

# **A Mixed-Methods Study of Shifts in Classroom Practice Related to Online Professional Development Courses**

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## **Introduction**

This paper presents results from a variety of program evaluation efforts designed to understand outcomes following online professional development courses. The paper reports on a study comprising two years (2004-2006) of data collection involving four cohorts of participants in 11 courses. The courses, offered through WIDE World (<http://wideworld.pz.harvard.edu/>), were 6-12 weeks long and provided coaching and collegial support for learning and putting into practice methods of effective instruction based primarily on the Teaching for Understanding framework (Blythe, 1998; Wiske, 1998; Wiske & Perkins, 2005; Wiske et al., 2005). Researchers sought to learn the nature of educators' pre-post change as revealed through different sources and analytical methods; to gauge its extent; and to understand educators' perspectives about it.

We conducted this exploratory study in two parts:

- Phase I (Summer 2004-Fall 2005): development of and findings from pre- and post- surveys (n=520) that primarily assessed "constructivist" (including inquiry-based and student-centered) classroom practices; and also assessed "traditional" classroom practices as well as attitudes toward instructional collaboration, computers, and online communication.
- Phase II (Fall 2005-Spring 2006): naturalistic case studies building on results of the first phase and quantitatively and qualitatively investigating teaching practice and reported changes in practice among a smaller selection of participants (n=9).

The two strands of data analysis offer methods triangulation (Patton, 2002) on crucial questions of the nature and extent of instructional change.

An important task facing researchers in teacher professional development is that of devising self-report measures, for surveys and/or interviews, that can be administered cheaply and efficiently and that can serve as reasonable substitutes for more comprehensive data collection efforts. Such indicators are particularly needed for professional development that aspires to work across subject matter boundaries to influence teachers' knowledge, attitudes and behavior around matters of general pedagogy. We are interested in developing ways to measure such variables quantitatively primarily because of the large scale at which our program and others similar to it hope to operate and the limited availability of resources for intensive follow-up. An additional reason is that program stakeholders—institutional clients, funders, government regulators—are placing greater emphasis on quantitative results and so-called scientific research in education.

To address such a need, through this study we sought to answer the following questions:

- What kinds of changes in teaching practice and student learning do teachers attribute to participation in an online course?
- In what ways do the practices as directly observed and inferred by researchers differ from and/or align with teachers' reported changes?

We use results from these questions in the service of drawing out implications for the design of self-report indicators capable of providing valid and reliable insight into teachers' shifts in practice.

## Rationale and Research Questions

Efforts towards systemic educational reform over the past decade increasingly recognize teachers' ongoing professional development and learning as a linchpin of success for their students and for the renewal of schools (Ball & Cohen, 1999; Darling-Hammond, 1998; Elmore, 2002; Feiman-Nemser, 2001; Guskey & Huberman, 1995; Hargreaves, 1999; Joyce & Showers, 2002; Little, 2001; National Commission on Teaching and America's Future, 1996, 2003). Key to this success is the "phenomenal leap" teachers must make from professional development activities to classroom practice (Huberman, 2001).

Nearly three decades of research attest to the difficulties that programs of teacher professional development have in promoting this leap. The one-day workshop and afterschool "in-service" rarely show an enduring effect on practice (Cohen & Ball, 1999). Such efforts fail because of their lack of connection to teachers' classroom work (Little, 1993), lack of congruence with subject matter knowledge (Wilson & Berne, 1999), inconsistent follow-up (Ball, 1996), and absence of fit with broader systemic improvement (Carnoy et al., 2003; Elmore et al., 1996).

New trends in professional development align with research findings in the field that downplay direct instruction and instead emphasize the importance of construction of new knowledge and skills while involved in practice (Cohen & Ball, 1999, Wilson and Berne, 1999). Such efforts aim to engage teachers "in the pursuit of genuine questions, problems, and curiosities, over time, in ways that leave a mark on perspectives, policy, and practice" (Little, 1993).

In the service of promoting instructional excellence, innovative professional development efforts have shifted towards harnessing the interactive potential of the networked environment. Information and communication technologies establish new kinds of connections among peers and outside experts and across time and distance that may help teachers apply in the classroom what they have learned through their continued education (Barab & Duffy, 2000; Moore & Barab, 2002)

Current designs identified as exemplary in the research literature vary along several dimensions: their underlying approach to learning and teaching; the domain of teaching practice that is the intended target; and the extent to which the online environment is the primary or ancillary means of interaction. The approach to learning and teaching taken by most exemplary online professional development programs can be characterized as an increase in "learner control, opportunities for dialogue, and emphasis on thinking skills rather than mere comprehension" (Bates, 1995; see also: Bransford et al., 2001; Garrison & Anderson, 2003; Thorpe, 1998). Program content ranges from a tight focus on specific disciplinary and/or grade-level topics to wide-angle views of general pedagogy. An additional dimension is the extent to which the activities of the program rely on the online environment. "Hybrid" approaches that combine an online learning experience with on-site support are increasingly common.

One example of a discipline-specific offering is the Learning to Teach with Technology Studio<sup>1</sup>, developed at Indiana University, Bloomington. This program, which aims to “help teachers learn to integrate technology into their content-focused teaching,” (LTTS, 2006) is designed to be learner-centered, relevant to classroom needs, and consistent with standards as well as supported through on-site workshops and extended guidance. PBS TeacherLine<sup>2</sup> is a national program that provides both disciplinary and general pedagogical professional development, leveraging “current technological advances to create online learning that meets individual needs” (Hopkins and Dunfree, 2003). A third program from children’s publisher Scholastic, Scholastic Red,<sup>3</sup> offers extensive teacher professional development in improving reading instruction following what the developers describe as “state of the art” design principles for professional development that include “a guiding role for teachers, participation by the larger school community, and a process that includes planning, sustained effort, and evaluation” drawn from “the best existing research and judgments of many experts” (Hudis, Calderon, and Sanborn, n.d.). In a similar fashion, WIDE World, described in greater detail below, bases its design on a solid foundation of research in teaching, teacher professional development, and adult learning.

These and many other online programs are being offered on a small and large scale locally, nationally, and internationally. The growth in such programs has led to increasing calls for delineating “what works” for teachers and for students alike. Research into online teacher professional development has tended to be exploratory, concerned with describing the possibilities of online courses as a solution to the need for effective teacher professional development, or the degree to which the programs adhere to good design principles and e-learning research. Literature reviews by Barnett (2002) and Dede *et al.* (in press) speak of what research has yet to reveal, and the need for more methodologically sound, empirical studies to reveal it.

In fact, not just online teacher professional development but professional development in general suffers from a paucity of systematic research about its impacts on classroom practice and student learning. The U.S. Department of Education’s Institute of Education Sciences (IES) recently noted that “we have little evidence as to what constitutes good professional development that will... change teacher practice, lead to improved student achievement and can be sustained” (U.S. Department of Education 2003, p.2, as cited in Hudis *et al.*, n.d.). Increasingly, researchers are calling for the development of better methods of establishing what teachers learn and how they might make use of it in the classroom (Forsyth and Schaverien, 2005; Tienken and Achilles, 2006).

Of course, those committed to the most rigorous data collection possible can draw from many time-tested methods. These include classroom observations; interviews with teachers, students, parents, and school administrators; analysis of teachers’ lesson plans and other work products; and analysis of student work. But these methods are often prohibitively time- and resource-intensive. As a result, research to date has tended to rely on teachers’ self-reports rather than on more objective data about teaching and lesson development—let alone on measures of student outcomes (Fishman *et al.*, 2003).

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<sup>1</sup> <http://ltts.indiana.edu> (see Malopinsky *et al.*, 2002)

<sup>2</sup> <http://teacherline.pbs.org>

<sup>3</sup> <http://www.scholasticred.com>

On the other hand, self-report measures that could serve as reliable indicators of instructional change would constitute a significant advance in helping research and evaluation efforts to promote professional development of high caliber.

To address such a need, through this study we tackle the following questions:

- What kinds of changes in teaching practice and student learning do teachers attribute to participation in an online course?
- In what ways do the practices as directly observed and inferred by researchers differ from and/or align with teachers' reported changes?

We use results from these questions in the service of drawing out implications for the design of self-report indicators capable of providing valid and reliable insight into teachers' shifts in practice.

## **Program Background**

### ***WIDE World Online Courses***

WIDE World is an online teacher professional development project of the Harvard Graduate School of Education. Educators from around the world take part in the courses; the majority are K-12 educators in the United States. Courses comprise 6 sessions in three semesters—July to August (weekly sessions), September to December (biweekly), and February to May (biweekly). Each session includes several small “performances of understanding” or discrete activities that build towards larger, course-long curriculum projects. Teachers in the course carry out these discrete activities in their own workplaces to encourage the active application of the framework during and after the course.

Those in the course use the information from these experiments as grist for their biweekly discussions with others in small online “study groups” of 6 to 8 learners. Each “study group” is facilitated by a “coach”, an educator who has solid experience in applying the principles of Teaching for Understanding in her or his own classroom (see below). Every study group also has its own threaded discussion forum on the course website, through which all online interactions take place. Participants in this study enrolled in the two oldest courses offered by WIDE World: Focus on Understanding (TfU 1), which offers an introduction to the Teaching for Understanding framework for educators of all disciplines and levels; and Teaching to Standards with New Technologies, a course that uses the Teaching for Understanding framework to help teachers integrate new technologies in ways that improve student learning.

### ***Central Concepts of Teaching for Understanding***

The Teaching for Understanding framework is derived from a multi-year collaborative research program that synthesized contemporary theories of pedagogy (Brown & Campione, 1990; Collins et al., 1989; Tishman et al., 1995) with analyses of effective classroom practice (Blythe, 1998; Wiske, 1998; Wiske & Perkins, in press; Wiske et al., in press). This framework has been widely used to plan, conduct, and assess teaching aimed at developing learners' capacity to apply their understanding flexibly in varied situations. The four principles of the framework are: (1) organize curriculum around *generative topics* that are both important to the subject matter and

relevant to learners' experience; (2) define what students will learn about these topics with public *understanding goals* that may relate to specific knowledge, methods of inquiry, underlying purposes for learning, and/or forms for presenting knowledge; (3) engage learners in a variety of *performances of understanding*, focused on target goals, that require learners to think and apply their knowledge creatively; and (4) conduct frequent *ongoing assessment* based on public criteria related to goals that generate useful suggestions for improving students' work. In recent work, Wiske, et al., (in press) have included a fifth principle: (5) support learners in reflective, collaborative communities based on shared goals, a common language, and norms of respect and reciprocity.

## Methods

This research employed first quantitative and then qualitative approaches. We initially set out to create pre/post survey scales to gauge change for teachers. We then looked closely at responses to open-ended questions about program impact in a follow-up survey we conducted for this study. From these we developed a Pedagogical Change scale. This last scale, and the nature of the open-ended responses themselves, helped direct our qualitative work.

### Survey Scales

*Instrument development.* We developed scales so as to measure changes for teachers, both from precourse to immediately following the course (four months later) and from precourse to 11-14 month follow-up (i.e., a follow-up point 7-10 months after completion of the course). Several of these scales had already been validated and had been used in our program evaluations for up to two years. They measured experience in instructional leadership (among a larger sample, Cronbach's alpha = .74) and attitudes toward instructional collaboration, computers, and online communication (alpha = .72, .81, and .74, respectively; see Appendix A: Selected scales from WIDE World surveys). Our chief focus in research described here was to create effective quantitative measures of instructional practices used in the classroom.

We sought to create a scale to measure teachers' use of constructivist (as well as student centered and inquiry oriented; hereafter, simply "constructivist") practices. Our sources for specific items included Becker and Anderson's (1998) survey of constructivist teaching and similar surveys conducted by the Center for Research on the Context of Secondary School Teaching or CRESST (1991). We also drew on three other validated research protocols, each with a partially constructivist emphasis: Mayer's (1999) instrument measuring practices encouraged by the National Council of Teachers of Mathematics (NCTM); the math/science-focused Reformed Teaching Observation Protocol or RTOP (Piburn & Sawada, 2000; Sawada et al., 2002); and the Teaching Attributes Observation Protocol or TAOP (Abbott & Fouts, 2003; Fouts & Associates, 2002; Fouts, 2003).

From these instruments as well as from work within our program we identified 12 items to serve as indicators of constructivist teaching. For these we chose language that would not require familiarity with terms from the TfU framework, but rather would be commonly recognizable as signs of positive pedagogy. Prominent among these items were the practices of having students discuss ideas for a sustained period of time; explain their thinking or reasoning at length; develop and then discuss alternative ways of solving a complex problem; help establish criteria on which

their work is assessed; and review their work in relation to such criteria. These were also the items with the highest constructivist factor loadings from factor analysis (see below). Additional items ask how often the teacher directs students to give demonstrations, create portfolios, work on long-term projects, and work in groups.

We also created a scale of more traditional practices which were not especially consistent with constructivist teaching. These included having students attend to a teacher's lecture, use workbooks, and demonstrate factual knowledge in front of the class. We measured use of five such methods, both to document extent of use and to see whether use of constructivist and traditional practices would diverge after the course. Items from each of the two scales were interspersed on the survey to minimize the influence of several common response styles.

Mayer (1999) found that practices such as these, which were essentially teaching behaviors (or at least choices), could be measured validly and reliably via self-report only if each were captured by a composite of two items -- one covering frequency of use and one covering typical duration during the lesson. Mayer reported successful validation of his scales, not only through test-retest of survey responses but also through correlations with classroom observations of these practices' frequency and duration of use. We followed his approach to scale construction, but we obtained distributions that were extremely skewed. This meant that correlations and other test statistics were unstable, being quite vulnerable to outlying and influential cases. For one item, a single case in a sample of 25 changed the test-retest  $r$  by .53. Conducting log transformations created nearly normal scale distributions and stabilized findings, and we proceeded to see whether our transformed scales, like the untransformed scales of Mayer, would stand up to validation.

As an alternative to these items measuring Use, we also asked teachers about their Plans for implementing the identified practices. We copied the Use item stems but now provided ordinal choices as follows: "I have specific plans to do less of this my classroom," "I intend to do less, but have no specific plans," "I intend no change," "I intend to do more," and "I have specific plans to do more" (coded from -2 to 2).

*Validation.* Factor analysis on 464 pre-course survey scores confirmed that the traditional and constructivist items did indeed cluster together as hypothesized. It also strongly confirmed 2 as the best number of underlying factors to explain the patterns of responses. The  $r$  is only .30 between these factors, which provides some evidence for discriminant validity.<sup>4</sup>

For each Use scale we computed a test-retest  $r$  using a pilot sample ( $n = 25$ ). Results were strong at .9 for constructivist and .7 for traditional. From the larger sample, internal consistency as measured by Cronbach's alpha was, respectively, .87 and .85 for constructivist use and plans, and .73 and .80 for traditional use and plans.

We also checked concurrent validity by computing correlations of change scores, derived from the constructivist Use and Plans scales, with other measures of course-induced change. In doing this we adjusted for the attenuation to  $r$  endemic to change scores (Pedhazur, 1997). First, we

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<sup>4</sup> To his surprise, Mayer (personal communication, August 2004) also obtained nonnegative correlations between the NCTM-approved and the more traditional practices. Future studies may need to control for a type of response style that affects the magnitude of frequencies and durations listed across-the-board.

checked the constructivist change scales' correlation with a retrospective Effect on Practice scale. (In our course evaluation, participants are asked about course impact on such areas as lesson plan design and communication with students. This five item scale had been previously validated through factor analysis, screening for social desirability, and reliability testing, with  $\alpha = .88$ ).

*Use.* The correlation with Effect on Practice varied greatly by demographic group ( $-.5 < r < .7$ ), which was inauspicious for validity. Overall,  $r$  was very low at .16.

*Plans.* Correlations were much higher, averaging .43 (.52 after correcting for attenuation), and were fairly consistent for different demographic groups.

For the instructional practices Use scale (if not the Plans scale, for which no previous data were available for this group), we also attempted to validate through correlation with numerically coded follow-up survey comments that described teachers' changes in classroom practice since taking the course. We created a measure of retrospective Pedagogical Change by coding each non-blank comment with a number from zero to three to indicate degree of change: none, slight, moderate, or great. This rough measure itself seemed to have some validity, as it correlated with retrospective Effect on Practice,  $r = .40$  (or, after correcting for attenuation,  $r \sim .5$ ). But Pedagogical Change and the instructional practices Use scale were uncorrelated ( $r = 0.0$ ).

*Conclusions about validation.* Contrary to the findings of Mayer (1999), these varied efforts clearly point towards discontinuing work with both of the Use scales. Favorable reliability and factor analytic results, and the overcoming of the distributional problem, our dwarfed by the overwhelming lack of evidence for concurrent validity. On the other hand, validation confirms the utility of the two Plans scales. Internal consistency is strong or at least adequate for each. With Effect on Practice the attenuation-adjusted  $r = .52$ . Also, discriminant validity is supported by 1) factor analysis, which reveals largely separate constructivist and traditional factors, and 2) gains in use of constructivist practices after 11-14 months that were not seen for more traditional practices (see below).

### ***WIDE Classroom Observation Protocol (WICOP)***

The WICOP was a parallel tool designed to gauge the extent to which classroom teachers put into practice the principles of the Teaching for Understanding framework. Some of the 21 items were adapted from sources described above. Other items came from Newmann, Secada, and Wehlage (SITE) or from our Focus on Student Understanding course (after being adapted to fit classroom observations in which information about the wider curriculum was not known). As with the RTOP and TAOP, values for each item range from 0 to 4, indicating the extent to which it is exemplified in the lesson. In general, the observer is asked to make each judgment taking into account both the quality and the extent of the teacher's implementation. Ratings are based on teacher's design or conduct of the lesson rather than on its success with students.

Appendix B, WIDE Classroom Observation Protocol, presents the items in full. Their order strikes a compromise between grouping similar topics together and listing the more readily observed before the more abstract. Each item is tagged with one or more abbreviations --

- GT -- Generative Topics
- UG -- Understanding Goals
- UP -- Understanding Performances
- OA -- Ongoing Assessment

- SC -- Student-Centered

The first four of these constitute elements of the TfU framework and are described above. The last relates to student centered or inquiry-oriented learning. Several items probably relate to more than one of these elements (the instrument was piloted before this study but on too small a scale to allow for quantitative development or validation).

### **Qualitative Methods**

The findings about validity noted above underscored the need to look closely at a smaller selection of respondents in order to go beyond the limits clearly inherent in self-reported data. We turned to interviews and observations to get a more in-depth look at ways teachers were putting coursework into practice. Our interest here was first to craft richly descriptive accounts of teachers' practice that corresponded with course ideas and aligned with their own reports of influence from the course. We then hoped to move beyond description to identify particular phenomena that appeared highly indicative of effective use—or lack thereof—of course ideas.

### **Participant Selection**

We decided to select those cases with the greatest self-reported change, using a “critical case” approach to sampling. The approach hinges on the identification of cases that can make a point “quite dramatically” and hold the promise of yielding “the most information and have the greatest impact on the development of knowledge” (Merriam, 1988; Patton, 1980). We used a score of moderate or great on the Pedagogical Change score (above) as one of six criteria for selecting participants for continued study. For the other criteria, a participant had to be a US teacher working in grades K-12; and had to have completed either the Focus on Student Understanding or Teaching to Standards with New Technologies course (obtaining at least 35 participation hours). We sent out emails inviting those at a distance to take part in one 45-minute telephone interview. For those teaching in schools in the Boston metropolitan area, we requested 1-3 classroom observations followed by a post-observation interview (see below). Five teachers at a distance and four local teachers accepted our invitation.

Figure 1. Data sources by case.

Case	Surveys at precourse, postcourse, and follow-up	Lessons Obs.	Pre-obs. interview	Post-obs. interview	Interview without obs.	Online discussion posts within course
Courtney	Yes	1		Yes		
Hannah	Yes	2	Yes	Yes		
Louise	Yes	3	Yes	Yes		Yes?
Mercedes	Yes	1		Yes		Yes
5 interviewees not observed	Yes				Yes	

Note: "obs." = classroom observation

## Data Collection

*Text from interactions online and course and follow-up survey responses.* For the four observed participants, we excerpted transcripts of online exchanges with instructors, coaches and peers in the online discussion area of the course web sites. We also collected data from open-ended responses for all participants from the end-of-course survey and the follow-up survey.

*Telephone and Post-observation interviews.* We used a semi-structured, open-ended format for both telephone and post-observation interviews. We conducted one 30-45 minute interview per participant and included specific questions and prompts for each interviewee based on other sources of data. (See Appendix C: Post-observation Interview Protocol.) We also conducted brief pre-observation interviews with two of the four teachers observed. All interviews were audiotaped and summarized. Post-observation interviews were also transcribed.

*Classroom observations.* We observed two teachers for one lesson, one teacher for two lessons, and one teacher for three lessons. We recorded observations in field notes during the event and we also completed the WICOP described above for each lesson observed. Immediately after the observation, we wrote up notes, including reflective remarks and identification of key segments. (See Appendix D: Observation Summary Form.)

## Data Analysis

*Inductive approach.* We derived our initial set of codes inductively from responses to two open-ended prompts in the follow-up survey. We refined this initial set iteratively through check coding and discussion. Throughout, we identified key themes and patterns as well as contradictions and paradoxes (Coffey & Atkinson, 1996; Patton, 2002).

*Deductive approach.* Once we had coded a full set of data from one of the observed participants and refined the codebook several times, we then labeled codes to the extent possible with one of the five elements of the Teaching for Understanding framework. We did this in order to be able to associate the kinds of outcomes we had derived inductively in the first rounds of coding with criteria related to course-specific outcomes in terms of the Teaching for Understanding framework. We used this codebook to code the full set of data for all participants. (See Appendix E: Codebook.)

## Case Analysis

The second phase of our analysis consisted of within-case analyses of each observed teacher. We followed this with cross-case analysis of the four teachers with supporting data from the five participants interviewed by telephone.

*Within-case analysis.* Narrative profiles and within-case data displays enabled us to understand patterns within each case. Following Miles and Huberman (1994), we used matrices and networks to recontextualize categorized data. This analysis served as the basis for developing a narrative profile of each observed teacher (Stake, 1995). We present these narrative profiles in our Findings section.

*Cross-case analysis.* This part of our design allowed us to see outcomes within each case more clearly, helped identify patterns and themes that contradicted expectations (negative or discrepant evidence), and allowed us to develop a more robust description and sophisticated explanation of teaching practice across cases (Miles & Huberman, 1994). We constructed cross-case displays to highlight similarities and differences (Miles & Huberman, 1994; Yin, 2003). Throughout the process of analysis, we continuously “interrogated” the data (Delamont, 1992), searching for confirmatory and negative evidence and recording those interrogations in analytic memos.

## **Validity**

Maxwell (1996) identifies the main threats to validity in qualitative studies as descriptive, interpretative, and theoretical, corresponding with the three main types of understanding involved in qualitative research.

*Longitudinal data collection.* The design of this study called for collecting data from participants at several different points in time

*Triangulation.* The research design described above relies on data collected from several different participants in diverse settings using a variety of methods (audio taping, archiving online interaction, etc.). This data was analyzed in a variety of ways.

*Identifying negative or discrepant evidence.* As described above, we actively sought out disconfirming evidence.

*Feedback.* Team members conferred among themselves as well as with the Co-principal investigator of the WIDE project.

*Check-coding codes.* We took turns co-coding portions of data and discussing our application of the codes with colleagues not directly involved in this research project.

## **Generalizability**

Mason (2002) draws a useful distinction between empirical and theoretical generalization. This research makes no claims about empirical generalization; our sampling strategy and analyses were not designed to produce results that can be generalized to a wider population. The design detailed here is intended to provide reasonable rigor for theoretical generalization, however. These provide the basis for an understanding of teacher outcomes in relation to online course content. This theoretical generalization is strengthened by strategic comparisons that the research design includes as part of the approach to participant selection, by focusing on several teachers, and in analysis through constant comparisons at both the descriptive (multiple sources of data) and interpretive (multiple modes of analysis) level.

## Results and Findings

Below we present results from our analyses of data from the 100 respondents to our follow-up survey. We then present findings within the profiles of the four teachers whose lessons we observed and conclude with claims derived from our analysis across these cases as well as data from additional interviews conducted by telephone.

### **Gains in Survey Scale Scores**

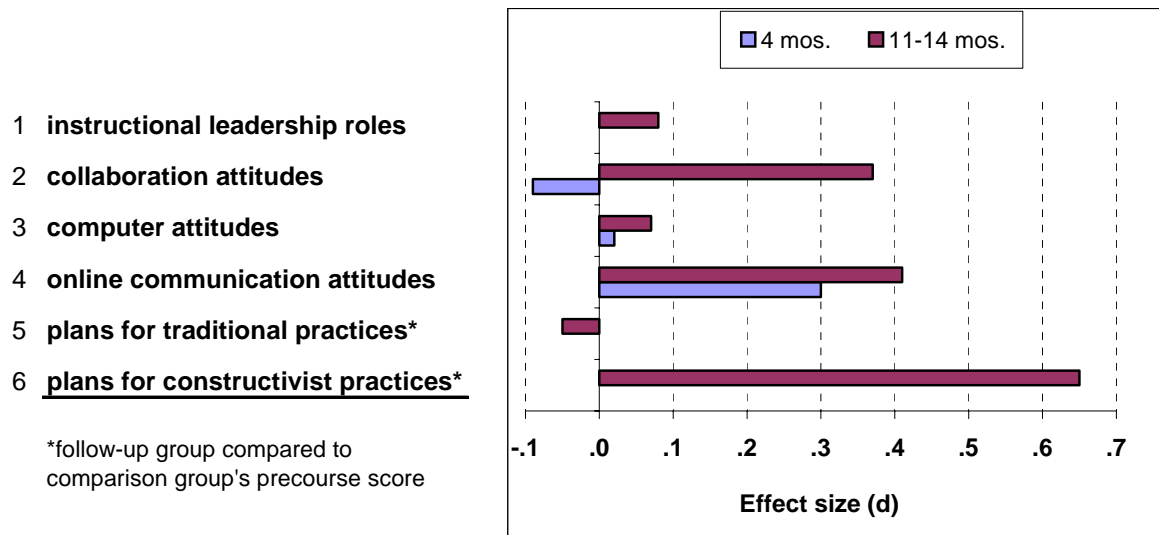
*Comparability and response bias.* The follow-up survey response rate was  $100/478 = 21\%$ , and the sample size for any given question was between 85 and 100. Respondents were very similar to other WIDE World participants in educational degree, years of teaching experience, baseline attitudes towards collaboration, and appraisal of course Effect on Practice. They had somewhat more positive baseline attitudes towards computers ( $d = .36, p = .001$ ) and online communication ( $d = .35, p = .002$ ), but if anything these differences would make gains in these areas more impressive.<sup>5</sup> Moreover, computer and online attitude scores showed little correlation with other outcomes of interest described below, even after correcting for attenuation ( $r < .18$ ). Finally, wave analysis showed that date of response to the follow-up survey had low correlations with responses themselves,  $.1 < r < .1$ , providing some evidence against response bias (Creswell, 1994).

The chart below summarizes survey score changes for both the 4-month period of the course and the 11-14 month follow-up period.

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<sup>5</sup> Strictly speaking, inferential statistics are only applicable in the context of random sampling. Nevertheless, many researchers report significance levels as convenient yardsticks even for nonrandom samples. In this vein, significance levels have been reported in this document. See Michael Oakes (1986). *Statistical inference: A commentary for social and behavioral sciences*. NY: Wiley.

Figure 2. Effect sizes for quantitative survey outcomes



*Affective changes.* Attitudes toward instructional collaboration showed a medium-sized gain of .37 standard deviations over the pre-course mean ( $d = .37, p < .0005$ ). Such an increase was not seen from pre- to immediately postcourse. Comfort and skill with Computers did not change appreciably. However, Comfort and skill with Online Communication underwent a medium-sized increase ( $d = .41, p < .0005$ ). This substantially improved on the increase seen from pre- to immediately postcourse. Adoption of leadership roles, which involved an attitudinal component, did not change.

*Instructional Plans.* (The following set of comparisons are not pre-post, since follow-up respondents were not previously given the instructional plans questions. Instead, we compared their follow-up mean to other cohorts' pre-course and postcourse means.) The group responding at follow-up reported a great many more plans to use constructivist practices than did the other cohorts at precourse ( $d = .65$ ). A scale score at the 50th percentile at follow-up would be at the 74th percentile at precourse. If one accepts the comparability of groups (see above), then  $p < .0005$  for follow-up compared to precourse and  $p = .003$  even compared to immediately postcourse. Among specific items, the largest difference was seen in the percentage with specific plans to have students "find more than one way to solve a problem or demonstrate understanding" (55% vs. 19%). A large difference was also seen in the percentage with plans to have students "explain their thinking or reasoning at length" (45% vs. 17%). In contrast, for more traditional practices, the mean and the individual items showed little difference compared to results at earlier junctures.

## **Teacher Profiles**

To address our first and second research questions, we look in-depth at four former participants in WIDE World online courses who allowed us to observe their classrooms and talk with them afterwards about the lessons we observed, Teaching for Understanding, and their WIDE World course. Below we profile each teacher in turn, highlighting claims from our analysis. Following the profiles, we look across the data we collected for these four teachers and additional data from five teachers we interviewed by telephone.

### **Courtney B.**

Courtney came to teaching five years ago after a career in computer programming. She has taught math and science in middle-school and is currently teaching an eighth grade computer literacy course in a suburban public middle school. She took a sequence of two WIDE World courses in the Fall of 2004 (Teaching to Standards with New Technologies) and the following Spring of 2005 (Practical Strategies for Integrating Technology to Improve Learning). As described earlier, Teaching for Understanding serves as the pedagogical framework for both courses; the sequence of courses entails using TfU to design or revise an existing unit that involves technology in the first course, and then trying out that unit in the classroom during the Practical Strategies course. She had no prior experience with Teaching for Understanding.

Claim 1.1: Courtney applied ideas from two online courses to help engage students in classroom activities. She noted and researchers observed her focus on student involvement in three areas: she selected topics that engaged students' interests; she encouraged student-to-student interaction in classroom activities; and she encouraged students' contributions in defining self- and peer-assessment.

Courtney, who characterized herself as "a fairly new teacher" [91:1]<sup>6</sup>, wrote in the final survey following her first online course:

Rather than spit out the answers, I'm trying to allow my students the opportunity to discuss and reflect among each other with a little guidance. [91:4]

This remark encapsulates themes we explore in a bit more detail below, around student-to-student interaction, increased student responsibility for learning, and increased attention to and student involvement with assessment. Similar comments about shifts in students' roles are a prominent theme of Courtney's remarks in the seven-month follow-up survey and subsequent interviews.

According to Courtney, the online courses had helped her to select projects that were sure to capture students' interests. As part of her coursework, she had put together a science game that involved taking on the role of protein. In her interview, she gave a fairly detailed description of a board game for developing math skills. The unit we observed successfully involved students in the design of a game for modeling computer systems.

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<sup>6</sup> Please see Appendix F for a key to source references. Sources are cited by the first number in brackets. The number following the colon refers to the specific citation within the text.

For each of these units, Courtney described going through similar kinds of activities with students. A general characterization of these activities might be that they reflected her awareness of the need to go "step-by-step" with students, rather than have them "spit out the answers" or "regurgitate it back." She did so by laying out all the activities at the beginning of a new unit and reviewing them later. She describes:

I went step-by-step over the, the game plan, that packet, the three pages, and I literally went through it piece-by-piece and had them write their thoughts down as we were going through it, instead of explaining it to them and I gave it to them as a homework last time. [71:11]

She contrasts "explaining it to them" and giving "it to them as a homework" assignment with eliciting their thoughts in a structured way. In doing so, she found that she "got a lot more responses," which is what she had sought in "providing more visuals" and developing activities that were more "hands-on." She also attributed an increase in responses to a new approach of modeling activities to the whole group of students before asking students to try them out on their own.

I'll put it up [on the overhead screen] and we can focus on it piece-by-piece so they know where we are... [71:26]

Once she has reviewed an activity bit-by-bit with the whole group of students, she structures activities in such a way that they can "take off and do the rest on their own" [100:22], which typically involves small groups of students working through problems together. She explains her rationale in doing so:

[W]hen they get to hear other kids' ideas, um, and they're not just hearing me say that this is the example, do this, they get some other ideas. They, they get some feedback from their friends, um, which I think is valuable to them...[71:19]

To structure activities in ways that made the possibility of such "guidance and feedback" productive, she put a lot of her effort into developing rubrics:

[I] focused a lot more time on [...] developing rubrics, and giving the kids their goals up front so they know what their ultimate expectations are and, hopefully, they can gauge their learning and the activities to complete that final product, um, without going into it blind and not knowing, you know, what am I going to use this for? They have a little more direction. [71:4]

In particular she described working with her students to develop their own rubrics, based on a basic "skeleton" which she provided:

[S]omething I tried because of my experience with the courses was having the kids design their own rubrics. ... I, I basically, I gave them like a skeleton. I want you to focus on these five things. These are the things you'll need to have and how would you rate it? How would you grade yourself? So, as a class, we would, you know, maybe come up with a scale of one to three, and they would talk about what deemed a one versus what deemed a three, and each class actually designed a rubric for that particular project. And I think, uh, I had never done that before, um, I think, for most of them, it really allowed them to think about their learning in a different way... [71:34]

As a result of their involvement in creating the rubric which they applied to one another's work, students were, Courtney felt, "a little more vested in the final product because they owned it, they did it" [71:34].

While we did not observe the students' process of coming up with criteria with Courtney, we did see ample evidence that the students were engaged with what they were doing.

Another unusual dimension of student involvement, not mentioned by any other teacher we observed, was Courtney's practice of having students evaluate her instruction. She attributed this to the online course, and we believed it was also connected to her background in business because of the rationale she gave for seeking their feedback in this way. She described students as "her clients" in the following:

They're my clients, so they're here with me everyday, and they can tell me first-hand whether or not I make sense or not [71:28].

Claim 1.2: Courtney's instruction provided little in the way of specifics that would identify her as having studied Teaching for Understanding, in particular. No explicit instructional goals aimed specifically at understanding (as opposed to building computer-related skills, such as file-naming conventions). Also, the design of her unit conflated notions of instructional goals, classroom activities, and informal assessment. It placed primary emphasis on student engagement and well-ordered set of steps rather than a sequence of activities aimed at higher-order understanding.

We make this claim having observed only one of Courtney's eighth grade computer literacy classes and then conducting a 45-minute interview. It is also important to note that computer literacy classes do not tend to emphasize strong disciplinary ties or forge instructional goals that take aim at deeper understandings. Computer literacy is often quite narrowly defined; teachers are expected to stress generic skills—word processing or using a spreadsheet. Also, what's noteworthy here is that Courtney does describe elsewhere her targeting of disciplinary understanding through student-centered activities in Math and Science, but we did not ask close follow-up about the kinds of goals that she had established in these settings.

Courtney mentioned goals in connection with the criteria and rules established in the rubrics. However, the goals she described and the activities we observed did not help students develop more flexible or in-depth understanding of what they were doing with computers. Of course, many important goals do not explicitly emphasize understanding, such as memorizing multiplication tables or, in this case, knowing the naming conventions for a set of files. However, the clarification of goals that aim at understanding is a principal focus for course instructors, and thus an element that one might expect to see in the classroom.

A desire to clarify and make explicit criteria for student work is admirable. More admirable still is the effort to seek students' input in setting criteria. Courtney made it clear in her survey and interview comments that feedback from her students in large part determined what she found most useful from the online courses. Courtney emphasized that she had applied ideas from the course to increase student involvement and interest in the content of her computer literacy course in several ways. She chose topics that she felt would interest students; she made sure to carve out

time to model activities step-by-step for students before expecting them to carry out those tasks independently; and she had adopted new ways of increasing interaction among students, such as “pair-sharing” exercises that asked students to give each other feedback according to explicit criteria. Yet our observations and Courtney’s comments led us to wonder how students’ involvement might be aimed at more ambitious ends.

### **Mercedes R.**

Mercedes teaches Spanish and Portuguese in a 1,200-student, comprehensive urban high school. She has been a language teacher for 26 years, speaks seven languages, and travels extensively during school breaks. In the Fall of 2004, she took the introductory Teaching for Understanding course as part of a team of two teachers. She and her colleague enrolled in the course because of a broad initiative in their school to adopt Teaching for Understanding as a common pedagogical framework across all disciplines. Every one of the school's 200 teachers had to take part in some type of professional development during that academic year; the school's administration made available online courses to those who wanted to take on more than the minimum 10 hours of on-site training. Mercedes and her colleague thus volunteered themselves for more demanding duty, which in her terms, stemmed from an interest not in Teaching for Understanding per se but in what the results of her taking part might mean for her students. When asked about her interest, she commented to us, "I want to see what really, really works for the students, and not particularly because it's TFU." [84:31]

Mercedes had "a touch" of Teaching for Understanding before taking the course, out of which she had begun to craft a set of broad goals for her language teaching that she subsequently refined in the online course. [84:4] She was well-versed in a range of other pedagogical strategies, particularly the use of drama in language teaching, and she was solidly confident of her teaching abilities in general. She characterized herself as having an "intuition for teaching," which she described as a sense about, "what I need to refine, what I need to work harder at." [84:34] One aspect of her confidence--perhaps linked with her experience with drama although she did not identify it in this way--was her facility with improvisation. As she describes, "(S)ometimes I have ideas that come in the moment, and I will try [them]." [84:34] For Mercedes, such flexibility countered the "certain rigidity" of following a scripted number of steps, even if the teacher herself was the one to have defined the script.

Mercedes’ curiosity about teaching, and her commitment to finding out "what really works for students" was evident in her selection of a class for our observation. Rather than choosing an upper-level course, one which she was more accustomed to teaching and for which she had already designed curriculum following the tenets of TfU, she invited us to observe a beginning, "Level One" class. She did so explicitly because she found applying Teaching for Understanding concepts to be "still very difficult at level one." [84:9]

The Level One class observed included 16 freshman, juniors, and sophomores. Our observation fell on a Friday towards the end of a week-long unit that covered basic vocabulary, including colors and numbers.

Below we put forward two claims about what we heard from Mercedes and observed in her classroom related to changes Mercedes attributed to the online course. The first claim concerns

the relationship of classroom activities and formative assessment in the interest of getting at what Mercedes describes as "deeper meaning" for her students. The second claim concerns the correspondences Mercedes found between prior professional development experiences and the Teaching for Understanding framework as well as her attitudes towards ongoing development of TfU concepts in her teaching.

Claim 2.1: Mercedes' application of course ideas helped her bring coherence to her existing, varied repertoire of classroom activities. In particular TfU gave her a framework for structuring the sequence of activities and for making informal assessment an integral part of those activities. As a result, she monitored her students' learning more systematically and encouraged her students' flexible and in-depth understanding.

At the end of her course in the Fall of 2004, Mercedes summed up her experience in the course by noting that she was then "more equipped to engage my students into deeper understanding of the subject I teach and how well they understand it" [90:4]. When we observed Mercedes' class and talked with her 13 months after she had taken the course, much of what she said and we saw supported her statement. She noted that her work with the ideas broached in the course helped her to know whether she was teaching in a way so that students are learning" [84:37]. She elaborates:

It was always my concern to know, uh, Am I reaching, uh, all students, but reaching, not reaching so much those who learn quickly, but those who have difficulties learning? And I think what the TFU does also, it makes the teacher much more aware, um, much more aware of what impact you are making (on) their learning. [84:37]

On one level, her concern here and what we observed in her class was that she provided a variety of ways that students' used even basic language in the classroom. These included repetition, structured peer interviews, song, and movement, all the while reviewing old vocabulary, practicing new vocabulary and finding different ways of putting the students in situations through which they needed to generate words on their own or with others.

These activities had a pattern to them both within the observed class as well as, from what she reported, across classes. Within the class, the observer noted:

The lesson consisted largely of rote learning, yet when the 90 minutes was over I had the feeling that students had a pretty rich learning experience that extended somewhat into higher order thinking [74:7].

Mercedes commented that the activities we observed were the culmination of a week-long cycle of activity, centering on helping students put basic vocabulary to use in different situations.

All of these activities were just to reinforce, uh, the lesson that we had done (...) the beginning of the week. So, many activities have gone to, for us to reach this point, in terms of, not only vocabulary, knowing the vocabulary, but knowing how to say it, to be able to recall it without having [to be prompted for] it, to be able to identify it written and orally, to be able to identify the object with the words, and, um, and today was actually the culmination. [84:7]

The ideas in the course had given her more systematic means of finding different ways to engage students at various levels. “[I]t’s almost like everyday I have to do a little bit of the class before, and then bring something new.” In more general terms, she characterized how the process of thinking through her classroom activities with Teaching for Understanding had helped her “clarify what (...) students have learned, even for myself” and this helped her envision the sequence of activities that might improve understanding for all students. She began to see more ways to concentrate on “the sequence of steps (that) is going to take me to an end result,” which in turn, allowed her to delineate clearly missing steps. Without such clarity both of the end result and how she intended students to get there, she believes she might have missed crucial intervening steps that might help any particular learner better understand [84:18]. And she relates that she became much more aware of creating sequences of activities that allowed her to “level it off for all the students” as a result of her work with Teaching for Understanding [84:27].

That awareness resulted from greater attention to the different ways she used various approaches to informal assessment to determine where students were as the class carried out different activities. The informal opportunities for self and peer assessment she created involved student-to-student interaction such as quizzing each other and conducting interviews meant to simulate more authentic situations. Informal assessments such as these led to increased student interest in and involvement with higher-level understanding, which in turn according to Mercedes led to students taking increasing responsibility for their learning, or led them to “own their own work” [93:4]. We did not see direct evidence of this in the one class observed, but the student engagement with the material described above pointed in this direction. Mercedes comments:

And they’re not learning because they have to take a test for me, but rather because they want to learn and go to the next level. [84:6]

For Mercedes, student engagement went beyond just being interested in a particular lesson but in pursuing more language classes over time. “I have students who continue to level two, level three, level four,” [84:6] which is significant for a language such as Portuguese which is not commonly studied in US schools.

Mercedes in her remarks to us and survey and course comments detailed the kinds of activities she had planned for her higher-level classes, including a unit on Brazilian dance and “Carnevale.” we only observed Mercedes for one class for this study and that class was a beginning class with highly-structured, fairly basic activities; we are not able to make claims about teacher and student relationships or about student involvement with more complex topics. Nonetheless, the topics she noted and specific instructional goals she described for her higher-level classes appear promising for “deeper understanding” of language and culture. Given what we did observe and gleaned from past coursework and comments--her attention to varied activities, structuring a range of activities, integration of informal assessment, and close attention to where different students were in their understanding--this would certainly point strongly to her ability to carry out a coherent set of activities in and around the classroom that aimed at higher order understanding of more involved topics.

Claim 2.2: Mercedes considered her work with TfU part of an ongoing process of her own learning about teaching. The shifts in her practice she attributed to the framework meshed with previous professional development experiences, and she had specific ideas about weaknesses in her understanding and plans for ongoing work with the framework that involved colleagues.

Mercedes described her experience with TfU as part of “an ongoing process” of learning both during the course and when we followed up with her. As we mentioned earlier, her interest was not in TfU per se, but in “what really, really works for the students” [84:31].

She described Teaching for Understanding as “something that you grow as you put into practice” [84:18]. When she reflected on her work with the ideas of the framework, she noted that she wanted to “master” one aspect of the framework at a time. Over the previous year, she had first dealt with refining goals for language-learning across all of her courses, then worked on refining unit-level instructional goals for the advanced courses, including the units on Brazilian dance and festivals mentioned above. She felt ready to take on a new area of focus--informal and formal assessment. She characterizes this pattern in terms of how she views herself as a learner: “I need to master [one aspect] to feel comfortable with it, and that moves into, um, experimenting with other things.” She did not specifically mention devising activities that tied to goals. She had spent a good deal of her work in the online course on refining goal-oriented classroom activities and had acknowledged at the time that this was the most “intuitive” aspect of the framework for her, the one that lined up best with approaches to teaching language she was already using.

These previous sources on which she drew included training in drama, a set of experiences which she found aligned well with what Teaching for Understanding offered her. Her background in drama provided her with abundant ideas for creating activities that went beyond traditional ones. How much the TfU framework contributed to her design for various understanding performances and entry points is confused with the influence her background has. The TfU framework might have simply resonated with her in this regard, perhaps reinforcing what she already believed and did. The point of contrast between her drama training and TfU that she herself offered hinged on the central question about linking her teaching with students’ understanding emphasized by TfU:

I have to say, I think... for me, I took it as something that ...I felt ... complemented a lot that I had learned in drama strategies...workshops. [But] at the same time, it was a way for me to know, ‘Am I teaching in a way that the students are learning?’  
[84:37]

### **Louise M.**

Louise has worked for the past two years as the science coordinator of a public, K-8 charter school in a major city. Her job of serving as science mentor, coach, and “lead learner” for the school’s regular classroom teachers holds particular importance because of the school’s mission to promote science and technology learning for a student body of 320, 95% of whom are African-American or African/Hispanic. Before coming to the school, Louise taught science for three years in a suburban middle-school and then worked as a science coordinator in an urban district charged with helping primary school teachers adopt inquiry-based, “hands on” science curricula.

In the 2004-2005 school year, her school had state funding to offer professional development in Teaching for Understanding for all staff. A handful of teachers, including Louise, chose to take an online course in addition to the face-to-face workshops run by an outside facilitator. Louise took Focus on Student Understanding in the Fall of 2004 and subsequently enrolled in the online coach development course. She currently serves as an apprentice coach in one of the courses. Louise described her introduction to the framework as a “homecoming” because “it addressed, organized and explained so much of my thinking and beliefs.” Louise and a group of experienced science teachers used the framework to structure the school’s science curriculum around 4-6 major themes or “generative topics” at each grade level, pulling in curriculum units from a variety of research-based and nationally-known curricula. She also used the concepts of Teaching for Understanding in her mentoring and coaching work with the majority of other teachers on staff who did not have strong science backgrounds. Here she found her task particularly challenging, as it involved not only working with teachers with notions of pedagogy, but, crucially, with their own understanding of the science concepts they were to teach. She characterizes this problem in the following way:

[I]t’s a very serious dilemma in the, um, in the lack of content knowledge of the teachers. So, when you ask them, What do you really want the students to understand? It’s often, you know, very superficial. [81:5] ... And it’s easy [for the teachers] to get discouraged. It’s easy to go back [into their classrooms] and say, Okay, well, here’s this list of facts and, uh, I’m just going to make sure they know this list of facts, and I’ve done my job.[82:64]

Louise invited us to observe three lessons in one of two 6<sup>th</sup>-grade science classes she was co-teaching with the regular classroom teacher. She had agreed to take on more responsibility with these classes so that the regular teacher could observe Louise teaching some of the time, and at other times, do her own science coursework in preparation for the subsequent unit. The three consecutive lessons we observed were part of a semester-long theme of exploring human body systems. They fell in the middle of a six-lesson unit on comparing frog and human body systems through frog dissection. Similar to Mercedes’ desire to have us visit a Level One classroom—where she perceived her greatest struggles to be in applying TfU concepts--Louise wanted to show us her work on a new unit, one that she had just finished putting together as a model lesson for the classroom teacher and that neither she nor the teacher had taught before.

Claim 3.1: The activity of frog dissection greatly interested students in Louise’s class, and the goals she established attempted to build on this interest by bringing together many of the themes prior lessons had broached. However, the ambitious instructional goals Louise established for these lessons were not clearly aligned with the ways the students carried out the dissection or with what they appeared to take away from it.

Louise had her instructional goals clearly laid out on a large piece of flipchart paper attached to the whiteboard at the front of the classroom. Under the heading “Understanding Goals/Frog Dissection,” the sheet contained the following four goals:

- 1 How does dissecting a frog help us understand more about the human body systems?
- 2 What features and body systems do frogs and humans share?
- 3 Do organs that do similar jobs have similar shapes?

- 4 Why do frogs and humans belong to the same sub-phyla (vertebrate) and to different classes (amphibian and mammal)?”

According to an interview held before she taught the lessons, the ideas of TfU guided Louise back to the "big context of the unit" on human body systems, as she developed her instructional goals for the "smaller context" of the immediate tasks of frog dissection [82:7]. The “big context” of human body systems was how she came to define all four of the goals above. She knew from the beginning of the year that students were eager to dissect a frog, but she insisted that she would only do so if the dissection fit coherently within the curriculum.

In sketching out the above goals, she hoped to cover several previously-taught areas in which Louise felt students' understanding was shaky or non-existent. She recalled saying to herself in planning the unit, “There [are] so many things I would like this unit to do.”[82:45] These areas included identifying the components of particular systems (circulatory, respiratory, nervous, digestive), as well as being able to characterize the system as a whole (e.g., the “closed loop” of the circulatory system vs. the “feedback loop” of the nervous system). The fourth goal covered a topic, classification, which she had covered in the previous semester and which she knew had caused problems [82:10].

In what we observed, the two teachers, Louise and the classroom teacher, and their students emphasized understanding how to do dissection in a way that allowed students to recognize different parts of the frog. Students spent time following the teachers’ instructions, reading through detailed printed instructions, gaining familiarity with handling new tools and vocabulary (i.e., probe, scalpel, forceps), and trying with great care to carry out complicated procedures that allowed them to peel away the different layers of the frog’s anatomy so that they could even begin to differentiate organs.

It was noteworthy that, for the most part, students were engaged throughout. And it was precisely this high level of energy related to dissection that Louise noted she needed to contain with the above activities, if the students were to have any chance of ending up with a specimen they could learn from. She commented:

I feel like on Friday [the first day] if I had handed them tools and a frog, they would have cut it up. It would have been all over the place. [82:48]

Louise acknowledged that students got only as far as identifying individual organs, and missed the connection of what the organ looked like to what it did, as corroborated by our observations (#2,3) [78:79]. She also said, “I think the kids, in fact, are developing a sense of form and function.” [82:37] We did not have a basis for evaluating the degree to which students were making sense of their discoveries in larger ways; it was clear that they were very excited by the process of discovery, however.

In the next to last of the six lessons, Louise discovered that students had many questions about frogs and their habitat that a dissection could not answer. She had tried to elicit and address general questions about frogs early on but found that students did not have much to offer at the beginning. As homework on the night before the fifth lesson, which was to be a debriefing of what students had learned from the dissection, she assigned a two-sided sheet that talked about

frogs in general. During the following day's debriefing, students, by and large, did not draw much on their experience dissecting the frogs when offering observations. Louise remarked:

[W]hen I did a processing at the end, they actually began to ask more questions about the frog, and here, here was a dilemma for me because we weren't just studying frogs 'cause I had put it into the context of body systems. And, um, and then, so, the kids' questions that later came up, that were very interesting had to do with: How many spots does a frog have? Can you tell whether it's a male or female by the number of the spots? Does the, you know, that came up later. They actually didn't come up the first lesson when we looked at the external features of the frog. [82:13]

Many students were confused by a subsequent activity in which they were asked explicitly to connect their dissection observations to the questions posed in the instructional goals about human body systems and classification. Nonetheless, students did raise many points that they could have only gleaned from their reading, and the dissection activity had clearly piqued their interest in frogs and their anatomy.

Claim 3.2: Louise was capable of critiquing her own design and identifying some specific areas to improve, including the reframing of instructional goals and restructuring activities to align with those goals.

Louise readily offered up a critique of her goals in a conversation after she had finished the dissection unit, saying that she had gone "too far" [82:9] in her attempt to use high interest in dissection in the service of making up for gaps she perceived in students' understanding in other areas. "Too far" for Louise meant, in part, that these understanding goals were overly abstract:

[I]t's a funny thing because, in some ways, the understanding goals really, you know, kind of, tend to want to take me to this intellectual place...[82:34]

"Too far" also meant that they did not line up with what the students ended up doing:

[S]ome of my goals should have been, the kids will be able to recognize and use the tools of a dissection kit. [82:34]

She comments that these goals should have taken precedence:

And that, in fact, in some ways, given their grade level, [goals focused on dissection itself] could have been first...

And the other stuff, which was, which was intellectually more interesting to me, and where I wanted it to go for some understanding, was not as much for them. [82:54]

Louise offered several ways that instructional goals might be revised the next time around in addition to greater attention on dissection per se [82:15, 45]. These include goals linked with basic student questions about frogs, (e.g., habitat, sexing, spots) as well as being selective rather than comprehensive in comparing human and frog body systems. She mentioned that one way to do this would be to focus on a feature of the frog that bore closer resemblance to human anatomy, such as the tongue, and which could be easily connected from the outside to the larger internal system of which it was part (i.e., throat, stomach, intestines, cloaca).

She also commented on the implications such goals would carry for the kinds of activities she organized, elaborating in particular on the culminating reflection activity that had been derailed

by students' broader interests in understanding frogs and recognizing the need for a more coherent "processing piece." [82:36]

Louise's articulate critique of her unit did not offer specific ways she would revise her ways of gauging students' understanding in an ongoing way. Her characterization of how she might integrate informal and formal means of assessing students' understanding in the service of revised goals and activities was not clear. This lack left us with questions about how she would come to mold the activities to the specific needs of students, and on a different level, how she would help the teacher she was coaching probe students' understanding.

### **Hannah K.**

Hannah K. teaches English Language Arts at a public high school in a mid-sized city. She has been teaching for 12 years, and over that time has had many different formal and informal opportunities to learn Teaching for Understanding and apply the ideas in her classroom. Of particular importance to Hannah has been her continued contact with a teacher who served as her mentor when Hannah was student teaching. The teacher has many years of experience working specifically with the framework. Hannah took over that teacher's classroom and initially used lesson plans designed with the framework in her first years of teaching. Hannah took the introductory TfU online course, Focus on Student Understanding, in the Summer of 2004. She describes it as "the only real formal TfU" [76:1] training that she has had. Similar to Mercedes, Hannah also took part in several one-day workshops about the framework and is part of an ongoing teacher-research group that works with ideas about pedagogy closely related to those espoused by the framework. These multiple connections, according to Hannah, help the ideas stay "close to the top" as she plans, teaches, evaluates how she has taught a lesson, and works with other teachers and student-teachers.

Hannah invited us to observe two consecutive lessons towards the end of a month-long unit on William Golding's *Lord of the Flies* in a ninth-grade World Literature class. At Hannah's high school, most courses, including World Literature, were split into two levels based on academic rigor. Hannah chose to teach only classes that were in what was informally called the "lower track" because of her belief in providing a high-quality education to all students.

Claim 4.1: Over time, Hannah had developed a tightly-integrated unit that brought together instructional goals, classroom activities, and various means of informal assessment. The unit used "character" as a way of engaging students in the material and aiming them towards producing "traditional 5-paragraph essays."

Hannah had a set of seven goals for student learning in the *Lord of the Flies* unit on a flipchart at the front of the classroom. These included the following:

- 1 How do humans create or safeguard a sense of dignity - esp. in situations of extreme stress?
- 2 How do I "read" symbols in text and media? How does the context of a symbol determine its meaning?
- 3 How does an author create/develop a character and how do changes in a character relate to the theme in a work of literature?

- 4 How can I use focused note-taking to improve my ability to respond to literature both in discussion and formal writing assignments?
- 5 How can knowledge of the historical period in which a piece of literature was written add to my understanding of a text?
- 6 How can I write a successful analysis of a piece of literature?
- 7 How can discussion with peers add to my understanding of a text and help me achieve understanding goals? [72]

Hannah noted that she had developed these unit goals on her own and had a sense of pride in them. They were "mine," as she describes, and had worked for her with very different groups of students.

I still feel good about, about these understanding goals, and they still, uh, really, I feel help to guide, not only what I taught but, but the... The, kind of, the, um, the final, their final performance, and their performances along the way. [76:9]

The third goal, emphasizing the role of character, was a topic that Hannah wove through all others. Hannah chose "character" rather than plot as a "jumping-off point" [76:6]. The initial idea to do so came from a colleague. After teaching the unit in this way several times, Hannah found that the topic opened possibilities for engaging students with the text in ways that surpassed her own expectations of students and their expectations of themselves as writers.

We observed and Hannah highlighted that the emphasis on character gave students a clearly-delineated way of exploring the text. Concern with character created empathy. Hannah elaborated:

I feel like it really contributes to understanding because it creates empathy, and I don't think that's a necessarily, um, an obvious connection, but I find that the students, even if, if I randomly assign them a character, or if they choose a character themselves, they tend to become invested in that character and that character's perspective, um, on, on the world, or that character's value to the group.[76:6]

She found that interest in a particular character led students to read more on their own and to stay interested during the times students read sections together in class.

Character also proved fruitful for tying together two of Hannah's course-long goals, which were to foster student independence and build students' skills in writing genres essential to their success in school.

I feel like this whole connection to the character gives a gigantic, like, jump-start to this process of writing a paper, which is not a fun or exciting thing to do, but a really, really important skill that they need to have, and that they come pretty much without any experience in doing. [76:6]

The theme of student independence was a prominent one in our conversations with Hannah and in the lessons observed. In two classes we observed, we could see clear evidence of her orienting activities towards the third, fourth, sixth and seventh goals above. These activities increased student engagement with the text in various ways and supported students' taking on responsibility for articulating and defending their own ideas tied to their chosen character.

Activities in the lessons we observed were spelled out in detail in a packet of several pages that had gone out to students the week before. The activities delineated in the packet helped students work up their notes, observations, and reflections into the final activity for the unit, writing a 5-paragraph essay. Hannah noted that this allowed students to work on their own without her involvement at each step:

A lot of times, the way the classroom will look is that a kid is just going to sit there and wait for us, you know, until somebody can come over. And helping students to become more independent learners is just something that has to be up at the top... [76:10]

Student activities in the lessons we observed included independent work with the packet; work with a "reflection partner" on critiquing writing; small group discussion about the work of reflection partners; and whole group presentation. In the latter, Hannah modeled the next section they were going to work on by showing a page from the packet on the overhead and filling it in as she talked through her own examples. This variation in activity and groupings were decisions she had made to bolster student participation [76:15].

Informal assessment was integral to each activity and, according to Hannah, was part of her plan to foster independent learners [76:15]. In the design of the packet and student-student as well as student-teacher interactions, explicit criteria existed for how to look at one's own and others' work in ways that helped students build on and improve their writing.

Observations showed that a core group of students (5-7, depending on class) were generally engaged with the assignments described in the packet and seemed to draw on a variety of sources (their own notes, focused conversations with peers, one-on-one with teacher or student teacher) to help them progress. We noted that some one-on-one interactions between teacher and student aimed towards teacher-defined ends rather than building on those defined by student. Three to five students were disengaged for much of the lesson in both observations. Nonetheless, even these students engaged with the materials at some point, although their interaction with the teacher tended to be much more directive.

Observers and Hannah herself questioned the extent to which such a highly-structured "packet" served as support versus a crutch for students. Nonetheless, we were confident that a majority of the class had engaged seriously with the text and with their own and others' ideas and writings in a wide variety of ways. Hannah's goal of fostering "independent learners" appeared on track. She summarized:

And, so, this paper, which I thought might be too much for them, that I thought might fall flat on its face, does not feel like that at all. In fact, I've got kids who are really, um, surprising themselves, I think... [76:18]

Claim 4.2: Hannah actively sought a range of supports for her ongoing learning about Teaching for Understanding. She was committed to examining critically her approaches to teaching and her students' learning in ways that would lead to continuous improvements in her practice. Such dedication also made attribution to any one source of support—one online course, for example—impossible.

Hannah has sought out opportunities to further her work around ideas closely-related to TfU in many different venues in addition to online coursework: within-school working groups; across-district workshops; summer intensives; and after-school seminars. She continues to look for occasions to connect with other teachers interested in the framework. As we mentioned, she notes that the course was her only "formal" introduction to the framework (as opposed to her informal collaborations with other teachers and use of their materials in her own teaching) [76:62]. The many other professional development venues in which Hannah has worked with ideas directly and indirectly related to TfU make it impossible for us or Hannah herself to draw definite connections between what the online course offered and her subsequent use of ideas in practice. Hannah's experience demonstrates the complexity of relationships in this realm. It also shows a mature example of TfU in practice working with a difficult student group.

### ***Observation Ratings***

We used our observation protocol described above to generate ratings for the seven lessons of the four teachers we observed. (See Appendix B: WIDE Classroom Observation Protocol.) In some cases we rated multiple lessons for the same teacher or had more than one person rate the same lesson. In this way we obtained a total of nine ratings for any given topic on seven observed lessons (averages given below are based on seven lessons). For the most part, framework elements that were addressed early in our courses drew higher ratings than those dealt with later.

Items associated with Generative Topics (12, 13, 14, and 15) were generally rated highly on our 0-4 scale. All four teachers were given at least one rating of 2 among these rows. Scores for number 12 on clarity and disciplinary importance of topic were especially high. Connections to other content disciplines (15) was the exception in the Generative Topics sphere, as it drew nearly all zeros.

We saw no instance of truly effective use and integration of Understanding Goals. Items related to Understanding Goals (items 1, 3, 4, 18-21) drew middling ratings, usually near 2, but only one of these rows was given any 4s (item 1, on the teacher's reference to goals). Understanding Performances ratings (2-8, 16-19) were a little lower still, averaging 1.6. Only two of these 11 rows were assigned any 4's (6 on collaboration and 8 on multiple routes to learning). And for Ongoing Assessment (5, 9-11), only Hannah's lessons drew high scores, while for all the other teachers scores averaged less than 1.0.

The seven lessons we observed were not particularly high in the characteristics we considered student-centered (2, 5-7, 16, 18). A subset of these involved transferring authority to students; these dealt with encouraging students to help direct the lesson or to challenge ideas (5 and 7). For these two items, most scores were zeros, and again, only Hannah's lessons were assigned scores of 2 or above.

### ***Cross-case Analysis***

This section explores themes in the kinds of changes we observed and teachers reported following their participation in online courses. Before we do so, we want to take a moment for a

methodological aside concerning the plausibility of our claims. First we remind readers that our intention in the subsequent discussion section is to draw out implications from this small-scale study for the design of evaluation instruments that hold the promise of capturing large-scale findings that go beyond teachers' self-report of course outcomes. The credibility of that section hinges on the plausibility of our claims in this and the preceding sections. We realize that much might be found lacking in the choice of our participants and the completeness of our data. Participant selection for observations was problematic. We did select "critical cases," those that held the greatest promise of showing shifts in teaching practice following their taking part in an online course. Nonetheless, those available for observations largely came down to a handful of teachers willing to go out of their way to make arrangements for our visits.

The subjects and classes observed all present their own threats to plausibility as well. In Courtney's case, we observed a computer literacy class that did not necessarily aim towards "deeper understanding" of computers and the nature of systems, say, but instead was meant to give all students a certain level of basic skills. Thus, searching for evidence of designs for deeper understanding in such a setting could be misdirected. Likewise, Mercedes directed us to a beginning language class, which again stressed basics of vocabulary and grammar. Louise was a curriculum specialist pulled into a class that was not of her regular students; thus many of the explicit and tacit patterns that one might expect to be in place at the mid-point of the year were still under negotiation. Certainly, we also suffered from the methodological problem that plagues classroom observations, namely, how to define the unit of analysis—the number of observations and interviews necessary to make plausible claims about a particular teacher's routines.

We have tried to mitigate these deficiencies through multiple and overlapping sources of data, which ranged from the teachers' and their coaches postings in course discussion threads to survey responses to semi-structured interviews to classroom observations. Certainly flaws exist in this strategy as well, principally the dependence on self-report. We bolster our claims by pointing out that this data covers several different points in time from within the course to up to 14 months after the course. In addition, we use data from interviews with other study participants at a distance whom we did not have a chance to observe. Thus breadth and time give us at least some footing for our claims.

In the following, we explore themes across the four observed cases and draw in supporting or contrasting data from telephone interviews with other participants. We make several claims about commonalities we observed and/or heard among teachers. These areas of convergence include attention to selecting topics that engage student interests; making instructional goals explicit to students; and creating activities that encourage student interaction and involvement with instructional aims. We also note several areas in which teachers' attempts to apply course ideas vary greatly across these cases. Greatest variation occurred with regard to establishing well-defined instructional goals; designing a sequence of activities that is coherent across a unit; uses of formative assessment as both a means of monitoring students' performance and as a tool to foster learning; and commitment to continuous work related to TfU with colleagues.

### ***Areas of Convergence***

Below we briefly describe three major themes that all four observed teachers and most of the five interviews by phone reported as results of their online course experience. We characterize the

theme and then draw out ways that it varied across cases. The themes outlined in this first of two sections are those for which we had both teachers' reports of ways they had applied ideas from the online course and corroborating data from the limited numbers of observations we conducted. The section following this, in which we explore what we found to be areas of greatest divergence between what teachers reported and we observed, is more speculative due to our limited observations.

Claim 5.1: All nine teachers emphasized that ideas gleaned from the online course helped them identify unit topics that engaged students' interests.

All teachers emphasized ways the online course had helped them select unit themes and topics with students' interests in mind. In some instances, we observed that students affirmed their choices. Teachers described students' reactions with such terms as "engaged," "enthusiastic," "excited," "having fun." This sense of excitement was not in all cases effectively channeled in the service of getting to deeper disciplinary understanding. For example, students were fascinated with coming up with a computer game in the computer literacy class but instructional goals aimed at a basic level of operational facility, not higher levels of understanding how computer systems functioned.

Claim 5.2: All teachers noted that the online course helped them to develop and share with their students instructional goals aimed at deeper understanding.

In all nine cases, teachers made reference to the online course in describing ways they had come to pay greater attention to the value of making instructional aims clear to students. One of the teachers interviewed by phone echoed others when she said how surprised she was at students' new attention to her and her instruction once they had been provided with explicit goals. [62:10]

From our observations, we saw very different types of goals in play across the lessons observed. Courtney had elaborated task-specific criteria which she described as goals. Mercedes showed us overarching goals that she posted for students in all of her courses. She also described unit-level goals for her advanced learners and invited us to the "Level One" class specifically because she found so challenging the task of crafting goals (and activities) that targeted beginners' understanding. Louise had defined goals for her frog dissection unit that proved by her own account and our observations too ambitious for her students. Hannah had developed course goals, unit goals, and task-specific criteria that tied into one another. She emphasized that she had continuously revised all three as she taught the unit over the past few years. Hannah, Louise, and Mercedes all spoke of the need for—and difficulties of --continual refinement in delineating unit-level goals, in particular.

Claim 5.3: All teachers noted that course ideas had spurred them to find ways to promote student-to-student interaction and involvement with instructional aims.

All nine teachers noted that they had used what they learned in the online course to design ways of increasing interaction among students in the service of learning. "Pair-sharing" was the most frequent form of student-student interaction in the lessons we observed. We also saw small groups of students working together in the classrooms of Mercedes and Hannah. Courtney,

Mercedes, and Louise emphasized that their reasons for increasing student interaction were to encourage students' "ownership" of their learning. These teachers reported and we observed that ideas and resources from the online course had helped them to develop materials that structured students' interactions "step-by-step" for a particular task. Hannah, as we have noted, placed particular value on students' independence. In the lessons we observed, we saw how her packet defined how students were to interact with one another in particular tasks. Moreover, Hannah also articulated sequences of tasks over the duration of the lesson that involved different patterns of student interaction and built towards greater independence.

Claim 5.4: Eight of the nine teachers highlighted ways that collaboration had helped their understanding of course ideas and noted specific ways they were seeking support from colleagues for their ongoing exploration of the framework.

Almost all of those with whom we followed up mentioned ways that their collaboration with other teachers had helped in their application of the ideas of the online course. Of the teachers observed, those who expressed the greatest commitment to ongoing application of course ideas in their own practice had all taken part in professional development at their school emphasizing TfU. These three teachers also mentioned that they were looking for colleagues with whom to collaborate.

### ***Areas of Divergence***

Here we look into areas in which teachers' reports of what they intended to do and what we observed were at odds. Participants sometimes reflected on what they had intended to do and compared this with how things turned out in the classroom. When those self-reflections lined up with what we had observed, we felt more confident in our own observations. In other instances, teachers' reflections on their intentions and what they said they had done differed from what we observed. The plausibility of our claims based on this latter category is particularly at risk because our observations were limited, and we have not yet checked our claims with our participants. (Because of the limited data available from our telephone conversations, we have not included those interviewed by phone in this part of the analysis.) Nonetheless, we believe the following are important and useful points to put forward for further discussion.

Claim 5.5: Observed participants' lessons varied in the degree to which classroom activities and student work products aligned with instructional goals.

This theme touches on the degree to which students' work and activities line up in direct ways with the kinds of understandings identified for a particular lesson, unit, and/or course. In the computer literacy lesson, Courtney had spent considerable time in designing classroom activities that were well-structured and engaging for students. However, we did not see any indication that the activities were steering students towards the kinds of broader or deeper understandings that the online course encouraged participants to tackle in their curriculum. Louise had sophisticated goals for her frog dissection unit and yet in the lessons we observed ended up paring the activities and work she expected of students down to a much more basic level. Louise, Mercedes, and Hannah all noted how challenging they found the process of refining goals and aligning goals with activities and work products. Hannah, in particular, mentioned that this was why she

sought others with whom to work: “Coming up with really good, interesting performances of understandings [is] something that I need colleagues for.” [76:46].

Claim 5.6: All observed participants mentioned the importance of using informal teacher- and student-centered assessment to improve the quality of student work. We only observed this occurring in the lessons of one of the teachers.

All four participants emphasized the importance of explicit criteria in helping students achieve high quality work. We observed one of the four teachers incorporating assessment in ways that offered structured opportunities for iteratively improving the quality of student work. Another teacher gave detailed examples of ways she had included assessment in lessons for her students; in two other cases, the teachers appeared to distinguish assessment from other classroom activities in ways that made it distinct from, rather than integral to the production of, high-quality work.

Claim 5.5: Observed participants’ varied in the degree to which they articulated specific ideas about how they planned to revise their unit in accordance with the elements of Teaching for Understanding.

As we mentioned in the individual profiles, Mercedes and Louise invited us to observe lessons that they knew were problematic for them or still under construction. Louise in particular noted specific ways she planned to improve several different aspects of her lesson. Mercedes’ plans were more general—to figure out how to apply TfU in her Level One classes. Although Hannah had taught the *Lord of the Flies* several times before, she still noted ways she planned to improve the lesson, particularly some that could reduce her dependence on “the packet” to structure students’ experience.

### **Summary of Claims**

Below we list the claims highlighted in the preceding sections.

1.1: Courtney applied ideas from two online courses to help engage students in classroom activities. She noted and researchers observed her emphasis on student involvement in three areas: she selected topics that engaged students’ interests; she encouraged student-to-student interaction in classroom activities; and she encouraged students’ contributions in defining self- and peer-assessment.

1.2: Courtney’s focus on students provided little in the way of specifics that would identify her as having studied Teaching for Understanding, in particular. No explicit instructional goals aimed specifically at understanding (as opposed to building computer-related skills, such as file-naming conventions). Also, the design of her unit conflated notions of instructional goals, classroom activities, and informal assessment. It placed primary emphasis on student engagement and well-ordered set of steps rather than a sequence of activities aimed at higher-order understanding.

2.1: Mercedes’ application of course ideas helped her bring coherence to her existing, varied repertoire of classroom activities. In particular TfU gave her a framework for structuring the

sequence of activities and for making informal assessment an integral part of those activities. As a result, she monitored her students' learning more systematically and encouraged her students' flexible and in-depth understanding.

2.2: Mercedes considered her work with TfU part of an ongoing process of her own learning about teaching. The shifts in her practice she attributed to the framework meshed with previous professional development experiences, and she had specific ideas about weaknesses in her understanding and plans for ongoing work with the framework that involved colleagues.

3.1: The activity of frog dissection greatly interested students in Louise's class, and the goals she established attempted to build on this interest by bringing together many of the themes prior lessons had broached. However, the ambitious instructional goals Louise established for these lessons were not clearly aligned with the ways the students carried out the dissection and what they appeared to take away from it.

3.2: Louise was capable of critiquing her own design and identifying some specific areas to improve, including the reframing of instructional goals and restructuring activities to align with those goals.

4.1: Over time, Hannah had developed a tightly-integrated unit that brought together instructional goals, classroom activities, and various means of informal assessment using "character" as a way of engaging students in the material and aiming them towards producing "traditional 5-paragraph essays."

4.2: Hannah actively sought a range of supports for her ongoing learning about Teaching for Understanding. She was committed to examining critically her approaches to teaching and her students' learning in ways that would lead to continuous improvements in her practice. Such dedication also made attribution to any one source of support—one online course, for example—impossible.

5.1: All nine teachers emphasized that ideas gleaned from the online course helped them identify unit topics that engaged students' interests.

5.2: All teachers noted that the online course helped them to develop and share with their students instructional goals aimed at deeper understanding.

5.3: All teachers noted that course ideas had spurred them to find ways to promote student-to-student interaction and involvement with instructional aims.

5.4: Eight of the nine teachers highlighted ways that collaboration had helped their understanding of course ideas and noted specific ways they were seeking support from colleagues for their ongoing exploration of the framework.

5.5: Observed participants' lessons varied in the degree to which classroom activities and student work products aligned with instructional goals.

5.6: All observed participants' mentioned the importance of using informal teacher and student-centered assessment to improve the quality of student work. We only observed this occurring in the lessons of one of the teachers.

## Discussion

This section draws out the implications of what we report above for our next generation of research. Specifically, we are interested in developing better indicators that are capable of measuring, on a large scale, change in general pedagogical practice following teachers' participation in WIDE World courses. As we noted, our first attempts at tracking shifts in the application of course ideas using survey methods proved only partially tenable; teachers' attitudes and their reported plans to use various instructional methods could be measured reliably, whereas their actual use of these methods could not. We then turned to interviews and observations to get a more in-depth look at ways teachers were putting coursework into practice. Our interest here was first to craft richly descriptive accounts of teachers' practice that corresponded with course ideas and aligned with their own reports of influence from the course. We then hoped to move beyond description to identify particular phenomena that appeared highly indicative of their effective use—or lack thereof—of course ideas.

Below we present several directions that we find promising for more intensive development. First we present questions for which operationalized indicators are needed and then a discussion of potential data collection methods. We also examine what might make these directions problematic. Some would-be indicators deal with aspects of practice within particular TfU elements; some, with relationships among elements; and the last, with teachers' commitment to ongoing learning.

The following possibilities for indicators concern aspects of practice within particular elements.

- 1a. Generative Topics: To what degree is the teacher's lesson/unit topic central and generative as opposed to merely engaging students' interests?
- 1b. Understanding Goals: To what degree are goals scoped properly? (In some cases the teacher's stated goals do not match up with the set of activities for the unit, but instead are too broad, as with those encompassing an entire semester, or too narrow, as with those addressing only a single assignment.)
- 1c. Understanding Performances: To what degree are entry points considered? To what degree is a sequence of performances in place that reveals attention to the process of understanding, not just the products? For these areas, existing survey items about plans to incorporate constructivist methods can partially accomplish our goal, as most ask teachers about their plans to employ such performances.
- 1d. Ongoing Assessment: How varied and how sound is the teacher's use of ongoing assessment? Here, as with 1c, survey items on instructional plans may capture a modest portion of the domain, as they ask about use of assessment criteria and development of those criteria with students. But assessment may be the most difficult part of the framework to learn well, and so any measure of the soundness or quality of implementation runs the risk of missing initial gains that teachers make in other respects.

Looking for correspondence among elements also offers rich possibilities for the development of critical indicators.

- 2a. Alignment of Understanding Goals/Performances: To what degree are the work and activities teachers ask of students clearly helping them progress toward one or more of the understanding goals?
- 2b. Alignment of Ongoing Assessment: What part does assessment play in an ongoing way to suggest subsequent instructional steps in the classroom? How does assessment contribute to students' improvement of their own work towards one or more of the understanding goals?

Another avenue that may be interesting to pursue is measuring teachers' interest in ongoing learning about pedagogy and in connecting with professional community to continue learning. It is possible, however, that although level of such interest could accurately indicate attempts to use the framework, it might not correlate with effective use.

The ways in which we might make operational ideas mentioned above include the following:

Give a written test of educators' ability to discuss or critique the alignment of different framework elements (2a and 2b above). One idea would be to have teachers discuss such alignment in their own lesson plans. Another would be to have them critique the alignment of lesson plans presented in a scenario or vignette. -- Problem: WIDE World's offerings are general pedagogical courses, while such a test would have to deal with discipline-specific content. It would be impractical to try to design a separate test for each subject area. In addition, we know of no clearcut, reliable procedures that have been developed for scoring such critiques.

Have experts rate lesson plans submitted by teachers:

- To what degree do lesson plans attend to process and not just product... use entry points...use a range of performances... or include a sequence of performances, from less structured exploration/experimentation to more guided inquiry to a culminating performance (1c).
- To what degree is the topic central and generative to a discipline (1a).
- How sound and thorough is the plan for ongoing assessment; how varied are the activities designed to assess and improve learning (is student work assessed at multiple times in the unit and by multiple people, including teacher, peers, self, others) (1d).

-- Problem: again, ours are general pedagogical courses, whereas the above would require judging discipline-specific lesson plans. Attempts at a solution: the program could keep the assignment the same for all participants and use a single scoring instrument to evaluate learners' work, but train raters from a variety of content disciplines. In this way there would be no need to create separate, discipline-specific assignments. We have made some strides in this regard in performance assessment in our courses, through which each instructional team judges these and other aspects of lesson plans according to carefully developed instruments. Validity and reliability for the resulting ratings have been decidedly mixed (Eddy Spicer *et al.*, 2005). However, several other groups, such as the Renaissance Partnership (Denner *et al.*, 2001), have produced somewhat promising research findings as to the prospects for judging teacher work samples.

## **Conclusion**

We have come some way down the road towards defining self-report indicators of teacher growth in areas of general pedagogy, but we have not yet traveled its full length. We have some rich accounts; our analyses have yielded a list of plausible claims. We also have an equally long list of threats to the plausibility of those claims. Nonetheless, this study has tuned up our eyes and ears in ways that point us towards certain prominent features of effective practice that we find promising for further development. The path from these features to valid and reliable indicators still needs to be blazed. But we do have a better sense both of the challenge and way forward.

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## Appendix A: Selected scales from WIDE World surveys

General topic	# of items	Scale	Typical items (paraphrased)	Reliab./ Alpha	Reliab./ Test-retest, n=25
Retrospective measures of effect	5	Retrospective Effect on Practice	How much did the course improve your design of curricula, lessons and activities? your assessment of students?	.88	
Instructional and attitudinal changes (measured pre-post)	11	Constructivist practices -- plans	Have you made plans to have students do more or do less: explain their reasoning in depth, find multiple ways to solve a problem, take on complex projects involving collaboration or the creation of products	.85	
	5	Traditional practices -- plans	Have you made plans to have students do more or do less: use worksheets, work on factual information in front of the class, attend to teacher's lecture or presentation	.73	
	6	Leadership roles adopted	Have you mentored other teachers? Given presentations at trainings? Are you interested in doing so? [Leadership is also broken down into a Coaching/Mentoring scale and a Group Leadership scale]	.74	.8
	4	Attitude toward instructional collaboration	How favorably disposed toward collaborating by observing one another teach? by developing lesson plans with others? by discussing student assessment?	.72	.7
	6	Attitude toward computers	How comfortable working with different software? How often able to fix computer problems?	.81	.8
	4	Attitude toward online communication	Know how to use discussion boards? How comfortable communicating with colleagues online?	.74	.8

## Appendix B: WIDE Classroom Observation Protocol

(Includes ratings from lessons observed)

topic	item #	Aspect looked for in lesson	Han.-- rbs	Han.-- des	Han.-- des	Lou.-- rbs	Lou.-- des	Lou.-- rbs	Lou.-- des	Cou.-- rbs	Mer.-- rbs	avg of 7 lessons
UG	1	Teacher makes relevant <b>references to</b> explicit unit or lesson <b>goals</b> .	4	0	0	4	3	4	3	4	2	<u>2.6</u>
UP/SC	2	A high proportion of content-related talk takes place <b>between and among students</b> .	0	1	3	2	2	3	2	0	2	1.8
UG/UP	3	Students engage in <b>extended conversational exchanges</b> with the teacher and/or with their peers in a way that leads toward new meanings and understandings.	3	2	3	0	1	2	2	0	1	1.6
UG/UP	4	<b>Teacher and students explore central ideas in depth</b> so as to get at interconnections and relationships.	2	3	2	1	1	2	1	2	0	1.5
UP/OA/SC	5	Teacher encourages constructive criticism and the <b>challenging of ideas</b> .	3	2	2	0	0	0	1	0	0	0.8
UP/SC	6	<b>Collaboration</b> is used to help students engage actively with content.	0	2	4	3	4	3	2	0	2	2.2
UP/SC	7	Teacher includes student ideas to help determine the <b>focus and direction</b> of the lesson.	1	3	3	0	0	0	0	0	0	0.7
UP	8	Students are asked to find <b>more than one way</b> to solve a problem or demonstrate understanding.	2	2	2	0	2	1	0	2	4	1.7
OA	9	Students or teacher <b>refer to criteria</b> that have been explicitly articulated for assessment of student work.	4	4	4	0	1	0	1	1	0	1.5
OA	10	Students are asked to <b>review and discuss</b> their work in relation to assessment <b>criteria</b> .	4	4	4	0	1	0	0	0	0	1.2

OA	11	Students are asked to <b>reflect</b> deliberately on their work and then to <b>follow up</b> on that reflection in subsequent work.	3	2	3	0	2	1	0	0	0	<b>1.1</b>
GT	12	The <b>topic</b> of the lesson is clear and important to the discipline.	4	4	4	4	3	3	3	4	4	<b><u>3.6</u></b>
GT	13	Topic is designed to engage <b>student interest</b> .	4	3	3	2	2	3	1	2	4	<b><u>2.6</u></b>
GT	14	Relevant connections to <b>real-world phenomena</b> are explored.	0	0	2	2	2	2	1	2	4	<b>1.9</b>
GT	15	Relevant connections to <b>other content disciplines</b> are explored.	0	0	0	0	0	0	0	0	1	<b><u>0.1</u></b>
UP/SC	16	Teacher takes <b>student differences</b> into consideration through the use of classroom groupings, varied instructional approaches, and/or student options for activities.	3	3	3	2	1	2	0	0	3	<b>1.8</b>
UG/UP	17	Teacher takes steps to bring out <b>students' prior knowledge</b> in the process of developing new meanings and understandings.	2	3	3	1	1	2	1	1	2	<b>1.8</b>
UP/UG/ SC	18	Teacher takes advantage of student <b>confusion and misconceptions</b> in a way that supports the development of new meanings and understandings.	1	2	3	1	2	1	2	1	2	<b>1.7</b>
UG/UP	19	Students are engaged in making clear distinctions, solving problems, and developing <b>more complex understandings</b> .	2	2	3	1	1	2	1	1	3	<b>1.9</b>
UG	20	The lesson involves students in <b>manipulating information and ideas</b> to produce new meanings and understandings.	2	2	3	0	3	2	1	1	2	<b>1.8</b>
UG	21	The lesson promotes strongly <b>coherent</b> conceptual understanding.	3	3	3	1	2	1	1	1	3	<b>1.9</b>
<b>avg for lesson</b>			<b>2.2</b>	<b>2.2</b>	<b>2.7</b>	<b>1.1</b>	<b>1.6</b>	<b>1.6</b>	<b>1.1</b>	<b>1.0</b>	<b>1.9</b>	<b>1.7</b>

## Appendix C: Post-observation Interview Protocol

INTERVIEW SUMMARY (adapted from Miles & Huberman, 1994)

Please fill out this sheet as soon after your interview as possible and upload to the LTFU folder on the shared drive.

Interviewer:

Interviewee:

Interview Date:

Today's Date:

Research Question:

1. *What were the main issues or themes that struck you?*
2. *Summarize the information you got (or failed to get) in each of the target areas (impact on teaching practices--curriculum planning, classroom instruction, assessment; impact on students/student learning).*
3. *What else struck you as salient, interesting, illuminating or important?*
4. *What new (or remaining) target questions and key concerns do you have in considering any email follow-up with this interviewee or next contacts with others?*
5. *Comments to improve this interview process/protocol – Note anything related to wording of specific questions, question sequence, timing, etc.*
6. *Comments about implications of this for other instruments, especially WICOP items and pre/post survey questions*

Interviewee: \_\_\_\_\_ Date of Interview: \_\_\_\_\_  
Title/School: \_\_\_\_\_ Interview #: \_\_\_\_\_  
Online courses/semesters taken: \_\_\_\_\_  
Interviewed by: \_\_\_\_\_ Start time: \_\_\_\_\_ End time: \_\_\_\_\_  
Place: \_\_\_\_\_ Duration: \_\_\_\_\_  
Audio filename: \_\_\_\_\_ Transcript filename: \_\_\_\_\_  
Special notes about logistics, including recording: \_\_\_\_\_

[Interviewer Opening Script]

[Pay attention and note in field notes: attitude, references to material resources (copies of documents, online resources, etc.)]

Overarching RQ: What kinds of changes in teaching practice and student learning do teachers attribute to participation in an online course?

Specific RQ: What kinds of desirable teaching practices and evidence of student understanding are observable in the classroom?

Purpose—The Study: This will give us vital information about how you and others are putting course ideas into practice, and we hope it will give you a chance to think about your work in different ways. We want to emphasize that our focus is on what these courses might mean for teachers. As such, this will in no way be an evaluation of your teaching.

Purpose—This Interview: Our purpose here is to get more detailed information on your plans for the lessons we observed, your reflections on what happened, and your thoughts about specific ways you have used ideas from the course. Doesn't have to represent your best teaching or your most successful teaching moments.

Logistics—Tape recording, note taking, confidentiality:

I'd like to tape this interview because it's so important for me to get your words and ideas directly. Using the recorder will help me do this, and the only ones listening to the tape will be my research colleagues at WIDE and, possibly, someone doing the transcription. I'd also like to take notes during the interview, if that's alright with you. These help me keep track of the interview as it goes along.

/\_\_\_/ Recording OK? [Y for yes, N for no]

/\_\_\_/ Note taking OK?

[If interviewee does not agree to recording, take careful notes during the interview and make time immediately afterwards to reconstruct.]

I just wanted to remind you that you can withdraw your consent at any time. Nothing you say will ever be identified with you personally. We'll use a pseudonym in all our records and reporting. Do you have any questions or concerns about this?

Turn on the tape recorder.

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#### A. Observed Lesson and TfU

[RECAP brief, descriptive account of the lesson(s) you observed focusing on descriptive sequence of activities.]

What features or aspects of the lessons I observed would you point out as showing some evidence of the Teaching for Understanding framework?

Overall, how well did the lesson mesh with what you had planned?

What parts of the lesson do you think worked well?

Prompts: Why? For whom?

Prompt: What ways did you check in with students about their understanding?

Some examples of probing questions:

- What's your hunch about...?
- What was your intention when...?
- What do you assume to be true about...?

Given what you know now, what parts do you think didn't work as well?

What would you change about the lesson when you prepare to teach it next time?

- What is the connection between \_\_\_\_\_ and \_\_\_\_\_?
- What would happen if...?
- What if the opposite were true? Then what?
- How might your assumptions about X have influenced how you are thinking about Y?
- Why is this a dilemma for you? OR Why is this a dilemma for you? OR Why is this a dilemma for you?

#### D. Online Course

Was there anything in the lesson that you would attribute specifically to the ideas you worked with in your online course?

How did this differ from what you had been doing before the course?

Prompt: Teacher focus - Did you teach the same or a similar lesson before? If so, how was it different?

Prompt: Student difference- In what ways did your students this time approach what they were learning in ways different from what students in previous years/at previous times have done?

A. Context for the Lesson: Students, Class session, Lessons

How would you briefly characterize the range of learners in your class? Follow up: age range, English language learners, students with special needs, recent immigrants, race, ethnicity, socioeconomic background, and cultures represented, other. How similar or different are they to those in your other classes? Other years?

What about these particular class periods I observed? How typical were they for this group of learners in terms of attendance, student attitude... anything not having to do with the lesson itself?

How would you characterize this lesson that I observed? How similar to other lessons you taught this class this semester? How similar to other years? How about within this unit, where did this lesson fall?

E. Sweep Questions

Are there other examples or situations that provide examples of how other aspects of your teaching practice or student learning has changed?

Prompt: Be sure to ask about:

- Students, impact on
- Teachers, impact on planning, instruction, assessment, collaboration
- Ways to better use technology (for TSNT learners)

F. Validity-check Question

Were there ideas from the course that didn't work or that you found weren't helpful to your teaching when you tried them out?

What professional experiences have you had recently that have contributed to the ways you think about your teaching or teach?

G. Follow-up Video

Mention interest in video. Determine which lesson, when.

H. Closing Questions

[Summarize some of the interviewee's key points. Then ask:]

Is there anything that might have thought about while we were talking that would be important for me to know?

We're at the end of the interview. Is there anything you would like to ask me?

---

Closing script:

Thank you very much for letting me interview you. I'll send you a copy of the transcript. It would be great if you could look it over to make sure that what you said came across as you intended. I'd certainly appreciate hearing any other thoughts you might have. As you'll remember, we'll send you a \$xxx stipend (make sure to check for amount BEFORE iv) for taking part. Please feel free to get in touch with me at any time (give email).

## Appendix D: Observation Summary Form

### **LtFu: Observation**

Date of Observation:

Event:

Observed by:

Start time:

End time:

Duration:

Place:

Fieldnote locations-

Analysis log:

Special notes about logistics:

Hand-outs or other support materials

### **Summary**

Setting

Teacher-student dynamics.

Orientation to TfU.

Student understanding, Noteworthy segments.

### **Out of Field notes on Observation:**

summary of key issues:

### **Event/Interaction Transcript**

## Appendix D: Codebook (abridged)

There are eight categories of codes used in the analysis of cases. Codes that were not apparent from their title were given descriptions in the full codebook about how to apply them, in some instances accompanied by example quotations from survey responses. The codes are grouped and listed below, accompanied by the number of quotations that were tagged with each.

### CODES FOR GENERATIVE TOPICS

---

**GT – General** (Quotations: 5)

General mention or indication of TfU element “Generative Topic” that can’t be categorized elsewhere.

**GT - Importance to discipline** (Quotations: 11)

The topic of the lesson is clear and important to the discipline.

**GT - Topic engages students** (Quotations: 24)

Topic is designed to engage student interest.

**GT - GT & entry points** (Quotations: 18)

Specific mention of using multiple entry points for creating interest and appealing to multiple intelligences. Teacher learning about multiple entry points through course ideas and bringing this knowledge to bear in her/his practice.

### CODES FOR UNDERSTANDING GOALS

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**UG - Content over coverage** (Quotations: 6)

**UG - General reference to understanding goals** (Quotations: 57)

Mention of teacher and/or student increased focus on understanding goals or big ideas rather than smaller-scale learning goals or activities, or increased expertise or success with UG.

**UG+UP - UG align (or lack of) with UP** (Quotations: 21)

### CODES FOR UNDERSTANDING PERFORMANCES

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**UG+UP - Confusion w/ assessment** (Quotations: 14)

**UP - General reference to understanding performances** (Quotations: 41)

General mention of Understanding Performances not covered in other categories.

**UP - Depth of exploration** (Quotations: 33)

Teacher and students explore central ideas in depth so as to get at interconnections and relationships.

**UP - MI\_DI in UP** (Quotations: 9)

Specific mention of improved use of multiple intelligences and/or differentiated instruction in order to design Understanding Performances. Teacher consideration of student differences in lesson planning or other aspects of practice. Teacher learning about student differences through course ideas and bringing this knowledge to bear in her/his practice.

**UP - Range of** (Quotations: 7)

The conscious introduction of a range of kinds of performances, from early “mucking around” to guided inquiry to culminating. This is distinct from “Variety” which gets at the multiple ways that might be introduced to have UPs in any of these categories.

**UP - Selective exploration** (Quotations: 15)

Indications of teacher designing UPs that target key understanding by excluding some content and spending more time in other areas.

**UP - Student-student Interaction** (Quotations: 39)

Increased student interaction with other students in a way that makes the understanding performances better.

**UP - Student Authentic** (Quotations: 16)

Relevant connections to real-world phenomena are explored.

**UP - Student engagement** (Quotations: 47)

Students more engaged, enthusiastic (affective), confident. Mention of excitement, enthusiasm.

Mention of students taking on more challenges, challenging work.

**UP - Student Responsibility** (Quotations: 40)

Students taking responsibility for own learning by establishing criteria, goals. Mention of teacher handing over responsibility to students, student autonomy in learning.

*Example: “Since taking the WW courses I have students doing more investigative work to develop their own understanding of the mathematics rather than lecturing and showing techniques for solving the problems. My classroom is more problem-based and student centered. Students are paired or work in groups of 3-4. They have to explain their thinking to peers and classmates.”*

**UP - Understanding, scaffolding of** (Quotations: 23)

Reference to understanding as process.

**UP - Variety of** (Quotations: 37)

Mention or instances of variety of performances for a lesson (planned or carried out) as well as variety of ways of accomplishing a given UP.

Mention is made of greater variety of activities linked to understanding goals.

Students are asked to find more than one way to solve a problem or demonstrate understanding.

*Example: "I have noticed that the students like to be challenged more and in different ways. Using blocks for isometric drawings and orthographic drawings has helped a lot. They like hands on work and learn much more than trying to figure out a 3 dimensional drawing on a flat page in the book."*

## **CODES FOR ONGOING ASSESSMENT**

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### **OA - General Ongoing Assessment (Quotations: 66)**

Mention of teacher design of and/or putting into practice assessment activities, assessing students. Assessment activities here are driven by teacher but implicate students.

*Example: "Establishing criteria for students to work towards and reviewing them at the beginning of the project have helped students develop understanding and focus their efforts on the most important aspects of the assignment."*

### **OA - Student self+peer assessment (Quotations: 37)**

Mention of student assessing their own work, including reflecting on their learning in relation to course goals and/or criteria as well as establishing goals and criteria against which to assess their own or others learning and products. Teachers' plans for students' self-assessment of learning.

*Example: "My students now benefit from having clearly written and displayed understanding goals, they have the benefit of developing their own rubrics with my input, and using them to guide them throughout their projects. They have learned to write their own understanding goals. They have benefited from more and a variety of ongoing assessments. They have benefited from clearer understanding performances, and UPs that develop an even deeper level of understanding. They have benefited from ongoing assessments that invite mathematicians to meet with them and guide them through their projects."*

## **CODES FOR PROFESSIONAL COMMUNITY**

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### **PC - Coaching/Mentoring (Quotations: 8)**

Working with others one-on-one as expert or more experienced teacher around ideas from WIDE courses.

### **PC - Collaboration (Quotations: 25)**

Mention of working with other teachers on lesson plans, assessment of students, etc. Teachers working as equals.

*Example: "I took the WIDE course with two other teachers from my school. I am the music teacher and they both work in regular classrooms, one in lower elementary and one in upper elementary. As a result of our work, we wrote 3 curriculum units for our county and then created a multi-grade level project, which we implemented using their two classrooms. The project integrated music, writing, and technology and was a huge success. We will expand it to the entire 2nd and 5th grades this year to continue the grade level and content integration."*

### **PC - Presentation (Quotations: 5)**

One-to-many presenting or sharing ideas from WIDE course to groups of other teachers in public forums like workshops, conference sessions, etc.

## **MISCELLANEOUS CODES**

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**Misc - Contribution - TfU & Online course** (Quotations: 44)**Misc - Development, TfU over time** (Quotations: 5)**Misc - Student behavior** (Quotations: 3)

Improved student behavior.

**Misc - Teacher-Student Relationship** (Quotations: 33)

This code and “**UP - Student Responsibility**” are two sides of same coin. That is, this is from the perspective of a Teacher (handing over responsibility) and the other is from perspective of Student (assuming responsibility).

Specific mention of shift in power, responsibility, authority from teacher to students.

**Misc - Teacher enthusiasm, rejuvenation** (Quotations: 6)

Mention of personal and/or professional transformation linked to use of course ideas.

*Example: “My students are entirely engaged when I use TfU and integrate technology into course learning. It has had such a profound effect on me that I have changed jobs so that I can format my new 6th grade American History and Health classes this way. I can't wait!”*

**Misc - Teacher resonance with existing repertoire** (Quotations: 2)**Misc - Teacher self-reflection** (Quotations: 17)

Better able to (self-)reflect on one's own or others teaching practices, subject matter knowledge, relevance of educational theory to above.

*Example: “I always take a step back in recognizing why students are not understanding the material. What other medium could I use or rather could they use to understand better the information they are studying.”*

**Misc - Technology for TfU** (Quotations: 4)

Mention of incorporating technology in ways that are central to understanding goals.

*Example: “A video segment that I worked on with small groups of students allowed them to see their own performances and assess themselves before they completed their final project.”*

**Misc - Technology Other** (Quotations: 7)

Incorporating technology to improve instruction in ways not directly connect to devising understanding goals.

**Misc - Time, importance for saturation** (Quotations: 4)

*Example: “I took the course, then had a lot of time to think about it-a lot of it over the summer. What UGs are for the quarter.”*

**Misc - Unit design “hooks”** (Quotations: 12)

Use this code for mention of what “hooked” teachers at early stages into redesign of units.

Three things seem to be going on in this code category:

- 1) Before – after
- 2) “Hook” element that helped in redesign

3) “Big picture” -- rather than new activities, teacher found focus on big picture of understanding helpful in knowing how to go about revising unit.

**Misc - Unit design, MI\_DI** (Quotations: 4)

Specific mention of improved use of multiple intelligences and/or differentiated instruction. Teacher consideration of student differences in lesson planning. Teacher learning about student differences through course ideas and bringing this knowledge to bear in her/his planning.

*Example: “I work with children with and without disabilities. I have found that identifying their intelligence has made teaching all the different students simple! It also creates community in the classroom. When giving the information about individual students to other teachers, the students made tremendous gains.”*

## **CODES FOR INTERESTING OBSERVATIONS**

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**Obs class - environment, classroom** (Quotations: 12)

**Obs class - environment, school** (Quotations: 4)

**Obs class - student characteristics** (Quotations: 26)

**Obs class - teacher characteristics** (Quotations: 23)

**Obs class - teacher tfu background** (Quotations: 17)

The “obs class” codes are for descriptions of characteristics of the observed classroom that we can use for vignettes in portraying the class. These include descriptions or characterizations of: students, classroom environment, school environment, teacher.

## **CODES FOR OUTCOMES**

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**Out - Student – achievement** (Quotations: 1)

Improved student achievement, such as performance in connection with standardized tests.

*Example: “I had no students who failed this year! First time in 30 years! I would say that is success!”*

**Out - Student - subject matter knowledge** (Quotations: 3)

Mention of increase in students' subject matter knowledge as a result of course ideas.

*Example: “My students were able to articulate math processes as a direct result of this course.”*

**Out - Teacher Change 1** (Quotations: 0)<sup>7</sup>

**Out - Teacher Change 2** (Quotations: 0)

**Out - Teacher Change 3** (Quotations: 0)

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<sup>7</sup> The number of quotations here is usually zero because these codes were used in preliminary steps to help develop the codebook in the first place. These codes were not used in analyzing the cases cited in this paper. They are included here because of their important role in the overall methodology.

These are codes that provide a scale (0-3) for evidence of course-related changes in teachers' instructional practices. This could be in terms of design of lesson plans, understanding of subject matter as it relates to teaching, understanding/assessment of students and student work, change in classroom practices.

0 = reserved for people who expressly said the course did not change their teaching practice.

1 = Very slight but discernible evidence of course-related change. Little or neutral appraisal and/or description with little or no supporting detail.

2 = Modest account of course-related change in change reported through positive but tempered terms of appraisal like “some”/“often” or reports of changed practices accompanied by some descriptive detail.”

3 = Robust account of course-related change in pedagogical practices reported through emphatic terms of appraisal (“incredible” or “transformative”) or richly-detailed descriptions of change along the dimensions mentioned above.

## Appendix F: Key to sources

62: Telephone interview, 1 Dec. 2005.

71: Post-observation interview, Courtney, 3 Feb. 2006.

72: Classroom observation field note summary for Hannah's lesson of 18 Jan. 2006.

74: Classroom observation field note summary for Mercedes' lesson of 10 Feb. 2006.

76: Post-observation interview, Hannah, 20 Jan. 2006.

78: Classroom observation field note summary for Louise's lesson of 18 Jan. 2006.

81: Pre-observation interview, Louise, 20 Dec. 2005.

82: Post-observation interview, Louise, 25 Jan. 2006

84: Post-observation interview, Mercedes, 10 Feb. 2006.

91: Courtney's responses to open-ended questions, end-of-course survey, TSNT, Fall '04.

93: Mercedes' posting to online course discussion thread, Focus on Student Understanding, Fall '04, Session N, Assignment M.