study,
- 4. Sex, and
- 5. Type of institution at which bachelor’s degree was earned.

*Sample size.* In our initial design, we proposed a total sample size of 70 interviewees organized as follows:

**Table 1:  
Intended Sample**

“Point in career”	Delta dosage				Totals
	None	Low	Mid	High	
Early doc		4	4	4	12
Mid doc		4	4	4	12
Late doc	12	6	6	6	30
Postdoc	4	4	4	4	16
<b>Totals</b>	16	26	10	18	70

We consider the sample size to be the bare minimum needed, given that we anticipate attrition, and that we seek to achieve analytic saturation for participants in different “dosage” and “point in career” categories.

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<sup>4</sup> Research findings relevant to these other factors will be discussed in future reports.

The study interviewees are organized into two cohorts, differentiated by the year in which they were first interviewed, with Cohorts 1 and 2 first interviewed in spring 2005 and spring 2006, respectively. The Delta Participant Database was used to select a sample for screening interviews. Screening interviews are needed because the database does not include all the information needed for final cohort selection. The screening interviews resulted in a sample of 35, distributed across the cells in Table 1, above. However, only 30 individuals were available for interviews. To compensate, Cohort 2 will include 40 individuals. The number of Cohort 1 interviewees by dosage and point in career at initial interview appears in Table 2. This cohort comprises the population on which this report is focused.

**Table 2**  
**Cohort 1 (first interviewed in spring 2005)**

“Point in career”	Delta dosage				Totals
	None	Low	Mid	High	
Early doc		2	2	1	5
Mid doc		3	1	2	6
Late doc	4	2	2	3	11
Postdoc	2	1	2	3	8
<b>Totals</b>	6	8	7	9	30

## **2. Cross Sectional Component**

The cross-sectional study was designed by Norman Webb and Paul Dillenburg. Findings from the two cross-sectional surveys that are provided in this report were analyzed by Shihmei Barger. This component of the Longitudinal Study is based on survey items designed to answer research questions about attitudes and practices about teaching, and interest in future professional roles of UW-Madison STEM docs/postdocs. A version of the survey tailored to graduate students was sent to 1110 students selected at random from a total of 2477 STEM graduate students registered at UW-Madison in spring 2005. Of these, 464 completed surveys were returned for a response rate of 42%. A version designed for postdocs was sent to 407 of the 453 STEM postdocs at UW-Madison in spring 2005. Of these, 185 surveys were returned, for a response rate of 45%.

### **C. Limitations of this Report**

Most of the material in this report consists of thematic findings drawn from 30 interviews with Cohort 1, taken as a whole. Because another 40 members of our sample (Cohort 2) are yet to be interviewed, the themes presented here are subject to modification. Additionally, we believe that the numbers of individuals associated with many of our thematic categories are currently understated; to help correct for this, we will recode the Cohort 1 transcripts when we code the Cohort 2 transcripts.

We believe that the number of Delta participants in Cohort 1 (24) is too small to support disaggregation into groups defined by specific attributes (such as Delta “dosage,” and “point in career of initial participation with Delta”). Generalizations by these groups will be provided once all 54 Delta participants Cohorts 1 and 2 have been interviewed.

Due to time limitations associated with the departure of a research team member, there is inconsistency within this report regarding the extent to which sections are analyzed. Analysis provided on certain sections (including those on “struggle for balance,” “Teaching-as-Research,” and “outcomes pertaining to future professional roles”) is brief. In contrast, other sections (such as the section on “impact on learning” pertaining to learning communities) are fully analyzed at this time. Our fall 2006 report will provide a complete and even analysis of all sections.

Our fall 2006 report, which will be based on data from all 70 study interviewees (Cohorts 1 and 2), will present more refined analytic themes, cross-walk thematic findings with participant attributes, draw heavily on findings from the cross-sectional study, include a comparative analysis of findings from the 12 survey questions included in both the interview and survey parts of the study, and, overall, be more comprehensive. This second report also will provide Delta and other CIRTL implementers with findings on whether, and in what ways, our 54 Delta participants are acting on and integrating across their various Delta experiences. The data from our spring 2005 interviews, with 24 diverse Delta participants, are insufficient to support findings of this nature.

#### ***D. Notes on Reading this Report***

In this report, we use the term “interviewees” to refer to all 30 members of Cohort 1, including no-dosage interviewees, and the term “participants” to refer to the 24 Delta participants in Cohort 1. We use the capitalized version of the term “learning community” (more commonly used than “Teaching-as-Research” or “Learning-through-Diversity”) only when specifically referring to the Delta definition of this term. A list of acronyms used in this report appears in Appendix D.

To avoid use of verbal quantifiers so vague as to be essentially meaningless (e.g., the phrase “some participants” could refer to anywhere from 2 to 29 of the 30 interviewees), we have chosen to use the following convention to indicate more specifically the frequency with which a theme appears in our data:

<b>Verbal quantifier</b>	<b>Percent point range</b>
few	up to 15%
some	between 16 and 44%
about half	between 45 and 54%
many	between 55 and 74%
most	between 75 and 94%
virtually all	all but 5%

## II. Preliminary Findings

Our findings are organized to generally follow the structure of our interview protocol.

### *A. Background Characteristics of Cohort 1*

We begin with background information about the 30 Cohort 1 interviewees whose experiences and learning are the focus of the report. This section includes sections on attributes of these interviewees, their sources of interest in teaching, and factors that motivated their participation.

### *B. Impact of Delta*

We then turn to the central portion of the report—findings on the impact of Delta. We begin the impact section by presenting the only data in the report that compares Delta participants with non-participants. These data are drawn from the cross-sectional survey, and pertain to attitudes and beliefs that the Delta program seeks to develop in future postsecondary educators. (A complete treatment of the survey findings is available in a report by Shihmei Barger.)

All information in the remainder of the impact section is based on our interviews with the 24 Delta participants. Before turning to these interview-based findings, we present two contextual factors that condition all the impact information that follows: the “muddy attribution” issue, and the “struggle with balance” issue.

The main part of the impact section is organized into five categories of impact:

- **Types of Learning.** This section presents types of learning that participants attributed (more or less) to Delta. This section is structured into four types of learning that Delta leaders believe docs/postdocs should develop as a result of participating in the Delta program: “new knowledge and skills,” attitudes, confidence, and other types of learning. The new knowledge and skills data are discussed first in terms of findings about (in our words) the “new exposure continuum,” and then in terms of four types of new knowledge and skills— the Delta pillars, and “other types of learning.”
- **Outcomes Other than Types of Learning** – including, for example, the Delta certificate, and new social networks;
- **Opportunities for Practicing and Demonstrating Delta-based Learning** – presenting information on ways in which participants have or have not found opportunities to use their new knowledge and skills;
- **Outcomes pertaining to Future Professional Roles** – presenting early and thus limited information on how Delta participation affects participants in their future roles;
- **Participant Knowledge of Impact on People and Organizations** – providing Delta leaders information about participant views about the spread of Delta to others, and the effects that they perceive Delta is having on the UW-Madison and other organizations.

### *C. Recommendations*

The final section presents recommendations provided by the 24 Delta participants and 6 no-dosage interviewees.

## **A. Background Characteristics of Cohort 1**

### **1. Attributes of Cohort I Interviewees**

Here we report on demographic and other characteristics of the members of Cohort 1.

#### **Institutional Status**

As indicated in Table 2, above, Cohort 1 is comprised of 22 doctoral students and 8 postdoctoral researchers.

#### **NSF-designated Fields of Study and Departments**

We attempted to construct a sample that was well distributed across the NSF-designated broad fields of study (Table 3). Analysis of the Delta database revealed that the Delta community does not evenly represent STEM fields of study at UW-Madison. We therefore are not able to obtain a sample of participants that reflects broad field distribution at UW-Madison. We have, however, attempted to obtain a sample that is representative of the Delta STEM community. (Because the NSF-funded Delta is focused on serving the STEM disciplines, we did not include people in the social sciences or health sciences in our sample, even though more than 10 percent of the Delta population was from these fields.) Because a few individuals from some fields whom we attempted to include in Cohort 1 were unable to participate, Cohort 1 over-samples from other fields.

Please note that for the data presented in this report, interviewees' "department" is their current UW-Madison department affiliation at the time of their interview. This point is important when considering the affiliations of postdocs who may have been affiliated as a graduate student with a department other than their current one.

**Table 3**  
**Comparative Distribution by NSF-designated Broad Field of Study**  
**For UW STEM doctoral students, Delta docs/postdocs, and Cohort 1 sample**

	UW STEM doctoral* students		Delta Docs/postdocs		LS sample doc/postdoc	
	n	%	n	% (of known)	n	%
Biological Sciences	741	27	60	36	16	53
Engineering	693	25	21	13	5	17
Physical Sciences	478	17	7	4	3	10
Math/Comp Sciences	378	14	11	7	3	10
Health Fields (Other)+	158	6	4	2	0	-
Social Sciences+	148	5	19	11	0	-
Agricultural Sciences	129	5	22	13	1	3
Earth, Atmospheric & Oceanic Sciences	34	1	22	13	2	7
<b>Total</b>	2759	100	166	100	30	100
			8			

\* UW STEM overall population numbers from Sept. 2004 UW Office of the Registrar enrollment records (Revised March 21, 2005). Comparative UW-Madison postdoc distribution by broad field is not available. Hence our sample is compared to UW-Madison doctoral students only.

+ Individuals from Health Fields and Social Sciences are not included in the interview sample.

Going beyond broad field designations, Table 4 shows Cohort 1 distribution by UW-Madison department, using names adjusted to fit NSF subfield categories.

**Table 4**  
**Cohort 1 Docs/Postdocs by NSF-designated UW-Madison Departments**

Department	Number of Participants
Cell and molecular biology	4
Biochemistry	3
Botany	2
Chemistry	2
Mathematics and applied math	2
Metallurgical and materials engineering	2
Electrical engineering	2
Pharmacology	2
Zoology	2
Entomology and parasitology	1
Genetics	1
Geosciences	1
Zoology	1
Microbiology, immunology, and virology	1
Atmospheric and ocean sciences	1
Physics	1
Statistics	1
Biomedical engineering	1
None	1

**Sex**

Cohort 1 includes 13 females (43%) and 17 males. As Table 5, below, shows, the Delta community is not aligned with the UW-Madison STEM population in terms of distribution by sex by broad field. To adjust for this discrepancy, we selected a sample that, taken overall, falls between the UW (37% female) and Delta (59% female) distributions, and we will attempt to select Cohort 2 so that the percentages of our total sample by broad field and sex fall between the UW and the Delta distributions.

**Table 5**  
**Comparative Distribution by Sex and NSF-designated Broad Field of Study**  
**For UW STEM doctoral students, Delta docs/postdocs, and Cohort 1 sample**

	UW STEM overall population*				Delta database population				LS sample interview population			
	Male		Female		Male		Female		Male		Female	
	n	%	N	%	n	%	n	%	n	%	n	%
Biological Sciences	359	48.4	382	51.6	21	38	3	63	8	50	8	50
Engineering	549	79.2	144	20.8	8	38	13	62	1	20	4	80
Physical Sciences	303	63.4	175	36.6	5	45	6	55	3	100	0	0
Math/Comp Sciences	294	77.	84	22.2	6	55	5	45	3	100	0	0
Health Fields (Other)	49	31.0	109	69.0	3	75	1	25	0	-	0	-
Social Sciences	69	46.6	79	53.4	6	32	13	68	0	-	0	-
Agricultural Sciences	77	59.7	52	40.3	9	41	13	59	0	-	1	100
Earth, Atmospheric & Oceanic Sciences	21	61.8	13	38.2	10	45	12	55	2	100	0	-
<b>TOTAL</b>	<b>1721</b>	<b>62.4</b>	<b>1038</b>	<b>37.6</b>	<b>68</b>	<b>41</b>	<b>98</b>	<b>59</b>	<b>17</b>	<b>57</b>	<b>13</b>	<b>43</b>
					8 blank records							

\* UW STEM overall population numbers from Sept. 2004 UW Office of the Registrar enrollment records (Revised March 21, 2005). Comparative UW-Madison postdoc distribution by broad field is not available. Hence our sample is compared to UW-Madison doctoral students only.

### Undergraduate Institution

In an attempt to ensure inclusion in our sample of people with diverse undergraduate experiences, we seek to include about half whose undergraduate degrees are from institutions with a strong research or post-master's professional focus, and half whose degrees are from institutions that have as their main focus terminal master's and baccalaureate degrees. For Cohort 1, our distribution across these two groups is 13 and 17, respectively.

### Post UW Career Aspirations

During our screening interviews, we asked interviewees if they planned on teaching in the future and, if so, in what capacity. Table 6, below, shows how Cohort 1 interviewees are distributed by their stated intentions for future careers.

<sup>1</sup>Comparative UW-Madison and Delta data for STEM postdoc distribution by broad field is not available and our sample is compared to UW-Madison and Delta doctoral students only.

\* UW STEM overall population numbers from Sept. 2004 UW Office of the Registrar enrollment records (Revised March 21, 2005)

**Table 6**  
**Cohort 1 Interviewees' Claims Regarding Future Careers**

Possible Career	Number of Participants
Professor at small (liberal arts) institution	11
Professor where teaching is emphasis	2
Professor at technical college or 2-year institution	2
Professors (no indication of type of institution or emphasis)	8
Professor at research-intensive institution	4
No interest in teaching	1
Undecided	2

### **Past Teaching Experience**

During interviews, most respondents indicated that they had some teaching experience, most often as a teaching assistant (Table 7, below). Twenty-one indicated they had been TAs while in graduate school, and 8 respondents said they had been a teaching assistant while still an undergraduate. Others gained teaching experience by giving individual lectures (8), presenting in informal settings such as museums (8), or by instructing their own courses (6). About half of our respondents indicated that they had some type of teaching experience that did not fit into one of these already stated categories.

**Table 7**  
**Past Teaching Experience of Cohort 1 Interviewees**

Background/Teaching experience	Number of Interviewees
Teaching assistant in undergrad	8
Teaching assistant as graduate student	21
Gave individual lectures	8
Taught in an informal setting	8
Served as instructor of own class	6
Other	13
None	1

### **Non-Delta Professional Development**

We asked all interviewees, whether involved in Delta or not, what types of non-Delta professional development they had participated in. Responses are organized into three categories.

#### 1. Pertaining to Teaching and Learning

Overall, 19 of our respondents indicated that they have been involved with some type of non-Delta affiliated teaching and learning professional development. Two others answered our questions about this but did not definitively offer an activity that may be viewed as teaching and learning specific. In addition, one no-dosage student had awareness of pedagogical professional development but claimed to have had none.

Of the 19 interviewees who claimed some history with teaching and learning professional development, 12 said they had been involved with more than one non-Delta type of

professional development. Numbers of non-Delta professional development activities ranged from 1 to 6 per person, with an average of 2.3 activities per person.

Table 8, below, shows the diverse types of non-Delta professional development experiences that these 19 people reported. In particular, 11 of our interviewees had been involved in specific teaching and learning professional development programs, such as HHMI or KTI. Seven interviewees indicated that they had attended or led a campus or departmental teaching assistant training. Six spoke of past teaching experiences (such as the GUTS tutoring program on campus) which served as teaching and learning professional development. Five claimed that they had attended talks or poster sessions at disciplinary or educational meetings that focused on pedagogical issues. Five interviewees claimed to be involved in some type of disciplinary outreach organization that allowed them to interact with K-12 students. And 8 interviewees indicated they were involved in teaching and learning professional development of some “other” kind, the most notable being 3 who cited involvement through a faculty member, often an advisor.

### 2. Pertaining to Research

Of the 12 people responding to questions regarding their participation in professional development activities regarding their research, 2 claimed that there was none available to them. Four claimed to participate in research professional development via disciplinary meetings or institutes. Two others spoke of gaining research professional development as project or research assistants. One spoke of more general professional development gained during his involvement with the engineering program and another highlighted his past work experience in the field. Another respondent claimed the majority of his research professional development happened in research seminars and lab meetings.

### 3. Pertaining to “Other”

We found that a few members of our sample (4) had engaged in professional development that did not fit into the above categories. Of these four, 3 spoke of the importance of some sort of work experience in their respective fields, 2 specifically mentioned the importance of internships in steering them towards future careers and decisions to attend graduate school, and 2 highlighted the importance of acquiring practical job skills.

**Table 8**  
**Interviewees' Non-Delta-Affiliated Teaching and Learning Professional Development**

Professional Development Activity	Number of Interviewees
<b>T&amp;L Professional Development Program</b>	<b>11</b>
HHMI/WI Program for Scientific Teaching	4
KTI	2
TALS	1
BIGS	1
Math Ed-AW	1
New Experiences in Teaching Math	1
Chem 901 (Chem.course on teaching)	1
<b>TA training</b>	<b>7</b>
General	4
Helped run chemistry TA training	2
Engineering TA training	1
<b>Other on-campus Teaching Experiences</b>	<b>6</b>
PEOPLE program	4
GUTS	1
Gave independent lectures	1
<b>Meetings With T&amp;L Focus</b>	<b>6</b>
UW teaching and learning symposium	2
Council for undergrad research meeting	1
American Society of Microbiology	1
American Chemical Society	1
Attended other talks re:T&L	1
<b>Disciplinary Outreach</b>	<b>5</b>
ME&T (toxicology outreach)	1
IPSE (nanotechnology outreach)	1
Ways of Knowing College Biology	1
Science on Saturdays (bioT outreach)	1
Chadborne learning community	1
<b>Faculty Professional Development Program</b>	<b>4</b>
Future Faculty Partners	2
Preparing Future Faculty	1
Emerging Scholars Program	1
<b>Other</b>	<b>9</b>
PD <i>via</i> interaction with faculty member	3
In T&L discussion group	1
GWIS	1
VIGOR (undergrad research outreach)	1
REU	1
FIG/WES	1
RWP	1

## 2. Sources of Interest in Teaching

We asked all interviewees about the sources of their interest in teaching. Twenty-four of our respondents, including a few no-dosage individuals, offered sources of their interest.

Eighteen answered affirmatively when asked if their prior experiences as either undergraduate or graduate student had affected their interest to teach. Of these 18, 16 mentioned something about their undergraduate experience that attracted them to teaching.

- Of these 16, 14 claimed that a positive characteristic(s) of their small or liberal arts' undergraduate institution had attracted them.
  - Eleven respondents spoke of faculty characteristics, such as good teaching, greater involvement in institutional decisions, good mentoring, and closer relationships with students as having fostered their teaching interest. An example is:  
  
*It truly was a liberal arts education. Frustrating at times but very rewarding. And I really liked the teaching that I got at X, so that's why I chose it... You know I've learned so much from that and it's made me lean towards that realm of teaching... towards the smaller school as opposed to the big research university.*
  - Four cited the extra attention, research opportunities, and teaching experiences they gained at these smaller institutions as source for their teaching interests.
  - Three interviewees cited other faculty characteristics—greater involvement, good mentoring, close relationships with students—as motivating factors.
  - Two interviewees claimed that the interdisciplinary collaborations and subject diversity at smaller/liberal arts institutions had fostered their desire to teach in such environments in the future.
- Four of those 18 who linked their teaching interest with their past experiences as undergraduate or graduate students spoke negatively of their time at large/research extensive institutions.
  - All 4 of these respondents made negative comments about the teaching they had experienced as undergraduate or graduate students, such as:

*Yeah it's funny because initially [undergraduate experience] sparked my interest in going into research because I had a great experience -- learned a lot and I got to do hands-on research, as a senior, of my own design, guided direction from different faculty members... I feel, like the teaching was enormously better there than it's been here. Which is to be expected... So I got really excited about research there and continuing my education and then when I got here and the education wasn't quite as robust and interesting as I wanted it to be, I found myself sort of inspired*

*by the teachers I'd had at [the undergraduate level] and wanting to sort of follow that kind of path instead.*

- Three explicitly indicated a desire to engage in alternative practice when they became faculty members.

Six of the 24 interviewees that offered sources of their interest in teaching highlighted professional development activities.

- Four of these mentioned that their experiences as a teaching assistant or teaching assistant trainer led to growth of their teaching interest.
- Four spoke of some aspect of Delta that added to their interest, with 2 making specific reference to the new knowledge and skills they had acquired and desired to try out in their own classrooms. Comments pertaining to Delta impact included:

*And actually, to give DELTA credit, I took the College Classroom course thinking it would just be kind of a way to give me lots of ideas about how to teach better, but it actually completely changed my thinking about what teaching was because I was still stuck in the idea that I stand up there and lecture and the really good teachers are the ones that are most entertaining and had the best lecturing style. But I think good teaching is more a [matter of] facilitating learning, which includes various activities. I thought “Well, I can do this and I actually enjoy doing this kind of stuff.”*

Lastly, 10 interviewees offered some “other” sources of their teaching interest.

- Of these, 2 spoke of inspiration gained through their personal connections with other educators, such as parents who were science teachers.
- Two others claimed to feel a responsibility to engage in community outreach.

*I was also interested, even way before I took the course, in informal science education. I believe that whatever university or college that you are at, it's that college's responsibility to at least take in the community around it and educate it.*

- Two cited discovery that they were more interested in/gifted at teaching than research.
- Offered by one respondent each were an interest in instructional materials development, an aspiration to change peoples' perception of scientists, and a desire to live a better lifestyle than those working at research intensive universities.

### **3. Motivation for Delta Participation**

We asked Delta interviewees about their motivation for participating in Delta, both in regards to their initial and continued participation. Overall, interviewees responded in two main ways—speaking of their own felt needs for the intervention, or of attractive characteristics of the Delta program.

We infer that participant motivations for initial and continued participation in Delta are correlated with their felt needs. Yet, it is important to point out here a complication that we run into when interpreting participant motivation data. While specifically asking about the factors that initially attracted them to Delta and *then* those that secured their continued participation, we suspect that our respondents may have had difficulty differentiating between factors influencing their initial and continued involvement. We are aware that some answers to our question regarding initial participation may have been offered with hindsight built through participation regarding what Delta actually offers. We are cognizant that firm distinctions between factors contributing to their initial and continuing participation with Delta may not easily be made. This said, none of our interviewees offered the same answer in response to the two separate motivation questions and this allows us to be more comfortable in keeping separate our analysis of the “initial” and “continued” participation motivations offered by participants.

Also, it is important to note that some no-dosage individuals made comments about motivation for initial participation with Delta. While these individuals did not end up acting on such motivation, they still spoke of why such a program may be attractive. Thus, their responses are included in our “initial motivation” analysis.

#### **a. Initial motivation**

Over half (19) of our interviewees attributed their initial involvement with Delta to their own interest in issues of teaching and learning (Table 9).

Many of these interviewees sought Delta offerings to help address their felt needs for professional development as educators. Specifically, 12 interviewees spoke of a need for greater professional development in regards to issues of teaching and learning, making comments such as:

*And this was just after I had taught that first semester so I was kind of thinking, “Oh yeah, people probably think about that when they start kind of thing.” And so that was my first inkling to that. Yeah, it is a good thing to start thinking about now.*

- Of these, 9 made reference to pursuing future careers with more of a teaching focus.
  - While doing so, 4 of these interviewees lamented that they had no previous professional development of this kind.
  - One specifically stated that a lack of similar programs at the departmental and university level was responsible for the predicament.
- Some of these same 9 interviewees were more specific about the needs they were hoping to have met through Delta’s professional development program.
  - Five interviewees were looking for any skills that may help them to develop into effective educators and not simply emulate the poor teaching they had witnessed as students.

- Ranging from low to high-dosage and from early-career doctoral students through postdocs, 5 respondents sought ways to gain a market edge over the competition for academic jobs. Such responses were similar to:

*I sort of thought, “Well hey, maybe if I could get involved in this program it would not only make me a little bit more well-rounded but maybe I’d have a leg up on some other applicants further on down the line.”*

- Two mid-dosage postdocs were, respectively, looking for a way to increase confidence as an educator and for alternatives to lecturing.

Over half of our sample stated that their initial attraction to the program stemmed from direct contact with individuals working for Delta, marketing efforts, Delta teams, or other contacts through their home departments.

- Many (11) of these interviewees cited contact with a Delta-affiliated individual as their reason for their initial involvement. Of these, 5 specified that information supplied by a departmental colleague was instrumental to their initial involvement.
- Five interviewees spoke of specific marketing efforts that encouraged their involvement although no respondents stated that the Delta website served as a relevant initial contact.
  - Two interviewees cited the principal investigator’s marketing efforts as having influenced their decision to participate.
  - Three others doctoral found Delta email announcements compelling.
  - Two came to be more involved in Delta after a lesser initial involvement with the Delta teams during the planning phase of the project.
- Five others spoke of their home academic departments’ ties to Delta as being instrumental to their initial involvement.
  - Two interviewees indicated that their advisor served as their initial contact with Delta and provided a firmer draw to the program.
  - Another indicated that multiple faculty members from his home department encouraged him to join the Delta community.

Some interviewees cited attraction to other attributes of Delta as having initially drawn them to the program.

- Five claimed that various programs/activities/classes offered by Delta “sounded interesting” and that they entered into the program through their participation in one of these.
- Three offered that Delta seemed to be able to provide different types of experiences than they had encountered elsewhere. A comment typical of these follows.

*...anyway I was getting sort of bored, I was like, “This is great. I am doing all this but I feel like I am missing out on so much that this campus has to offer.” So I don’t know what email list I was on that I saw this expeditionary learning thing,*

*Delta things, but I was like, “This looks kind of interesting. It seems like a fairly minimal time commitment, I get to explore campus, I should do that.” So, that is sort of what led me to Delta--just sort of wanting to explore campus.*

- One respondent stated that the program’s flexibility drew her in.

Overall, findings regarding interviewees’ motivations for their initial participation with Delta reflect findings of a UW-Madison needs assessment conducted by Millar, Clifford, and Connolly (2004). That report organizes its findings into types of barriers to enhanced STEM teaching, types of need for support and assistance, and advice that interviewees—particularly the campus administrators, program directors, and faculty members—offered to CIRTl leaders and other reform leaders. Examples of types barriers cited in that report are university rewards and resource allocation systems, and the experience that the demands of both teaching and research take too much time to give equal weight to each. A few of the many types of need for support presented in the Needs Assessment report are: need for assistance with teaching strategies and practices, need for help from people who can be trusted and who can provide support when learning how to teach, need for information about careers and resources related to teaching and learning, and need for first-hand teaching experience. Examples of types of advice presented in this report are “involve the right people,” and “meet graduates-through-faculty where they are.” Findings regarding interviewee initial motivation to participate in Delta are summarized in Table 9, below.

**Table 9**  
**Numbers of Participants: Initial Motivations for Participating in Delta**

<b>(24 participants + 6 “no dosage”)</b> <b>numbers reflect number of people mentioning</b>	
<b>Felt Needs</b>	
	<p><b>Attracted via interest in issues of teaching and learning (19)</b>            Felt need for PD in T&amp;L (12) (No past teacher training, looking for alternative to bad teaching)            Considering teaching as a future career (9) (“Market edge”)            Overall interest in teaching (5)            Attraction to theories of T&amp;L (1)            Recognized own strength in teaching (1)</p>
<b>Program Attractors</b>	
	<p><b>Attracted via Delta contact (16)</b>            Individuals (11) (Department colleague)            Marketing efforts (5) (Bob M, emails)            Department contact with Delta (5) (Advisor)            Delta Teams (2)</p>
	<p><b>Attracted via other attributes of Delta (8)</b>            Offering sounded interesting (5) (Courses, programs)            Provided different experiences (3) (Expand normal zone of interaction)            Program’s flexibility (1)</p>
	<p><b>Other</b>            Grant securement (1)</p>

## **b. Motivation for continuing**

Of the 24 members of our sample selected as Delta participants, two-thirds (16) spoke of a desire to continue with their pedagogical professional development (Table 10).

Six indicated their reason was based on their consideration of teaching as a future career. The following is representative of these comments.

*Okay so one of the skills I guess that I'm still looking to acquire is how to mentor undergraduates or graduate students. If I continue on the course that I am on I would end up being a professor (laughs) I mean that seems to be the way things go...I still feel like I could use more help in that area though.*

- Four specifically alluded to their desire to gain a market edge over the competition.
- Three mid-dosage doctoral students, ranging from low- to high- dosage claimed that Delta helped them to become a better teacher.
- Another 3 respondents more specifically indicated that their continued participation was spurred by the realization that Delta teachings had already been useful to them as educators in teaching assistantships and outreach endeavors.

*I think it's rather new styles of teaching that I never knew before. So it was more interesting and a curiosity as well, and more practical reasons. If I were to continue the old style of what I have gone through in education, probably it never [would have] motivated me to participate, but Delta programs had a different style of teaching. They span a wide range and that was something I never knew before. So knowing and briefly touching all of those different ways of teaching has benefited my teaching.*

- Other respondents went to the next level, offering more specific teaching and learning issues they wished to continue exploring with Delta. Of the 5 respondents who made such claims,
  - three wanted to learn more about student evaluation and two others more about the process of evaluating one's own teaching and
  - three participants were specifically interested in finishing a teaching and learning project already started under Delta.

Again, these findings are consistent with findings reported in the UW-Madison Needs Assessment report (Millar, Clifford & Connolly, 2004).

Of those who continued participating in Delta, about half cited as their motivation some element or characteristic of Delta (attractiveness of the program).

- Twelve participants claimed that Delta provided interesting and/or enjoyable experiences and that these experiences brought them back to the program time and time again.
  - Seven individuals were specific regarding a particular Delta offering that they found most interesting and/or enjoyable, such as a course like Informal Education, College Classroom, or Instructional Materials

Development, or other programs such as Roundtables, Internship and Expeditionary Learning.

- Five mid- and high-dosage participants stated that they found the new perspectives on teaching and learning most interesting and worthy of their continued involvement.
- Three participants pointed to their various, new connections with other participants as motivation.
- 
- Five cited Delta's characteristic as a *learning community* as an important motivation for their continuation with the program. "Delta as learning community" was a comment made by a set of doctoral students (almost all high-dosage, ranging from early- to late-career) about the program as a whole and in regards to specific Delta programs, such as the internship and roundtables.

*Enjoying the material, enjoying what I've learned, enjoying the people, like interacting with the people that I've met. So it's very nice to have finally found on campus a community of people who are sort of like-minded and who sort of talk about teaching. It's kind of like finding your niche finally.*

- Three low-dosage doctoral students spoke of Delta's characteristic diversity, both in regards to other participants and the topics covered by the program, and stated things such as:

*I liked meeting people outside of my department. And of different age brackets too because it wasn't just students. I liked the interdisciplinary and I liked the topics ...oh that it's not just material scientists or it's not just biologists. You get to meet people from all the sciences. Which is fun.*

- One mid-career participant claimed that the Delta program had characteristics that made it applicable to the specific point in her career, a time during which she needed to decide upon which career direction to pursue.

Lastly, a few participants attributed their continued participation to a specific Delta contact or marketing effort.

Most Delta participants whom we interviewed planned to continue participating with Delta to some extent. Only 3 claimed they did not intend to participate after our interviews. Of this group, 2 doctoral students claimed that they did not have enough time to continue participating. One spoke of competition for her time between Delta and another campus educational professional development program. For her, the longer standing program won out. Lastly, the third doctoral student indicated that her choice to end participation stemmed from her feeling that her Delta activity was "not a good fit."

Findings regarding participants' motivation to continue participating in Delta are summarized in Table 10, below.

**Table 10**

**Number of Participants: Motivation for Continued Participation in Delta**

<b>(24 participants) numbers reflect number of people mentioning</b>	
<b>Felt Needs</b>	
	<p><b>Desire to continue professional development (16)</b>            Considering teaching as a future career (6)            To continue learning regarding specific T&amp;L (5) (Student evaluation and assessment, evaluation of own teaching)            Hope to gain market edge (4) (Future teaching career, grants)            To finish started Delta project issues (3)            Find Delta teachings useful/applicable to teaching career (3)            To become a better teacher (3)</p>
<b>Program Attractors</b>	
	<p><b>Attributable to other Delta elements/characteristics (15)</b>            Interesting/enjoyable (12) (Connections, new perspectives on T&amp;L, Delta courses/programs)            Delta as learning community (4) (“Focused on T&amp;L!”)            Diversity (3) (of participants, of topics)            Program catered to point in career (1)</p>
	<p><b>Attributable to Delta contacts/marketing effort (2)</b>            Individuals (1)            Marketing efforts (1)</p>
	<p><b>Overall interest in T&amp;L issues (2)</b></p>
	<p><b>Didn’t continue participation (3)</b>            Lack of time (2)            Program not a good fit (1)</p>

***B. Impact of Delta***

**1. Initial comparative findings from the cross-sectional survey study**

In this first report, the only information provided on how Delta and non-Delta participants compare with respect to attitudes and beliefs is from the cross-sectional survey. Although these data are analyzed in only a simple way, we provide them to give at least some comparison between Delta and non-Delta participants.

Findings from both cross-sectional surveys returned during spring 2005 from a sample of UW-Madison STEM graduate students and from STEM post-doctoral employees enable us to compare aggregate responses of individuals in three different groups:

- “Delta PD”: those who participated in Delta professional development activities (n = 95)
- Non-Delta PD”: those who participated in only PD activities which were not sponsored by Delta) (n = 344), and

- No PD: those who participated in *no* professional development (n = 210).

Table 11, below, shows the means for the doctoral and postdoctoral respondents (combined) for each survey item pertaining to the Delta pillars, comparing the Delta PD and No PD groups, the Delta PD/Non-Delta PD groups, and the Non-Delta PD/No PD groups. P values for each of these comparisons also are provided. P-values less than or equal to 0.05 are considered statistically significant. This simple presentation of these data indicate that:

- the differences between the Delta PD and No PD groups are significant on 9 items (all but Questions 4, 8, and 12),
- the difference between the Non-Delta PD and No PD groups are significant on 7 items (1, 3, 5, 6, 7, 8, and 9), and
- the difference between the Delta PD and Non-Delta PD groups are significant on 5 items (1, 2, 7, 10, and 11).

These findings suggest that, relative to individuals who participated in *no* (teaching and learning-oriented) professional development, Delta participants, and to a lesser extent those who participated in professional development that did *not* include Delta, respond more favorably to the survey items on attitudes and beliefs about teaching. The findings suggest that professional development programs, and particularly Delta, may be having the impact that these 12 items are designed to measure, although future longitudinal analysis is needed to control for other confounding variables.

A sophisticated analysis of these data (see the forthcoming Barger report) will draw out the implications of these findings in a more meaningful way. As noted in the “limitations” section in the Introduction, findings from the Barger report will be fully integrated with findings from the interviews in our fall 2006 report.

## **2. Contextual Findings that Inform Other Findings**

### **a. The “Muddy Attribution” Issue**

Of the 24 Delta participants, 17 responded to questions about Delta impact by explaining that they found it difficult to distinguish the effects of Delta from other experiences. We noted 31 such comments, with many of these 17 people each making 2 such comments, and 2 people each making 3 mentions. We organized these comments into a set of mentions pertaining to specific other influences (19 mentions), and another set that cited unspecified relevant experiences (12 mentions).

**Table 11**  
**Comparison of respondents with Delta PD, Non-Delta PD, and No PD**  
 Spring 2005, UW-Madison STEM doctoral students and postdocs

Survey Item	PD Groups Compared*	means	P Value
1. Effective teaching requires input from others.	Delta PD/No PD	4.60/4.23	0.000
	Delta PD/Non-Delta PD	4.60/4.40	0.002
	Non-Delta PD/No PD	4.40/4.23	0.003
2. As a teacher, I would study the effects of different instructional practices in my own classroom.	Delta PD/No PD	4.24/3.91	0.000
	Delta PD/Non-Delta PD	4.24/3.96	0.001
	Non-Delta PD/No PD	3.96/3.91	0.408
3. As a teacher, I would seek pedagogical advice from those outside my department.	Delta PD/No PD	3.94/3.65	0.005
	Delta PD/Non-Delta PD	3.94/3.80	0.155
	Non-Delta PD/No PD	3.80/3.65	0.032
4. An effective teacher studies his/her students' learning in order to teach students of all types effectively.	Delta PD/No PD	4.33/4.15	0.068
	Delta PD/Non-Delta PD	4.33/4.25	0.294
	Non-Delta PD/No PD	4.25/4.15	0.122
5. I rarely talk to my colleagues about teaching. (reversed)	Delta PD/No PD	3.65/3.14	0.000
	Delta PD/Non-Delta PD	3.65/3.47	0.134
	Non-Delta PD/No PD	3.47/3.14	0.001
6. A teacher does <i>not</i> need to collect data on the effectiveness of his/her teaching. (reversed)	Delta PD/No PD	4.43/4.18	0.006
	Delta PD/Non-Delta PD	4.43/4.31	0.122
	Non-Delta PD/No PD	4.31/4.18	0.036
7. I believe it is important to try to facilitate learning among all the students in my class.	Delta PD/No PD	4.53/4.12	0.000
	Delta PD/Non-Delta PD	4.53/4.28	0.002
	Non-Delta PD/No PD	4.28/4.12	0.009
8. As a teacher, I would vary how I teach my courses, based on my own knowledge about my students and their learning issues.	Delta PD/No PD	4.12/3.93	0.074
	Delta PD/Non-Delta PD	4.12/4.08	0.658
	Non-Delta PD/No PD	4.08/3.93	0.026
9. It is not important for me to discuss my teaching with others. (reversed)	Delta PD/No PD	4.39/4.01	0.000
	Delta PD/Non-Delta PD	4.39/4.24	0.062
	Non-Delta PD/No PD	4.24/4.01	0.001
10. As a teacher, I would use teaching activities that take into account the different backgrounds of my students.	Delta PD/No PD	4.04/3.75	0.004
	Delta PD/Non-Delta PD	4.04/3.83	0.011
	Non-Delta PD/No PD	3.83/3.75	0.263
11. As a teacher, it would be more important for me to cover the course content than to attend to the different needs of the students in the course. (reversed)	Delta PD/No PD	3.54/3.11	0.000
	Delta PD/Non-Delta PD	3.54/3.15	0.000
	Non-Delta PD/No PD	3.15/3.11	0.702
12. I know how to organize others for the purpose of discussing teaching and learning.	Delta PD/No PD	3.14/3.04	0.392
	Delta PD/Non-Delta PD	3.14/3.13	0.908
	Non-Delta PD/No PD	3.13/3.04	0.262

\* The number of respondents in these 3 groups are Delta PD - 95, Non-Delta PD - 344, No PD – 210.

*Difficulty distinguishing the effects of Delta from **specific other influences** (19 mentions)*

Of these comments, 9 focused on other programs that offer professional development in teaching (5 of which were the HHMI program.) Typical of comments of this type is “I think [the impact] was a combination of TALS and Delta. I consider them kind of one in the same.” Another 5 comments focused on the way Delta learning melded with non-Delta classroom or laboratory teaching opportunities. One such comment was: “It’s all coming to fruition with [TAing Biocore], just sort of seeing how it works and how I can actually make it work in my classroom.” A few others (5) mentioned overlap with either specific professional organizations, outreach programs, or a campus PD program not focused on teaching (the Writing Center).

*Difficulty distinguishing the effects of Delta from **unspecified other relevant experiences** (12 mentions)*

The 12 people who made these comments each said something to the effect that, while Delta affected them, they were not able to separate the effects of Delta from other experiences. Typical of these comments are these two:

*I would say [Delta] has a role but like I said, it’s hard to untangle what you’ve learned from experience and what you’ve learned from [referring to Delta] people who filter how you interpret that, what you do everyday.*

*In Delta, I realized there are different ways [to teach] in place... without Delta, I didn’t actually realize those [different ways to teach]. I just knew from experience, but Delta formalized it.*

**b. The “Struggle with Balance” Issue**

Many study participants commented on the challenge of balancing the demands they feel to attend to their research, teaching responsibilities, interest in professional development as teachers, and their personal lives. This “struggle with balance” issue is an important context for the findings presented below. Due to insufficient resources, analysis of these comments is not presented here. However, many of the themes evident in these comments are picked up in the “recommendations” section, below.

**3. Categories of Impact**

**a. Types of Learning**

*(1) Knowledge and Skills*

As noted in the Study Design section, above, we asked the following open-ended questions early in our interviews: “Would you say that you have learned from your participation in Delta?” and then, if yes, “What knowledge and skills have you learned?” People tended to respond with categories of knowledge and skills that mostly pertain to the kinds of knowledge and skills associated with teaching courses. That is, these

responses tended to be related to knowledge and skills pertaining to teaching, and *not* to learning communities, or diversity. By contrast, when responding to our very open-ended questions about their motivation for participating in Delta, and to our request for phrases that captured their experience with Delta, many respondents made comments pertaining not only to knowledge and skills pertaining to teaching, but also pertaining to learning communities and diversity. Later in the interview, we announced that we would ask more specific questions about what they learned in Delta. With respect to the Delta pillar “Teaching-as-Research,” we asked, “Have you learned anything about how to find out about how your students are learning?” With respect to the “Learning-Through-Diversity” pillar, we asked, “Have you learned anything about how to work with the differences among students in college classrooms?” And with regard to the “Learning Communities” pillar, we asked, “When you participate in Delta activities, do you feel as though you are a part of a learning community (as you understand this term)?” During this more focused portion of the interviews, it became evident that many respondents had indeed made discoveries about and gained knowledge and skills pertaining to all three of the pillars (although less so with regard to Learning-Through-Diversity). We infer from this that most respondents’ understanding of topics that are appropriate to address when asked about “knowledge and skills” do not include diversity or learning communities, even though it is evident from responses to other questions that indeed they had learned about diversity or learning communities

We organize this section on Delta impact on knowledge and skills into comments that conveyed the idea that “this was really new stuff for me” (“new exposure continuum”), and comments on specific types of new knowledge and skills.

### **New Exposure Continuum**

This section presents “new exposure” comments pertaining to knowledge and skills. Essentially all the quotes presented here are double coded with many quotes appearing in the “specific topics” sections, below.

#### **1. First exposure, gained little usable knowledge and skills**

Some participants explained that, in effect, Delta opened a door for them, and now they are at least aware of other approaches to teaching, broader academic career options, or diversity issues. Typical of these remarks is, “I think [Delta] has probably seeded some ideas just to kind of store away for the future in terms of different strategies for working in a classroom.”

#### **2. First exposure, gained some usable knowledge and skills**

About half of the participants made comments to the effect that Delta not only opened doors for them, but also helped them pass through those doors and gain knowledge and skills that they felt confident they would use, or already had used. The modal comment of this type was about how teaching is a skill that needs to be learned. Typical of these comments is this:

*I also sort of had the attitude, “Teaching, how hard can it really be?” So, I mean I sort of undervalued teaching as a skill and now I see that the people out there who are really good teachers are really working hard at it. And it definitely is a very important skill and it is not something that people do naturally – “Oh, if I am a good researcher, I can teach” – I don’t think that is true anymore. I think [I have the skills now to teach in the environment I plan to teach in, and] I would definitely like, before I graduate, to have an opportunity to practice those skills.*

Other types of new exposure comments that these participants made focused on realizing that:

- a person could evaluate her own teaching practice
- there is research-based knowledge on differences in how students learn and on different ways to teach

*I was exposed to a lot of facts that I was unaware of about how students go about learning. It’s one of those things we read, we’re breaking things down, males versus females and how they learn different scientific concepts, etc. Yeah, it was really an eye-opener.*
- learning communities can focus on teaching and learning
- teaching could be done other than in lecture style

*Having come from a school where I was taught predominantly in one method, I hadn’t really spent any time actively thinking that there was another way to do it... So [Delta] really has exposed me to some literature on other methods and what other people are doing to improve their teaching and gotten me to think about how I can approach teaching other than in a lecture style.*
- people differ in terms of the ways they learn

*I think I’ve learned a lot about diverse learning styles. I didn’t realize, I mean I knew everyone was different but I didn’t really realize that people learned so differently from each other.*
- diversity in the classroom can be used to enhance learning

*Becoming aware of using the inherent diversity of the classroom to enhance the learning for all is something that I had never thought of before. Recognizing things like learning styles and learning disabilities as diversity rather than what we are taught to look at—ethnicity and skin color first of all—was an interesting topic that I am still trying to grasp.*

### **3. More deeply exposed, gained a lot of usable knowledge and skills**

A few participants indicated that, although they already were aware of the types of knowledge and skills offered by Delta, they acquired a deeper exposure in the program, and gained a lot of knowledge and skills in that area. For example:

*In terms of now being able to formulate a successful undergrad class, I’m a lot more prepared because of my experiences in Delta than I would have been before.*

*And I didn't realize there were so many resources available as well in terms of [assessment].*

#### **4. Already aware, and no significant gain from Delta**

When asked about what the term diversity means in terms of teaching and learning, a few participants explained that because they had learned quite a bit about this area in previous life experiences, Delta experiences had not added much. However, we did not hear comments of this type with respect to other types of learning.

#### **Specific Types of New Knowledge and Skills**

##### ***Pertaining to Teaching-as-Research***

*Note regarding data and analysis:*

A focused study conducted by CIRTL ERT members Connolly, Bouwma-Gearhart, and Clifford, (in progress) regarding Delta participants' notions of the Delta pillar "Teaching-as-Research"(TAR) indicates that Delta participants do not always agree on the components and goals of this core idea underpinning the Delta program. While certain components of what Delta participants call TAR seem well understood and shared by participants overall, there is disagreement about other components. The variability in the meaning of this core term presents a dilemma for analysis: we cannot organize our interview data in terms of a concept that varies depending on the speaker. We decided to resolve this dilemma by privileging the meaning of TAR that emerged from the Connolly, Bouwma-Gearhart, & Clifford study. That is, when we use the term "TAR" in this report, we refer to the "researcher" meaning articulated in this study. To keep this point visible, we use the acronym "TAR (ERT)."

Connolly, Bouwma-Gearhart, and Clifford found that TAR, as conceptualized by Delta participants, consists of nine main components and these components form the theoretical backbone of TAR (ERT). Appendix C includes a description of the nine components of TAR (ERT) against which we analyzed our 24 participants' offerings regarding practitioner research.

##### **Analysis of participants' claims pre-Delta:**

No participants (0/24) indicated that interest in TAR (ERT) initially attracted them to Delta. Rather, participants came seeking more general pedagogical knowledge and skills, many of which are attributes of TAR (ERT).

##### **Analysis of participants' claims post-Delta:**

- Participants only began to associate these attributes as aspects of TAR (ERT) after being exposed to the concept in Delta.
- Some participants indicated a desire to learn more about the TAR (ERT) components as reason for their *continued* participation with Delta or made recommendations to Delta regarding more coverage of TAR (ERT) components.

- Certain components of TAR (ERT) were more salient for certain individuals and most individuals only address 1-2 components, as indicated in Table 12, below.

**Table 12**  
**Number of Participant Mentions of Components of TAR (ERT)**

Component	# participants that mention component (n=24)
<i>informed by the work of others</i>	5
<i>explicit question</i>	2
<i>explicit design/plan</i>	2
<i>collecting data</i>	14
<i>data analysis/conclusions</i>	4
<i>Dissemination</i>	2 (claimed necessary), 2 (claimed not necessary)
<i>reflection and action</i>	3
<i>cyclical/ongoing</i>	5

We conclude from these findings, as well as findings not presented here, that participants are working with an incomplete understanding of TAR (ERT) because:

- ❖ their understanding of this phenomenon lacks some of components of the construct, and
- ❖ they do not connect these components into an inter-related phenomenon, or practice.

We hope to gain insight regarding the reasons for our participants' incomplete understanding of TAR (ERT) during future longitudinal study interviews.

### ***Pertaining to Diversity***

In this section, we use the term “diversity” to refer to *all mentions* of diversity as it pertains to teaching and learning. We use the term *Learning-Through-Diversity* only to refer to the specific meaning of this term as defined by Delta in 2004. In particular, the Delta meaning of *Learning-Through-Diversity* requires that a teacher:

- Know the diverse backgrounds of their students and their implications for learning.
- Identify curricular, teaching and assessment practices that promote learning for all.
- Draw upon the diversity of their students to enhance and enrich the learning of all.
- Recognize existing inequities, and promote an equitable, inclusive and respectful climate for learning.<sup>5</sup>

As noted at the beginning of this section, almost no participants discussed learning about diversity when asked what knowledge and skills they had learned through participation in Delta. Yet, many participants commented on learning about diversity when responding to our open-ended questions about their motivation for participating in Delta, our open request for phrases that captured their experience with Delta,<sup>6</sup> and to our leading

<sup>5</sup> For a fuller understanding of these components of Delta’s definition of “Learning-Through-Diversity,” see Appendix B

<sup>6</sup> Findings from this question are not presented here.

question, “What does the term “diversity” means to you in the context of teaching and learning?”

In response to our leading question, or at other points in the interview, 16 of 24 participants spoke about what diversity meant to them in the context of Delta. (Further analysis of the transcripts is needed to understand why the other 8 participants are not coded as presenting a definition.) All 16 expressed the view that “diversity” as used by Delta includes the idea that people learn in different ways. This meaning is at least consistent with the first component of the Delta definition of Learning-Through-Diversity, above. Many of these 16 also indicated that diversity also referred to, or might also refer to other types of difference such as race, ethnicity, sex, class, disability, and of these some expressed confusion about which of these differences Delta leaders wished to highlight. With regard to understanding the implications of diverse backgrounds for student learning, some explained that it is important to adjust one’s teaching methods to account for the differences among the students in the class (components 1 and 2 of the Delta definition, above). For example, the next two quotes illustrate a more minimal and more developed understanding, respectively.

*Definitely an emphasis on, from what I remember, that we all learn differently and so if you are giving power point presentations every day, and someone just likes to be building it or reading it or listening to it, or seeing it, just how important it is to either assess where your class is or to vary it up so that everyone is kind of getting a chance.*

*[I learned that it’s important] first of all, I guess, to not assume that all of the students are the same and from the same background, and to take that into consideration and use different techniques of grouping, specifically making small groups with diverse students or not—there are kind of pros and cons to each of those. And [I learned] how you can incorporate issues of diversity into even the most standard science or math curriculum—that there are techniques of integrating different issues into the curriculum itself.*

A few comments indicated awareness of inequities, and the need to promote an equitable, inclusive and respectful climate for learning. Only one or two comments (depending on interpretation) included the idea that within the context of a classroom, a teacher can make use the diversity among students to enhance the learning of all.

Interestingly, however, when discussing the value of learning communities, 9 people volunteered the point that they value diversity (primarily in disciplinary background) in group members because this enhances their learning. This point is consistent with the “inclusive learning environment” element of the Delta definition of Learning Communities. As such, this finding indicates that participants experience in an integrated way various aspects of the concepts that Delta leaders present as 3 separate “pillars.”

### *Pertaining to Learning Communities*

We use the term “learning communities” in this section to refer to *all mentions* of one or more of the core ideas in the Delta definition of this term. These core ideas are:

- Shared discovery and learning
- Functional connections among learners
- Connections to other related learning and life experiences
- Inclusive learning environment.<sup>7</sup>

As we found with respect to “diversity,” almost no participants discussed learning about “learning communities” when asked what knowledge and skills they had learned through participation in Delta. However, many participants commented on the value of learning communities when responding to our open-ended questions about their motivation for participating in Delta, to our request for phrases that captured their experience with Delta. In addition, all participants responded to our leading question, “What does the term “learning communities” mean to you in the context of teaching and learning?”

We consider the definitions participants provided first in terms of a rough estimate of the adequacy of the definition, and then in terms of the attributes of learning communities that were mentioned.

To get a general sense of the quality of the definitions, we grouped them into 3 categories of “adequacy.” Most of the definitions (18) demonstrate that the speaker has an internally consistent definition that has more than one attribute, although the attributes mentioned may not correlate well with the Delta elements. We are likely to subdivide this category more finely once we have interviewed the other 40 members of our sample. Some (4) suggest that the speaker has only a vague understanding of what this term means. A third category (2 people) consists of “problematic” responses—a person who refused to define the term because it is so overused, and one who did not properly address the question.

Upon analyzing these definitions in terms of the attributes of learning community that these 24 participants mentioned, we came up with a set of themes that is quite well aligned with the core ideas of the Delta definition of Learning Community. (It is of note that we had not yet read the Delta definition when we analyzed these data, and thus we are confident that these themes emerged from the data and not from what we hoped to find.)

Most participants mentioned an attribute that pertained to the “shared discovery and learning” core idea of the Delta definition. Associated with this core idea are the participant “mentions” that a learning community is:

- informal (11 mentions), meaning, for example, that the activity of the group is directed by the participants, doesn't always stay on task, allows for informal feedback among participants

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<sup>7</sup> For explanations of each of these core ideas of the Delta definition of “Learning Communities,” see Appendix B.

- interactive (3 mentions)
- combines both social and academic aspects of life (4 mentions)
- is supportive in tone, characterized by camaraderie and collegiality (6 mentions)

Another set of mentions (10), noted above at the end of the section of diversity, directly relates to the “inclusive learning environment” core component of the Delta definition of Learning Community. Of these comments, 9 speak to the idea that learning communities are attractive when their members represent diverse backgrounds and experiences because this kind of diversity enhances the learning of all participants. The 10<sup>th</sup> mention, made by someone whose definition of learning community we classified as “vague,” made the opposite point—that diversity in what he called a learning community inhibits learning.

A point made by participants (9) is that learning communities are characterized by people coming together voluntarily around a shared interest in, if not excitement about, learning about a particular topic. (About half of these 9 comments specifically mention an interest in teaching and learning.) This point is tangentially related to a third core component of the Delta definition, “functional connections among learners”: this third component emphasizes that learning communities develop when the interactions among learners are meaningful, and people are more likely to come together voluntarily around topics that are meaningful to them.

Only 3 individuals mentioned that an attribute of learning communities is that they work on actual, practical problems. This point corresponds with both the “functional connections among learners” and the “connections to other related learning and life experiences” components of the Delta definition of Learning Communities.

One last attribute of learning communities mentioned by 3 of the 24 participants is that these communities are part of a collaborative network. This attribute is related to, but does not obviously correlate with, the core ideas in the Delta definition.

We briefly mention a few other findings pertaining to learning communities. More analysis of these findings will be provided in our 2006 report.

- Upon analyzing the responses to our question about whether a participant felt like a member of Delta learning community, we found that we actually asked this question of only 17 participants. Of these, 12 said yes, 2 said “kind of,” and 3 said no.
- We also obtained 19 responses to our question about whether a participant believed they had the knowledge and skills to create a learning community on their own. Of these 19 people, 5 said they already had created at least a small learning community, 9 said they believed they could do it although they hadn’t yet tried, and 5 were negative about whether they could or would attempt to do this.

- Other relatively minor points that emerged from our analysis of comments pertaining to learning communities include positive testimony about the value of learning communities (5 people), and that there is synergy between Delta and non-Delta learning communities (3 people).

### ***Pertaining to Other Types of New Knowledge and Skills***

When we asked our open-ended question about what participants had learned in their Delta experiences, a few mentioned types of learning that do not fall within the categories of TAR (ERT), diversity, or learning communities. These include:

- Perceiving how Delta operates as a program that one might seek to copy or adapt at other universities, and that Delta-like programs can be used to foster change (5);
- Developing the ability to present one's research more effectively to diverse audiences (2);
- Learning how to write education grants, and how to plan one's academic life (1 mention each).

### ***(2) Attitudes***

Very preliminary findings on data pertaining to the impact of Delta on participants' attitudes are presented here.

Of the 24 Delta participants interviewed, 13 made comments that were coded as pertaining to change in their attitudes. However, many of these comments fall into the "muddy attribution" category; it is difficult to say at this point to what degree these changes can be attributed to their Delta participation.

Our first analysis resulted in several types of attitude changes that were articulated by at least 2 and up to 6 of the 13 participants. In decreasing order of number of mentions, these changes entail:

- feeling greater appreciation for the existence of research on teaching and learning
- feeling greater appreciation for the value of learning communities associated with teaching
- feeling greater excitement about teaching
- placing more value on student interest in learning
- acquiring a more positive attitude toward academic jobs
- taking greater responsibility toward all learners
- believing that the teaching and learning system in higher education can be changed

### ***(3) Confidence***

Very preliminary findings on data pertaining to the impact of Delta on participants' confidence are presented here. Of the 24 Delta participants interviewed, 20 made comments that were coded as pertaining to change in their confidence. (One reason this number is larger than the number who commented on attitude change is that our protocol included a specific question about confidence but not about attitude change.) All 20 people indicated an increase in confidence, although the increase varied from "a little bit"

to transformative. In addition, many of these comments fall into the “muddy attribution” category. We will analyze findings about confidence in more detail, exploring relationships between increase in confidence and key mediating factors such as “Delta dosage,” and “Point in career of initial participation with Delta” in our fall 2006 report. At that time we will combine data from first interviews with Cohort 1 and Cohort 2, to obtain a number of study participants that is large enough to support this type of analysis.

## **b. Outcomes Other than “Types of Learning”**

Preliminary analysis of our initial interviews with 24 participants clearly suggests that various kinds of learning gains is the major type of impact of the Delta program. However, many participants also mentioned other outcomes of their participation that they consider valuable. We organized these other outcomes into three main categories: artifacts and opportunities, networks as by-product, and synergy with other professional development programs.

*Artifacts and opportunities.* Eleven participants described various artifacts or opportunities that they obtained through Delta. Five of these individuals mentioned 2 or 3 of the artifacts or opportunities listed below, suggesting quite an uneven distribution of these types of perceived benefits.

- Developed a teaching philosophy or statement (valuable for self-confidence and job market) (7)
- Already have experienced an advantaged position in the job market (5)
- Obtained or will obtain the Delta certificate (2)
- Publications they otherwise would not have had (2)

*Networks as by-product.* Of our 24 participants, 16 mentioned that another type of outcome of their participation in Delta is the development of new networks. This finding is distinguished from findings on participants’ learning about learning communities because these comments describe the outcome value of the networks participants now have. The focus of comments ranges from describing the value of national connections that a participant made through Delta (“it gave me a way to connect with peers at other institutions too”), to their good fortune in finding new mentors, to emphasizing the value of a new network (“I’ve met a couple of people that work in the department that are also looking at teaching careers, so networking I guess would be an outcome”).

*Synergy with non-Delta professional development programs.* Five participants made the point that one type of outcome of Delta for them is the synergistic learning experience they had as a result of participating in Delta and one or more other teaching and learning-focused professional development programs. For example, one person said, “I got introduced to the concept of Teaching-as-Research through the instructional materials development class, and certainly that was reinforced in Jo Handelsman’s teaching biology

class, where we're putting it into practice and being mindful of it as continue to work on instructional materials that we developed for [a certain] course.”<sup>8</sup>

### **c. Opportunities for Practicing and Demonstrating Delta-based Learning**

All but 2 of the 24 participants addressed the question of what opportunities they have had to demonstrate, and practice, what they have learned as a result of participating in Delta. Of these 22 participants, 2 said they had not yet had any opportunity, and 20 had either Delta-provided or non-Delta-provided opportunities to use what they had learned. The type of knowledge that these 20 people most frequently mentioned having the opportunity to practice was their new knowledge of how to assess student learning. They also mentioned other types of learning that they had the opportunity to practice, including instructional design, the use of active learning. Of the 20 who reported having practice opportunities, 6 described situations provided by Delta that enabled them to demonstrate, and more importantly to practice and deepen their understanding of, what they had already learned in Delta. All of these situations were viewed as very valuable.<sup>9</sup> Three of these 6 also reported having had non-Delta opportunities to practice what they had learned in Delta. Seventeen (these 3 plus another 14) reported having had non-Delta-provided opportunities.

We organized the non-Delta-provided opportunities for practicing or demonstrating Delta learning that these 17 people described into the following types of activities:

- lectures or seminars (7 people)
- informal education contexts (4)
- TA opportunities (4)
- job interviews (2)

### **d. Outcomes Pertaining to Future Professional Roles**

We devote little attention in this preliminary report to findings pertaining to Delta participants' future professional roles other than to state that, when specifically asked, most of the participants said they had gained both knowledge and confidence that will be valuable in their future professional roles as a result of Delta. We are cautious about presenting other findings from our efforts to assess outcomes pertaining to future professional roles because our questions were posed in terms of pre- and post-Delta changes. We found that some interviewees had difficulty assessing whether their current views about future professional roles were different as a result of Delta or other factors, while some others explained that could not discuss post-Delta change in their ideas about their future professional roles because they had not formulated clear ideas about this prior

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<sup>8</sup> In our fall 2006 report, we will devote an entire section to synergistic outcomes across different components of just the Delta program, as well as with non-Delta programs.

<sup>9</sup> We anticipate that our ability to meaningfully analyze findings on Delta-provided opportunities for demonstrating Delta-based learning will be substantially improved by receipt of information from the Delta team about which Delta activities include substantial practice components.

to Delta. Another reason we are cautious about presenting findings on this topic is that most participant responses to these questions were speculative and vague; only a few were actually on the job market and actively thinking about these issues. We hope that planned revisions to our questions on this topic will help us adjust for these problems.

Despite these caveats, we can present a few preliminary findings on this topic. One finding of which we are confident is that about half of the participants explained that Delta had expanded their knowledge of future professional settings and roles. (This finding about expanded horizons for future professional roles is in keeping with the findings about the importance of “new exposure” presented above.) In addition, some participants indicated that Delta had little or no impact on their plans for either positions they intended to seek or types of organizations in which they planned to seek future professional positions. Some others said that Delta experiences increased their interest in the teaching aspect of academic positions, and a couple said that it also increased their interest in the research aspect. A few said that they had acquired an interest in a different type of organizational setting than they had in mind before participation in Delta.

#### **e. Knowledge of Impact on People and Organizations**

Delta team leaders asked us to seek information about participant perceptions of the impact Delta was having on people with whom they interact, and on the organizations in which they participate. We report very briefly on our findings on these topics. Most of the doctoral students and many of the postdocs discussed how their participation in Delta was viewed by their major advisors or lab leader, and what, if any, impact they believed Delta had on their advisors. About half indicated that their advisors were supportive of the interviewee’s participation in Delta, while the other half said they were neutral, negative, or unaware of their advisee’s participation in Delta. Only some of the participants who said their advisors were supportive felt that Delta was positively impacting the advisor. As for knowledge of Delta impact on other people, many participants noted that they learned of Delta from department or laboratory colleagues, discussed Delta experiences with these same colleagues, or actively spread the word about Delta to them. Few participants were able to say that Delta was having any impact at the department level. Some noted, however, that the very existence of Delta on the campus encouraged them to believe change in research institution attitudes toward teaching not only was possible, but apparently underway. More detailed findings on this topic will be provided in the spring 2006 report.

### **C. Recommendations**

We asked both participants and no-dosage interviewees to provide recommendations to Delta. We have divided their responses into 7 main categories.

#### **1. Additional resources**

About half (14) of the interviewees hoped that Delta could work on providing additional or improved resources. (Table13)

- Of these, 8 called for additional opportunities to put into practice what they have learned, or to receive some official acknowledgement of such activities. For example:
  - ... *how do you handle a classroom sort of kind of [practical] stuff I guess. Having never really been in the classroom, that's kind of what I was looking for, something more practical like what do you really do. And I think that I have gotten some of that um like in the College Classroom course--we did the micro course teaching. But I kind of felt like I was just thrown into it.*
 Other examples from these 8 include,
  - one participant who solely requested the addition of more internships,
  - two (high-dosage) students who asked that participants be allowed to earn internships retrospectively or through a less demanding route,
  - one participant who requested that the Delta certificate credit be granted *via* experience teaching in high schools.
- Five interviewees stated that Delta should improve its presentation of various components that are already part of the overall program, including its overall vision (3), appropriate pathways through Delta (2), clearer definitions and a philosophy based on less jargon (2), and better planning/structure of Delta's class offerings (2).
- Two postdocs requested that Delta increase participants' access to others, including mentors to serve as teaching and learning resources and learning communities in which participants could discuss issues related to future job prospects.
- Additional financial support for postdocs and graduate students was requested by two interviewees.
- Two interviewees recommended that Delta conduct additional teaching and learning instruction through other programs, as such programs may be open to the Delta approach but are at a loss of how to present such an approach themselves.

## 2. Issues of time balance

About half of our respondents called for Delta to be more cognizant of and helpful regarding issues of time balance and highlighted either competing activities in their lives or strategies that Delta may wish to implement to help participants better deal with balancing their commitments. Comments were made, such as:

*I just would have liked to have more time to devote to this. I think I'm already starting to experience this balance [problem] -- trying to find the balance between teaching and research. Like, I limit myself to one or fewer of these (laughs) professional development things... Yeah, you know, there's my list of papers that I have to finish before some point (laughs). I've just been checking them off. Yeah, so, I'm working on it.*

Specifically, eight of these respondents cited activities that took time away from their participation in Delta during certain times in their doctoral careers. Of these,

- five claimed that work on their dissertation limited time they could devote to their professional development as educators,

- two interviewees also told of laboratory work impeding their progress with the Delta program,
  - one claimed his getting involved with another campus professional development program before the creation of Delta as his reason for his low-dosage involvement, and
  - one cited work as a teaching assistant as impeding his greater involvement with Delta as he was too constrained during business hours to attend functions.
- Some interviewees made recommendations to Delta as to how to best help participants with issues of time balance. Of these, three interviewees recommended that Delta offer shorter programs, like the Roundtables, to help graduate students better juggle competing interests and continue with a more limited participation if need be. Additionally, 2 interviewees explained that shorter programs also allowed participants a quick assessment of how the Delta program may fit their needs and how to best utilize the program, and 2 no-dosage participants argued that Delta needs to be sensitive to potential advisors' discouragement of their participation, indicating that advisors may view their advisees' participation as wasted time and space in their laboratories.

### **3. Additional instruction**

About half of our interviewees desired instruction, or more instruction, on a variety of topics pertaining to issues of teaching and learning, future job issues, and research concerns. For example:

- Six respondents called for more instruction regarding job candidacy issues, including the different types of academic jobs available (3) and how to find/secure a job (2).
- Four interviewees called for Delta to provide instruction on the basics, in regard to class, curriculum, activity, and tool design. For example:  
*It was just a lot of jargon being thrown around. I didn't know what that jargon was and I was like, "Ah, OK, this is not what I signed up for." I wanted a practical course on how to teach. This was actually the semester before I started TAing [a biology course]. I was like, "Oh, this is it, this will really help me become an awesome TA!" but it was not what I was looking for at all. It wasn't at all practical. It was very theory oriented...it was way beyond me.*
- Four requested more information regarding the different types of academic jobs available for those earning doctorates in the STEM disciplines.
  - Three wished for more instruction on the type of practitioner research that Delta calls "Teaching-as-Research (TAR). Of these, one desired more help from Delta in identifying worthy problems around which to shape her inquiry, and another called for more instruction on human subjects issues and dissemination of her practitioner research findings to the greater community.
- Two interviewees desired more opportunities to problematize diversity issues, including how to discover student differences and how to address such differences.

- Two called for more instruction on how to be a mentor that they envisioned being when they began working closely with undergraduates.
- Two requested Delta's help regarding interview preparation and building confidence as teachers.

#### **4. Delta marketing**

Twelve interviewees offered recommendations in regards to improvements that can be made regarding Delta marketing, many highlighting both audiences that Delta may wish to further target and means through which to secure a greater marketing advantage. For example:

- Three interviewees recommended reaching out to students in their earlier career to increase their chances for more intensive participation.
- Three interviewees suggested that Delta should market to departments with historically low Delta participation. One expanded such claim by stating that seeing familiar faces at Delta events would encourage her continued participation. Another, noting an upcoming move from Madison, thought that Delta could increase its marketing to postdocs and past Delta participants.
- Three respondents recommended that Delta reach out to prospective participants *via* other more established programs, such as the engineering professional development program or an entire department.
- One high-dosage participant called for Delta to continue marketing upcoming programs at their own events as she had, herself, been attracted to its programs in this manner.
- Not to be dismissed, one no-dosage respondent indicated that he would have been enticed to participate with the promise of free food.

#### **5. Preparing participants to work in non-receptive environments**

We also asked explicitly for interviewees to comment upon what Delta could offer to help them better prepare to work in environments not receptive to the ideals that Delta works to disseminate. Specifically, they were asked to make recommendations regarding what Delta could do to better help them prepare to work in such environments. Six interviewees offered specific recommendations in response to this question. Of these 6:

- Three recommended that the Delta program make additions to the content and experiences covered in their UW-Madison campus programs to better help participants develop certain personal skills.
  - One high dosage postdoc called for help acquiring knowledge regarding university structures and related bureaucracies.
  - Two graduate students recommended that Delta participants be encouraged to problematize and/or experience for themselves such non-receptive environments. In doing so, these graduate students indicated a need for some practice existing in more hostile places in order to not be shocked by what they may soon encounter outside of the seemingly more receptive UW-Madison.
- Three recommended that Delta should work towards more widespread reform and expand its sphere of influence in order to help turn historically non-receptive

environments into places that are more welcoming to those interested in quality teaching and learning.

- A no-dosage postdoc claimed that Delta should consider providing incentives for advisors to “give up” some of their workers’ research productivity as they transfer some of their time from their advisor’s research to Delta-like activities.
- Two other interviewees called for Delta to expand its influence outside of UW-Madison, specifically suggesting that the organization of Delta and its disciples disseminate their philosophy and supporting research to a the greater higher education community. One put this point as follows:  
*Spread the word, to as many universities and colleges as possible...I guess probably putting more literature out there. I think the best way to convince people, at least in my field, that something is really true and something worth looking into is having the research out there...you’ll have to also convince scientists the same way. You’re going to have to show them statistics. You’re going to have to show them the research, the background, what you’re talking about. If you have that, then they’re not going to argue about it. Multiple studies help too.*

## **6. Other recommendations**

Six interviewees made other recommendations that do not easily fit in with any of the above categories. Of these respondents:

- Five indicated that they believed that a successful Delta participant was one who intensively participated in the program. These participants recommended that individuals not participate with Delta in a half-hearted way, but instead “emerge” themselves in the Delta experience. Three of these respondents were concerned that participants be rigorously engaged in Delta also called for the program to allow participant flexibility in their commitment. Two interviewees cautioned that too demanding a commitment could cause participants to bail ship part way through the program.
- One high-dosage participant cautioned that Delta never lose sight of participants’ possible main interest in research. Although this participant felt Delta meets the needs of those moving towards a career that focuses on teaching, she worried that those that may see teaching as the lesser, although still very important, of two future endeavors may be turned off by Delta’s focus on teaching and learning issues, seemingly divorced from a research connection.

## **7. No recommendations**

Only two respondents had no recommendations for Delta.

- One no-dosage student simply felt that he had no need to explore issues of teaching and learning-his experience teaching and mentoring was comfortable and enjoyable and Delta intervention would be unnecessary and too time consuming. A high-dosage doctoral student had no recommendations but for completely different reasons. This student recognized a wealth of issues with

which she still needed help, thus making any Delta intervention potentially beneficial to her professional development as an educator.

Findings regarding participants' recommendations for Delta are summarized in Table 13, below.

**Table 13**

**Interviewee Recommendations for Delta**

(24 participants + 6 “no dosage”)
<p><b>Delta should provide additional resources (14)</b>            Additional opportunities for teaching practice connection (9)            Clearer Delta (5) (Vision, definitions/less jargon, class structure/planning)            Better access to others (2)            Additional financial support (2)            Additional teaching and learning instruction for other programs (2)</p>
<p><b>Consider competition for time/help with issues of time balance (13)</b>            Competing activities (8) (Dissertation)            Strategies to respond to time stressors (6) (Shorter programs, regarding advisor’s discouragement)</p>
<p><b>Delta should provide instruction (13)</b>            Issues of T&amp;L (9) (TAR specific, basic class/tools design, diversity issues, mentoring)            Job candidacy issues (6) (Info regarding different types of academic jobs, how to find/secure job)            Research issues (1)</p>
<p><b>Increase marketing efforts (11)</b>            Target certain audiences (8) (Early-career grads, low participation departments)            Add marketing means (5)</p>
<p><b>Delta should prepare participants for non-receptive environments (6)</b>            Delta courses/programs should build personal skills (3) (Problematize scenarios)            Delta should work for more widespread reform (3) (Regarding research and philosophy)</p>
<p><b>Other (6)</b>            Encourage intensive participation/rigor in program (5)</p>
<p><b>No recommendations for Delta (2)</b>            No felt need (1)            Any help is welcome (1)</p>

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## ***Appendix A: Spring 2005 (First Annual) Interview Protocol***

### **Intensive Component of the Longitudinal Study of Delta Program Impact on Doctoral Students and Postdoctoral researchers Delta Participant Version**

**Note:** Prompts for interviewer appear in *[brackets and italics]*.

#### ***Introduction***

As you may know, the Delta Program in Teaching and Learning—which you have participated in—is part of a 5-year, \$10M project that began in January 2003. I am a member of Delta’s Evaluation and Research Team, and this interview is part of a study of the Delta Program.

As you may recall, the broad goal of Delta is to help prepare present and future college- and university-level educators in the science, technology, engineering, and mathematics disciplines. The main purpose of this study is to find out what effects, if any, the Delta Program has had on you and on others. We (that is, the group of researchers conducting this study) will use your responses anonymously to help design Delta, and programs like Delta, so that they best serve the felt needs of people like you.

Just to review what we told you during our screening interview with you, we also plan to interview you during the spring of 2006 and 2007 in order to learn about any longer-term effects of Delta. Thanks again for agreeing to participate in the study. Do you have any questions?

Present human subjects consent and get signature.

Before starting, I want to note that we are using the term “teaching” to refer to activities performed, or materials created and/or distributed by an educator, in order to inform any group of people about a subject. That is, we use the word “teaching” to encompass activities ranging from lecturing in the classroom, to using a lab manual with students, to giving an educational outreach talk at a museum.

## I. Background of Interview Participants

A. The Delta Participant Database shows that you are a \_\_ year graduate student/post-doc in the Department of \_\_\_\_\_, pursuing a doctorate in [*Ph.D. program name*], with the intention of completing your degree by \_\_\_\_\_. Is this information correct?

B. [*For postdocs*] What was your doctoral program?

- At what university?

C. At what university did you earn your undergraduate degree?

- What was your major?

D. Our Participant Database shows that you have participated in the following Delta activities: \_\_\_\_\_

Is my list correct? Any additions/corrections? To jog your memory, here is a list of all the Delta activities in 2004-05. [*Present Handout 1, List of Delta Activities.*]

E. Please give me an update on any other teaching and learning-related activities (including professional development activities, such as workshops, etc.)

1. [*For doctoral students*] Have you had a teaching assistantship or graduate instructor position while enrolled in your program?
2. [*For postdocs*] Did you have a TA-ship while in graduate school, a lectureship while working as a postdoc, or given guest lectures, or done other types of teaching?
3. Have you participated in any formal or informal activities related to developing yourself in teaching, learning, or research that are not affiliated with the Delta Program? Please tell me about these programs. [*Probe for research activities if no mention of this.*]
4. What effect, if any, did your experience as an undergraduate [and, for postdocs, as a graduate student] have on you interest in teaching?

## II. Motivation for participation

A. Take a moment to think back to before you first participated in any Delta activity. What initially attracted you to participate in Delta?

B. After your first experience with Delta, what has motivated you to continue to participate?

### III. Impact of Delta

- A. Now think in general terms of *all* your experience with Delta. What two or three phrases come to mind that capture your overall sense of these experiences?
- B. Would you say that you have learned from your participation in Delta?
- If yes, what comes to mind as important?
  - Whether yes or no, what were you looking for that Delta did not provide?
- C. Has participation in Delta activities resulted in any outcomes for you in addition to the *kinds of learning* that you just described?
- D. Have you ever had the chance to demonstrate what you learned, and if so, in what ways?
- E. More specifically, as a result of participating in Delta:
1. Have you learned anything about how to find out about how your students are learning?
  2. Have you learned anything about how to work with the differences among students in college classrooms?
  3. *[Regarding learning communities:]*
    - a. When you participate in Delta activities, do you feel as though you are a part of a learning community (as you understand this term)?
      - If yes, in what way, and why?
    - b. Do you belong to any learning communities—in or outside of your department, or groups centered outside of UW-Madison—that are not sponsored by Delta?
      - If yes, how would compare your experiences with Delta communities with other communities that you may be part of that pertain to teaching/outreach or research?
    - c. Do you know how to generate a learning community?
- F. What about your participation in the Delta Program has been most important to you?

### IV. Outcomes Pertaining to Future Roles as an Educator

- A. Overall, has Delta helped you make more informed choices about future professional roles, and if so, how?
- B. **Before** you first participated in Delta:
1. In what types of **organizational settings** did you intend to seek a position?
  2. What types of **professional roles**, if any, that involve education did you intend to pursue?
  3. Did you feel you had **the knowledge and skills** needed to undertake these roles?
  4. Did you feel **confident** about your ability to play these professional roles?

C. **Since** you first participated in Delta:

1. Have your intentions about the type of **organizational setting** in which you intend to work changed?
  - If yes, did Delta activities or resources play a role in this change? Explain.
2. Have your intentions about future **professional roles** changed?
  - If yes, did Delta activities or resources play a role in this change? Explain.
3. Has your assessment of whether you feel you have **the knowledge and skills** you need changed?
  - If yes, did Delta activities or resources play a role in this change? Explain.
4. Do you feel **confident** about your ability to play the roles you intend?
  - If yes, did Delta activities or resources play a role in this change? Explain.

D. Applicability of Delta ideas

1. Do you think you have the skills you will need to teach in the environment in which you hope to teach?
  - To what degree would you say that Delta was a factor in developing these skills?
2. Is there anything (else) Delta could do to help you effectively use what you have learned through Delta in diverse teaching environments, including environments that traditionally have not been receptive to Delta ideals?

V. ***Specific Outcomes for Others***

We are interested to know what, if any, effects you perceive Delta had or is having on other people.

A. With respect to your faculty advisor or postdoctoral Principal Investigator:

- a. How does your faculty advisor feel about your participation in Delta?
- b. Are you aware of any other effects of Delta on your advisor?

B. Are you aware of effects of Delta on: *[modify/shorten as appropriate to the interview]*

- your peers
- other educators (postdocs, faculty, staff) with whom you interact
- your graduate program
- your department
- your college
- the university at large
- professional societies
- people you know at other universities or educational institutions

## ***VI. Survey Items***

I am interested in getting your feedback on some items from a Delta survey we sent out last spring that focused on many of the issues we are covering in this interview. The way I'd like to proceed is to have you complete 12 questions from the survey. Then I'll ask you to recall what you were thinking as you were answering a few of these questions.

*[Provide Handout 2, Survey Questions, and check for questions about the task.]*

Now please take a few minutes to mark the response that best corresponds to your own feelings about each statement, using the categories at the top of the survey.

1. Could you tell me what you were thinking as you were responding to statements:  
1? 2? 6? 10? 11? 12?
2. Did you find it problematic to answer any of these questions, and if so, please explain?
3. Were there any other items on this brief survey that you want to comment on?

## **VII. Conclusion**

- A. Is there anything that you wish Delta would do [could have done] to help you more, as you prepare for your future roles as an educator? We will pass suggestions on to the Delta program to inform their efforts to make the program more useful to people like you.
- B. Any additional points you think we should know at this time?
- C. Confirm email address and phone number, and remind about interview in March 2006.

## Handout 1

Name: \_\_\_\_\_

Date: \_\_\_\_\_

### Delta Activities

- Roundtables
- Brown Bags
- College Classroom course
- Informal Education course
- Instructional Materials Development course
- Teaching with Technology course
- Internship Program & Seminar activities
- Certificate Program
- Creating a Collaborative Learning Environment
- Expeditionary Learning program
- Workshops (ex: ILSE Evaluation, ILSE/Teaching Portfolio, NSF Broader Impact, Teaching Philosophy, etc...)
- Discussions and Discussion Groups (ex: ILSE, Post-Doc)
- Delta Informational Sessions and Networking Socials (ex: Certificate Launch)
- CIRTL/Delta Retreats

## Handout 2

### Survey Questions

Name: \_\_\_\_\_

Date: \_\_\_\_\_

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1. Effective teaching requires input from others.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
2. As a teacher, I would study the effects of different instructional practices in my own classroom.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
3. As a teacher, I would seek pedagogical advice from those outside my department.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
4. An effective teacher studies his/her students' learning in order to teach students of all types effectively.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
5. I rarely talk to my colleagues about teaching.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
6. A teacher does <i>not</i> need to collect data on the effectiveness of his/her teaching.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
7. I believe it is important to try to facilitate learning among all the students in my class.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
8. As a teacher, I would vary how I teach my courses, based on my own knowledge about my students and their learning issues.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
9. It is <i>not</i> important for me to discuss my teaching with others.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
10. As a teacher, I would use teaching activities that take into account the different backgrounds of my students.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
11. As a teacher, it would be more important for me to cover the course content than to attend to the different needs of the students in the course.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
12. I know how to organize others for the purpose of discussing teaching and learning.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

## **Appendix B: Delta Program Definitions of the Three Pillars**

The following excerpts about the Delta pillars are copied from the Delta Program website. For the complete description of these terms, consult [www.delta.wisc.edu](http://www.delta.wisc.edu).

### **Pertaining to “Teaching-as-Research”**

Participants (those graduate students, post-docs, and faculty who take part in the suite of Delta activities) will learn to apply a research approach to their teaching practice.

Conceptual steps in the Teaching-as-Research process are:

1. Learning foundational knowledge (What is known about the teaching practice?)
2. Creating goals for better student/participant learning (What do we want our students/participants to learn?)
3. Defining measures of success (What evidence will we need in order to determine whether students/participants have achieved learning goals?)
4. Developing and implementing teaching practices (What will we do [in and out of the classroom] to enable students/participants to achieve learning goals?)
5. Collecting and analyzing "data" (How will we collect and analyze information to determine what students/participants have learned?)
6. Reflecting, evaluating, and iterating (How will we use what we have learned to improve our teaching?)

### **Pertaining to “Learning Through Diversity”**

Delta provides development experiences, programs and resources that promote the abilities of present and future faculty to:

- Know the diverse backgrounds of their students and their implications for learning.
- Identify curricular, teaching and assessment practices that promote learning for all.
- Draw upon the diversity of their students to enhance and enrich the learning of all.
- Recognize existing inequities, and promote an equitable, inclusive and respectful climate for learning.

These aims require specific attention of the instructor to:

**Instructor-student interactions.** Such as inclusion and engagement of the ideas of all students; respectful teaching behaviors; accessibility for all students; mentoring of teaching assistants.

**Student-student interactions.** Such as respect for the ideas of all and recognition of their value; welcoming and respectful inclusion in collaborative work; accessibility outside the learning environment.

**Student-content interactions.** Such as how students experience content; how content can be varied; and how exploring of novel contexts for presentation can enrich the experience of students and instructors alike.

### **Pertaining to “Learning Communities”**

As defined by the Delta Program, the following four core ideas define the learning community process:

- **Shared discovery and learning.** Collaborative learning activities where participants share responsibility for the learning that takes place help develop a learning community. Rather than relying on traditional “expert centered” lecture formats, instructors should include collaborative learning techniques so learners can see their contribution to the learning goals.
- **Functional connections among learners.** Learning communities develop when the interactions among learners are meaningful: when they are functional and necessary for the accomplishment of the "work" within the courses or learning activities (rather than serving as “window dressing” or simply as a “feel good” activities). Moreover, meaningful connections must extend throughout the learning community—among students, postdocs, faculty, and staff—rather than simply among cohort- or role-related peers.
- **Connections to other related learning and life experiences.** Learning communities flourish when implicit and explicit connections are made to experiences and activities beyond the course or program in which one participates at any given moment. These connections help situate one’s learning in a larger context by solidifying one’s place in the broader campus community of learners. These connections decrease one’s sense of curricular and personal isolation.
- **Inclusive learning environment.** Learning communities succeed when the diverse backgrounds and experiences of learners are welcomed in such a way that they help inform the group’s collective learning. Whenever possible, activities should be sought that help participants reach out and connect with others from backgrounds different from their own.

## **Appendix C: Components of Teaching-as-Research:**

As Informed By a Delta Focus Study Undertaken by Connolly, Bouwma-Gearhart, and Clifford, 2005

“Teaching-as-Research Is\* . . . “

\*(Should not be viewed as steps to be conducted linearly)

### **Component 1: Informed by the Work of Others**

Instructors doing Teaching-as-Research involve others, such as colleagues, instructional support staff (instructors developers), and students (those helping to teach a course as well as those enrolled in the course itself) throughout the process of design, implementation, and documentation. “Others” also includes those whose teaching-related scholarship is consulted by the T-A-R practitioner.

### **Component 2: Includes an Explicit Question or Hypothesis about Teaching-Learning Relationships**

Instructors doing Teaching-as-Research have a question about teaching and learning that they want to address. It may be as informal as a speculation (“Did my students do today’s reading assignment?”) or as formal as a research hypothesis (“Will students who use a web-based module learn more about the nitrogen cycle than those who rely only on the textbook?”). Posing a question can both precede and follow the instructor’s data collection/observations.

### **Component 3: Shaped by an Explicit Design or Plan for Addressing the Question at Hand**

Instructors doing Teaching-as-Research organize their efforts to address their question into some sort of systematic plan that includes gathering evidence, making sense of it, and deciding what action, if any, to take to improve the teaching-learning connection. The plan may change as it is being carried out, but still provides an overall picture of the relationship between the question, evidence, and making changes in one’s practice.

### **Component 4: Collecting Credible Data as Evidence**

Instructors doing Teaching-as-Research systematically gather evidence—which may include textual (“qualitative”) data as well as numerical (“quantitative”) data—that ought to help them address their question. The forms of data and collection methods may resemble those involved in instructors’ disciplinary research or those of other disciplines.

### **Component 5: Analyzing Evidence and Drawing Conclusions**

After data are collected, instructors doing Teaching-as-Research take time to make sense of it. They organize and “clean” their data and then draw defensible conclusions or findings from them about the teaching-learning connection.

**Component 6: Reflecting and Taking Action**

Instructors doing Teaching-as-Research use their data to thoughtfully examine their current teaching practices and weigh the inevitable tradeoffs involved with changing one's teaching. After weighing such tradeoffs, instructors may choose to modify practice or not, thus taking action on their reflection.

**Component 7: Cyclical and Ongoing**

Instructors doing Teaching-as-Research see practices of teaching and learning essentially problematic. For these instructors, addressing one question may in turn suggest other questions about the relationship between teaching and learning that need to be explored. These instructors view T-A-R as an activity that is iterative and continuous to some degree, although the questions they focus on may not directly be related previous questions.

**Component 8: Results Are Documented and Disseminated**

In short, instructors doing Teaching-as-Research keep track of their processes and outcomes and share them with others. Sharing can be more informal or formal, ranging from conversations between individuals to presentations at meetings to publication of results in peer-reviewed journals.

**Component 9: The Practitioner Is Principally Responsible for the Inquiry Plan and Process**

At its core, Teaching-as-Research is a kind of “practitioner inquiry”—that is, the person whose practice is most directly affected by the inquiry is also responsible for planning the inquiry and interpreting its results. Whether working alone or with others, such as instructional support personnel, instructors doing T-A-R take a central role in directing the entire inquiry cycle and linking its findings to their teaching practice.

## ***Appendix D. Acronyms Used***

BIGS – Biology Interest Groups  
CIRTL – Center for the Integration of Research, Teaching, and Learning  
ERT – Evaluation and Research Team (of CIRTL)  
FIG - Freshman Interest Groups  
GUTS – Greater University Tutoring Service  
GWIS – Graduate Women in Science  
HHMI - Howard Hughes Medical Institutes  
IPSE – Internships in Public Science Education (a project of the NSF)  
KTI – Kindergarten Through Infinity (a project of the NSF GK-12 Program)  
PEOPLE program – Pre-college Enrichment Program for Learning Excellence  
NSF – National Science Foundation  
REU – Research Experiences for Undergraduates (a program of the NSF)  
RWP – Regional Workshop Program (a project of the NSF Course, Curriculum and Lab Improvement Program)  
STEM – science, technology, engineering, and mathematics  
TALS - Teaching and Learning Systems  
VIGOR (undergrad research outreach) – Vertical Integration of Research and Education (a program of the NSF)  
WES – Wisconsin Emerging Scholars Program