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Chapter 1

USING DEVELOPMENTAL RESEARCH TO EVALUATE BLENDED TEACHING IN HIGHER EDUCATION

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ABSTRACT

Accountability of teaching in higher education has taken on greater significance given an institution's need to provide evidence supporting its overall mission and specific features of strategic plans. Evaluation of teaching beyond the limitations of student surveys is needed to support adjunct, tenure-track, and tenured faculty members in their yearly performance as well as documenting overall department and college/school performance. One way to provide systematic documentation is through developmental research. A 12-year study of a master's level course is reported. Described are data sources and data analysis procedures. The 16 deliveries are summarized in terms of the developmental research cycle phases: design, implementation, and evaluation, and evolution of the activity-participation structures that characterized the course's blended instruction. These structures include classroom activities, design activities, textbook, personal conferences, web site, Wiki, and web board. The chapter provides guidelines on the use of developmental research in terms of identifying a study focus and conducing such a study. Implications of developmental research are discussed, including improvements for student learning, methodology for research, and how iterative inquiry provides data for individual and institutional needs.

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INTRODUCTION

Traditional course evaluation has taken the form of institutionally-developed student surveys, which are used for promotion and tenure reviews. This data forms the basis for promotion decisions, although the quality of teaching is only a function of what students said about the teaching. No criteria exists for teaching decisions, such as appropriate learning outcomes, and alignment of teaching and assessment decisions. Issues that faculty have with student surveys may stem from fussy assessment schemes, too many objectives, unclear task and project instructions, and non-responsive attention to questions and email queries. Low teacher evaluations and faculty views of students collide and interfere with faculty members' productivity in other areas. What follows is a report summarizing my teaching of a master's level course delivered 16 times over 12 years. A developmental research methodology was used to structure data collection and analysis.

RESEARCHING ONE'S TEACHING

Nature of Teacher Inquiry

Teaching has traditionally been viewed at all educational levels as an in-person activity, with the exception of correspondence courses at the high school, college, and training levels. Distance education options have also included telephone, television, and satellite technologies. With the use of online technologies, the face-to-face (F2F) option has expanded to include what are referred to as blended learning. Blended learning can be defined as systems that "combine face-to-face instruction with computer-mediated instruction" (Graham, in press). The use of the two approaches highlights issues of what teaching consists of and what experiences instructors can provide students to support explicit learning outcomes. Studying one's teaching, whether involving F2F or blended, contributes towards improved accountability of an instructor to students (and other constituencies, such as parents), and a faculty member contribution to the mission and purposes of one's department and college or school. One of the values of blended learning and of any instructional technology is that it prompts instructors to re-examine the purposes for a course, a curriculum issue, but also what learning outcomes that course should consist of. Studying the teaching in a systematic way provides data, results, and conclusions over time that not only improve student learning but model the inquiry process for students.

A number of approaches exist for the study of teaching, depending on the overall goal of the study. Reeves (2000) suggests three broad goals for research. The first goal is to refine existing theory, and empirical research is employed where a researcher uses research hypotheses and tests those hypotheses. Often experimental or quasi-experimental studies are used to address this goal. A second goal for research is to take action. Here action research or evaluation research methodologies are called for. The purpose for action research, frequently used by public school teachers, is to study and improve some aspect of a teacher's practice (Cochran-Smith and Lytle, 1992) and can be employed by teacher candidates or practicing teachers. Bullough and Gitlin (2001) characterize action research as an integrative methodology, capable of studying personal issues using autobiography and personal teaching metaphors, as well as the context of school using school histories, ethnography, textbook and

curriculum analyses. A third goal, according to Reeves (2002), is to seek an understanding of how an educational artifact, process, or intervention addresses educational objectives. The methodology applicable for this goal is developmental research, an iterative process in which the artifact is developed, tested, revised and refined based on observed outcomes, tested again, refined and revised, and so forth (Richey, Klein, and Nelson , 2003).

Developmental Research

Definition and types. Developmental research is defined by Seels and Richey (1994) as "the systematic study of designing, developing and evaluating instructional programs, processes, and products that must meet the criteria of internal consistency and effectiveness" (p. 127). Developmental research concerns itself with improving the growth, evolution, and change of the processes of instructional design, development, and evaluation (Richey, Klein, and Nelson, 2003). Development within a research context involves not only the creation of instructional products or programs, but their use and evaluation.

Developmental research lends itself to the generation of knowledge which has practical consequences. Richey, et al (2003) describe two types of knowledge that may arise out of this applied research: (1) process knowledge of dynamic systems, frequently represented by models; and (2) process understanding as a result of this knowledge. Richey, et al (2003) describe two types of developmental research. Type 1 developmental research studies specific products or programs and produces lessons learned from developing and analyzing the conditions that facilitate their use. Since specific products or programs are studied, Type 1 conclusions are context-specific. Meanwhile, Type 2 research studies design, development, or evaluation processes, tools, or models. Type 2 products include new procedures or models and the conditions that facilitate their use. Conclusions drawn from Type 2 developmental research can be generalized to other situations.

This research report documents a Type 1 developmental research study, as its emphasis is describing and documenting a context-specific teaching approach. The product from this study includes tactical "lessons learned" from implementing a course, but also the more strategic conclusions of implementing an overall teaching model across 12 years using blended delivery and how different forms of activity, described as participation structures, assist students in their learning. Although the results of Type 1 studies do not clearly transfer to courses in different contexts, the strategic conclusions of teaching model use, blended delivery, and participation structures may have implications for other content areas at different educational levels. A benefit of developmental research conducted over multiple course deliveries is the possibility that Type 2 conclusions are generated.

Characteristics. Richey, et al (2003) characterize developmental research through the use of six categories, which include: product or program focus, process focus, context of use, tools and techniques emphasized, research methods used, and the nature of conclusions. This study can then be characterized in terms of: full course (program focus); general description, development, and evaluation process (process focus); post-secondary (context use); needs assessment and learner verification (tools and techniques); descriptive case studies, observational (method); and context-specific and generalizations (nature of conclusions).

The sub-categories of process focus, according to Richey et al (1996), include description-development-evaluation process, needs assessment, content selection, design,

production, formative evaluation, use and delivery, management, summative evaluation, and learner outcomes.

The second category, process focus, merits a brief discussion. The broadest process focus is the "description, development, evaluation process," which has the instructor research to describe a course's design, what occurs during the implementation of the design, and evaluates student learning and student perceptions of their learning and of the instructor. The value of this approach is to produce a descriptive summary across the entire developmental cycle: design, implementation, and evaluation. An ongoing descriptive summary provides a systematic record, a cyclical benchmark from which not only course decisions can be made but to identify research opportunities in which other methods can be used to specifically study specific phenomena in laboratory settings (design experiments) and applied back to educational settings.

12-YEAR CASE STUDY USING DEVELOPMENTAL RESEARCH

A 12-year case study of developmental research of a master's level course is presented. This developmental research describes procedures and summarizes results of yearly cycles of design, implementation, and evaluation. Summarized will be the evolution of the course in terms of various activity structures that characterize the course's blended instruction. These structures include classroom, online, textbook/readings, personal conferences, and project.

The form of inquiry is a multi-case approach used to describe *how* a teaching model was implemented across 16 deliveries of a course over 12 years. The case study is used to describe settings which include contextual issues and implementation details (Richey, et al, 2003). A "how" research inquiry deals with operational links needing to be traced over time, rather than mere frequencies or incidence (Yin, 2002). The case covers the contextual conditions inherent in teaching and relies on multiple sources of evidence to describe the same phenomena from the design, implementation, and evaluation of the teaching model used.

Course Deliveries

This study documents the implementation of the reflexive teaching model across 16 deliveries of the course over 12 years from 1994 through 2006. Table 1 summarizes each case in terms of case number, date delivered, number of students, semester-length and if the course is off-campus, institution delivered for, the number of instructors used, and the delivery type (F2F, WWW, or blended). The course was taught by the researcher at two different institutions, denoted by institution A or B. Both institutions are Research-Comprehensive universities. The first seven deliveries of the course were co-taught. In terms of delivery, 5 were delivered face-to-face (F2F), 1 was delivered totally online, and 10 were delivered using a blended approach, featuring a mix of F2F and online.

Table 1. Course deliveries

Case	Date	Students	Length	Institution	Instructors	Delivery
1	Summer 1994	13	05 week	A	2	F2F
2	Fall 1994	22	15 wk	A	2	F2F
3	Fall 1995	20	15 wk	A	2	Blended
4	Fall 1996	19	15 wk	A	2	Blended
5	Fall 1997	16	15 wk	A	2	Blended
6	Spring 1998	23	15 wk off campus	A	2	Blended
7	Summer 1997	15	05 wk off campus	A	2	WWW
8	Fall 1998	10	15 wk	A	1	F2F
9	Fall 1999	8	15 wk	B	1	F2F
10	Fall 2000	17	15 wk	B	1	F2F
11	Fall 2001	20	15 wk	B	1	Blended
12	Fall 2002	20	15 wk	B	1	Blended
13	Fall 2003	16	15 wk	B	1	Blended
14	Fall 2004	13	15 wk	B	1	Blended
15	Fall 2005	18	15 wk	B	1	Blended
16	Fall 2006	17	15 wk	B	1	Blended
		267	15 wk = 14 05 wk = 02 on campus = =15 cases off campus = = 01 case	Taught at: Inst. A = 7 Inst. B = 9	Co-taught = 7x Solo = 9x	F2F = 05 Web = 1 Blended = 10

Participants

Students. Students were characterized by their instructional design experience, teaching experience, educational level of interest, and content focus (see Table 2). This information was acquired by self-report during the course. Students with formal ID experience totaled 24, while 243 had none. Of the 270 students in the course, 180 had teaching experience, while 87 did not. Educational levels of interest included 85 college, 54 training, 41 with an overall K12 focus, followed by 32 elementary, 32 elementary, 32 high school, and 22 middle. The largest content area focus of the participants included computing (42), science and technology (36), language arts (34), health and physical education (31), special education (22) and second language learning (20).

Instructors and institutions. Across the 16 deliveries of the course two instructors were used for this master's level course. For cases 1-7 both instructors co-taught the course at a land-grant institution, comprehensive-research university. For cases 8-16 the course was taught by the author at a second institution, also a land-grant institution, comprehensive-research university. The first instructor for cases 1-7 is a professor of educational psychology with teaching certifications in learning and behavioral disorders, and 9-years of teaching in public schools, in both general and special education settings. She also has developed two off-campus master's programs for K-12 teachers and has conducted numerous workshops for teachers.

Table 2. Participants background

Instructional Design Experience		Teaching Experience	
Yes = 24	None = 243	Yes = 180	None = 87
Educational Level of Interest		Content Focus	
College	86	Computing	42
Training	54	Science, technology	36
K12	41	Language arts	34
Elementary	32	Health and PE	31
High school	32	Special education	22
Middle	22	Second language	20
		Mathematics	17
		Training skills	15
		Other	15
		Social studies	14
		Consumer skills	10
		Music	06
		Business	05

The second instructor for cases 1-7 and the solo instructor for cases 8-16 is an associate professor of instructional design and technology. His background includes six years of experience developing customized audiovisual and written task training, safety, and orientation materials for corporate clients, and 15 years of experience of audio/video writing and production experience. He has taught at the college level since 1994, beginning with this course.

Course Description

The course sequence, as it has evolves, begins with an examination of personal (or institutional) learning beliefs and a survey of ID tools (e.g., learning theories, ID models), followed by an overview of instructional design's analysis, design, and evaluation components (see Figure 1). "Learning Beliefs" and "Design Tools" are a distinctive feature of this sequence over other ID models used for teaching (e.g., Dick, Carey and Carey, 2005), which typically begin with a needs assessment. Implementation issues are addressed through a discussion of formative program evaluation and the "Prototype Lesson" phases. The major learning activity is a student's ID project, which addresses an instructional problem of the student's choice. Project components are structured by task sheets, including task rationale, guidelines, and performance criteria. Ongoing assessment for each student, as well as formative evaluation for the course, consist of notations on the task sheet's criteria, written and/or email feedback on learning tasks, end-of-each-class feedback (i.e., "exit slips"), webboard replies, and personal conversations. One or more individual or group conferences (Cases 2-14) have been conducted during the course to determine students' interests and backgrounds, discuss learning tasks, and progress toward project completion. Assessment of student learning involves draft and completed ID projects, personal ID models, and a self-evaluation. Evaluation of the course is obtained from students' perceptions of the course from

a university course evaluation survey, in-class surveys, self- evaluation task, and conference interviews.

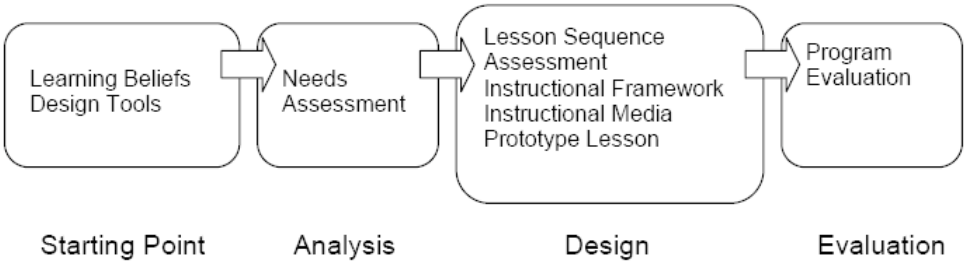

Figure 1. Course sequence.

Teaching Model Description

The reflexive teaching model consists of three components (see Figure 2). The first component visually represents students and instructor(s) in the model. The second component specifies multiple participation structures in which activity is structure. The third component is the use of dialogue between the participants and the structured activity.

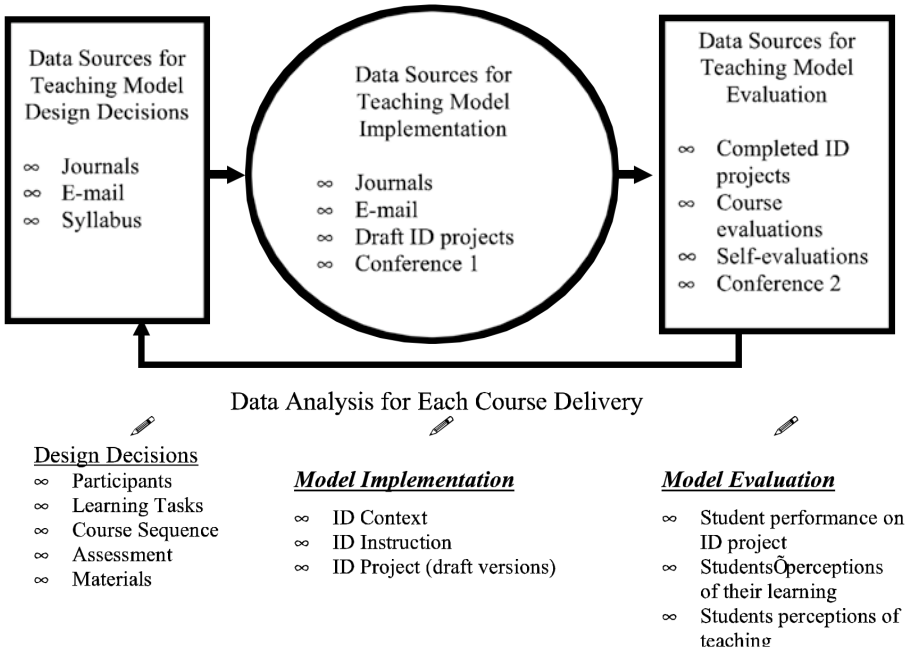

Figure 2. Reflexive teaching model

Instructor characteristics and roles. The reflexive teaching model identifies co-learners as including the instructor and the student. Both possess similar characteristics in that they are…. However, each takes on different roles. The instructor is responsible for the course

content, delivery, and assessment of student learning, while the student is responsible for performing required learning tasks.

Co-participation structures. As participants within the model include both instructor and student, the forms of activity within the course are labeled as "co-participation" structures. In other words, teachers have particular roles within each structure and may include the design of the structure, implementation, and evaluation of the structure, but also performing the activity alongside the student. The co-participation structures used over 12 years have included classroom activities, design activities (out-of-class), textbook, F2F/email, personal conferences, website, wiki, and web board (see Table 2).

Classroom activities are used to introduce, reinforce, or provide practice for students across each main topic in the course. The course assessment plan usually assigns these activities collectively as 10% of the course grade. Failure to show up for class and perform these classes results in a letter "drop" (e.g., from an A grade to a B grade). Student learning is further assisted through specific learning tasks, which are organized by task rationale, task procedures, and task assessment.

Design activities include 15 structured thinking and decision-making tasks, which together result in an instructional design document that includes analysis of an instructional problem and design decisions. Textbook use consisted of its own design activities with supporting text, reflective questions, scenario-stories, and references. These design activities were used in-class or as online activities and provided practice for the 15 structured design activities.

Table 2. Participation Structures by Case

Case	Class Activities	Design Activities	Text	Instructor F2F/Email	Personal Conference	Web Site	Wiki	Web Board
1	X	X	X-a	X	2			
2	X	X	X-b	X	2			
3	X	X	X-b	X	2	X		
4	X	X	X	X	2	X		
5	X	X	X	X	2	X		
6	X	X	X	X	2	X		
7	X	X	X	X		X		
8	X	X	X		2			
9	X	X	X		2			
10	X	X	X		2			
11	X	X	X		2	X		
12	X	X	X		2	X		X
13	X	X	X		2		X	X
14	X	X	X		1		X	X
15	X	X	X					X
16	X	X	X					X
	16/16	16/16	16/16	7/16	13/16	7/16	2/16	4/16

Email consisted of electronic communication between the two instructors during cases 1-7, as well as email between instructor(s) and student. In addition questioning takes place on responses to posted student work on web boards. Personal conferences between instructor(s) and students were used across cases 1-14. Online participation structures have included a

website for informational purposes, posting of course materials, and links to resources. Wiki or collaborative web pages have been used to enable students to post draft work along with peer critiques. A web board provides for threaded discussions, archiving of course materials, and posting of student work and peer critiques.

Dialogue. Dialogue involved assigned articles and text chapters and participating in class activities, as well as performance on the out-of-class activities. Performance in these out-of-class design activities necessitated that students make decisions, conduct research, reflect on these decisions, and provide feedback to peers and instructors. Instructor dialogue can be characterized by collaborating on course design decisions, interacting together and with students within the participation structures, and responding to student needs. Instructor actions can also be organized by multiple means of assisting student performance and include modeling, contingency managing, feeding back, instructing, questioning, cognitive structuring, and reflecting (Tharp and Gallimore, 1988). Table 3 identifies how participation structures matched these different means of assistance.

Table 3. Means of assisting student performance

	Modeling	Contingency Managing	Feeding back	Instruc-ting	Questio-ning	Cognitive structuring	Reflec-ting
Class activities	X	X	X	X	X	X	
Design activities	X	X	X	X	X	X	X
Textbook	X			X		X	
F2F, email	X	X	X		X		X
Personal conferences	X	X	X		X		X
Web site c3-7	X			X		X	
Web site c11-12	X				X	X	X
Wiki, c12-13	X		X		X		X
Web board C13-16	X	X	X	X			X

Developmental Data Sources

The developmental research cycle consists of three phases: design, implementation, and evaluation. In terms of this study, which studies how a reflexive model helps graduate students learn instructional design, each cycle can be labeled as Teaching Model Design Decisions, Teaching Model Implementation, and Teaching Model Evaluation. Data sources that address each cycle are identified in Figure 2 and are described below.

Data sources for design decisions. Journals or working logs, email between instructors (for cases 1-7), and the course syllabus provide data sources to describe what teaching decisions were made for each delivery of the course.

Data sources for implementation. Working logs, email, draft projects, and/or personal conferences described how the teaching model was implemented. Students developed projects over the course and draft components of the project were evaluated weekly. For 12 cases, a personal conferences was held with each student. These personal conferences held about one

month into the course served as a needs assessment briefing. The first six deliveries of this course the conference was audio-taped and supplemented by working log notes.

Data sources for evaluation. The major data source for this third cycle of the developmental research process involved analysis of students' final projects. A second personal conference held prior to final project submission acted as a formative one-on-one formative evaluation session. For the first six deliveries of the course the second conference was audio-taped and supplemented by working notes. In addition, students' course evaluations and perceptions of their learning provided additional data sources for this phase.

Developmental Analysis

Data analysis overview. Data were analyzed using the qualitative techniques of Miles and Huberman (1994), which consisted of data reduction from data sources and display of this reduced data in "frames" that enabled conclusions to be drawn. The data analysis sequence involves data collection, then data is analyzed, and the results are recorded into frames (i.e., tables). The data reduction documents for each course are kept in 3-ring notebooks, each divided by data sources. This strategy served to separate the data from the report and provided a means to organize the data and track the analysis sequence from data source to data reduction to data reporting.

Data analysis reporting. For each of the cases the documentation of the teaching, incorporating the reflexive teaching model, was reported in terms of the design and development cycle: design decisions, implementation, and evaluation. The needs assessment and subsequent design decisions, based on the teaching model, were reported by describing (a) participants, (b) learning tasks, (c) course sequence, (d) assessment, and (e) instructional materials. Analysis of the implementation of the model for each case described student performance and responses to instruction and instructor's assistance during (a) ID context activities, (b) ID process instruction, and (c) draft ID projects. Summative evaluation of the teaching model was reported on the basis of summarizing (a) student performance on the ID project, (b) students' self-perceptions of their learning, and (c) instructor responses to student needs.

DEVELOPMENTAL RESULTS – CASE SUMMARY

Features of the course that remained in place over the 16 cases included an instructional sequence that included (a) setting the context for ID instruction, examining one's learning beliefs, one's personal ID model, and surveying design tools, particularly other ID models; (b) ID instruction over a multi-phased set of components; and (c) self-assessment. The ID project was the principal learning task with task sheets providing students with explanation and guidance for each ID component. Assessment included weekly and final submission of an ID project, a revised ID model, and a set of miscellaneous tasks, including a self-evaluation. Co-participation structures that remained in place across the cases included in-class activities, learning tasks, and text. The following sections summarize changes in the above features across the cases (see Table 4).

Table 4. Developmental Case Summary: Major Changes

C	N	Length	Design	Implementation	Evaluation
1	13	05 wk	8 phases	Unclear on task and instructional analyses	Lacked research, challenging terminology, draft concerns
2	22	15 wk	9 phases: added "Beliefs" Mission statement (MS)	MS task difficult	Needs assessment, project choice critical moments
3	20	15 wk	Performance criteria added to tasks	Group activities for mission, needs assessment, assessment choices	Concerns on group activities, high ratings on personal conferences
4	19	15 wk	Design Activity forms	Goal identification activity, MS workshop	
5	16	15 wk	ID competencies, web site	Issues of sequencing and assessment in online projects	Only 5 complete. Mixed reactions to groups, small room,
6	23	15 wk off	Technology focus On-campus needs assessment visit	Encouraging teachers from different grade levels to talk	9 projects complete, minimal attention to media and technology, overwhelmed by readings
7	15	05 wk off	1 week summer F2F, rest online, email, website	Email response to questions on tasks	Mixed performance on projects, participants as PE teachers and coaches difficult to engage on tasks
8	13	15 wk	First solo teaching Internet capabilities	Resistance to needs assessment research	Identifying teaching, assessment, technology decisions on sequence visual
9	8	15 wk	No changes from case 8	3/8 difficulties in handing in drafts Crowded room	3 technology projects, 3 ESL projects, effort needed for weekly drafts; stress from taking web-based ID course
10	17	15 wk	Design cycle categories chunking process Written project assessment provided	4/17 late with needs assessment	6 technology projects, minimal needs assessment research, minimal media details, time limitations on demo briefings
11	20	15 wk	Reflective web site, online activities	10/15 deficiencies in needs assessment	4.20 technology projects Too many tasks: design activities and online tasks

Table 4. (Continued)

C	N	Length	Design	Implementation	Evaluation
12	20	15 wk	Project outline links	Weekly debriefs on	12/20 technology projects,

			with design activity tasks Teaching and assessment combined in project Web board added	progress and problems	comments on too many activities (project, in-class, online), work
13	16	15 wk	Collaborative web pages added (Wiki)	3 wks teaching demos Wiki for needs assess.	7/16 technology projects Wiki improved revisions
14	13	15 wk	Scenario activity for needs assessment Only 1 personal conference	Resistance to needs assessment Peer support	2 technology projects More debriefing on other's projects
15	18	15 wk	Personal conference deleted WebQuest as mid-term Tables recorded teaching and assessment Prototype separated from teaching demo	Technology-ready room	10/18 technology projects Teachers settled on options early Low ratings to midterm
16	17	15 wk	11 of 17 teachers	Technology-ready room 4 weeks needed for demos	6/17 technology projects Clarity to prototype-demo tasks

Cases 1-7 Co-Teaching

Each case will be summarized by three paragraphs which identify design decisions, implementation, and evaluation, respectively.

Case 1 (Summer, 1994, 13 students). Case 1 used an 8-phase ID process representation (i.e., design tools, needs assessment, lesson sequence, assessment, teaching models, sample lesson, media, program evaluation). Case 1 used Smith and Ragan (1993) as the primary text because of its emphasis on learning principles and teaching models.

Nearly half (6 out of 13) of the students reported they were unclear about task and instructional analyses and did not include a task analysis but did submit an instructional analysis. Some submissions mixed the two tools. Because of the time demands of a 5-week summer session in Case 1, customized media packets were distributed to each student, in addition to brief presentations on the use of media.

Cases 1 (6 projects available) included a small number of projects and a majority of the projects exhibited completeness, consistency, and coherence. Students reported they needed more time to complete tasks, read the assigned articles and chapters. Three students commented that there was not enough time for reflection during this 5-week summer course. Students called for frequent re-visiting of the "big picture" of ID process and using more examples. Students provided a wide range of comments about the ID project. On the critical side, some students stated that there was too much to do, that it was a "struggle," some initially experienced confusion on the scope (i.e., "How long?") of the project. Three students reported being uncomfortable with handing in draft work. However, comments were largely

favorable on the project: "Not as hard as I thought," and that the project was "the best way to learn instructional design."

Case 2 (Fall, 1994, 22 students). Case 2 added a Learning Beliefs component to the beginning of the ID process representation. Learning Beliefs, however, had always been in the course activities, just not in the formal representation. Students from Case 1 suggested that if we valued learning beliefs as an important issue, we should include beliefs as a component in the ID process. A structured learning task, a mission statement, was added to support students examining their beliefs on learning, learners, and teaching. The mid-term exam, used in Case 1, was replaced with individual conferences to increase one-on-one attention to student needs and as a more appropriate ongoing assessment tool. The first conference was held a month into the course and topics of discussion included student's mission statement, preliminary ID model, and project choice. During these conferences we as instructors learned more about their previous work and educational experiences. A second personal conference was held during the last week of the semester to discuss students' ID project, revised ID model, and self-evaluation.

Nine out of 20 students reported that their learning beliefs were expanded or clarified with the Learning Principles task. Students also reported struggling with the terminology of educational psychology and instructional design. The Learning Principles task was supported by a task sheet, three assigned readings, discussion, group activity, a mini-lecture on the differences between learning theories and their implication for instructional design, and a booklet of students' learning principles was distributed. The mission statement task was implemented to help students assimilate their important learning principles into a comprehensive statement of their view of learners, learning, and teaching. Twenty out of 22 mission statements had mismatches between students' learning principles and mission statement. Five students integrated their project description into their mission statement. Students described the mission statement as "hard work," that articulating and condensing their beliefs was a challenge.

Case 2 (4 projects available for analysis) included a small number of projects and a majority of the projects exhibited completeness, consistency, and coherence. Comments included "very demanding, time-wise," and "most intense, challenging course with just enough anxiety." Students, however, highly rated the value of course assignments (averaged 3.8 on a 1-4 scale). Students asked for more time in class to review peer's work on projects and complete the project. When asked what were the critical moments in the course, 7 out of 20 identified needs assessment, project selection (4 out of 20) and teaching model determination (2 out of 20).

Case 3 (Fall 1995, 20 students). We added performance criteria to each of the task sheets to clearly communicate our expectations for each task. We added an electronic Listserv to increase communications between and with students. Groups were used to introduce students to one another and share different perspectives and experiences. Mixing up the group membership several times during the first half of the course helped members to become acquainted and exposed them to different instructional problems. Grouping on the basis of project type was successful in the middle-to-later stages of the course when group members discussed design issues they had in common. Evaluating the effectiveness of groups during class meetings was difficult due to the large number of participants.

A needs assessment strategy was used to help students organize their research and prepare for their first personal conference. This strategy suggested that students identify what

questions to ask, who to talk to, where to look for more information, and how to summarize their research. We added a "flexible understanding" way of thinking about content and implications for learners, teachers, and sequencing (McDiarmid, Ball, and Anderson, 1989). Initial topical lists of content remained the same throughout the course for some projects, depending on students' view of what was to be taught and learned in the course. Students who chose a thematic approach to their content used much of their project to lay out these themes with supporting activities. Task and instructional analyses were also introduced during the Sequence phase as a tool to help students analyze the complexity of learning tasks.

Three out of the 9 projects available for analysis lacked sufficient detail in a needs assessment, learner profile, what it meant to teach content, or a literature review. One project failed to supply a mission statement. Two projects lacked insufficient detail in a sample lesson to give a clear picture of what was to be accomplished by the lesson, while another project lacked sufficient detail to guide an evaluation of an implemented project. Six out of the 9 projects exhibited consistency of learning beliefs across the project. One project's institutional beliefs were not addressed in the project, a second project did not have a mission statement to track consistency, and a third project's mission statement was unclear. Only 3 out of 9 projects exhibited a coherence. Four lacked an identification of project goals in subsequent components, one project confused the project with the overall institutional program, and one program lacked sufficient detail in the sample lesson to test out any of the project's design decisions.

Student perceptions of group activity were both positive and critical. On the one hand, students generally regarded groups as positive activities, as opportunities to share ideas and take risks, making the discussion of reading more interesting, and helpful when confused on tasks. On the other hand, student comments included wanting more group opportunities that were better structured, more task focused, and more sensitive to members who did understanding "teacher language." Some students wanted more time to work in groups, some liked the same groups, and others preferred different groups. The ID process helped some students to examine their beliefs and teaching and to examine an instructional problem, provided "different ways to think about the learners," and "forces a teacher to look at lots of details." On the other hand, some students regarded the process (and course) as "very difficult," with too much information. Two students objected to our labeling of some tasks as "hard," preferring instead to discover this out for themselves.

Case 4 (Fall 1996, 19 students). Two ID components, including Sample Lesson to Instructional Frameworks and Sample Lesson as Prototype, were relabeled to match the chapter titles of a a text we had written for the course. A new activity for the first class session was used at the beginning called "Design A Lesson" to help students to think, write, and discuss important learning issues and as a means to introduce themselves in the first class. We grouped miscellaneous learning tasks together for 15% of the grade. The primary text for the course was the publisher's prototype of text, with Smith and Ragan (1993) as an optional text. In addition, supplemental readings, which had been periodically distributed in class, were available on reserve at the library. Design Activity forms, which were included in the publisher's prototype, were electronic files to help students begin their thinking on a particular design component.

"Design A Lesson" was used during the first class session and helped to reveal students' existing planning/design processes and the complexity of planning/designing instruction. In this task students identified 21 different issues. A Mission Statement Workshop was

implemented to help students understand a mission statement's rationale and features, along with a range of personal, institutional, and learning examples. Goal identification, which was the major outcome from the needs assessment, was an ongoing challenge for some students. Some students resisted submitting goals. Some goals were unclear, too numerous, or were a mix of broad goals and activity objectives. An in-class group task was added that helped participants to identify goals from their research. We prompted students to identify the specific learning levels for each of their goals to gain a better understanding of what they were asking students to know (cognitive), do (psychomotor, social), or appreciate (social and other affective dimensions). Students were asked to specify what teaching methods they would use, the rationale for their choices, and how these approaches would support their project goals. A common problem in student projects was the lack of project goals identified in proposed learning activities; thus, it was unclear in draft submissions as to how their proposed instructional features supported their project intent. During this phase, 2-3 weeks were spent in having students enact teaching models. The Sample Lesson, or Prototype was a phase which allowed students to lay out the details of a lesson including its place in the overall instructional sequence, assessment, media, and teaching approaches, and an optional "Plan B." A task analysis and instructional analysis were requested for their prototype or sample lesson and frequently the same analysis, conducted during the Sequence phase, was used. However, students revealed misunderstandings about both tools.

All 5 projects available for analysis exhibited completeness, consistency, and coherence. Students also cited the changes in their thinking: "Totally changed the way I see the world" and "I can think and listen in terms of a designer".

Case 5 (Fall, 1997, 16 students). A web site was added to increase student access to course tasks and resources, including process learning hints (e.g., "How to Use the Text") and links to educational resources. Instructional Media was moved before Prototype in the ID process, so as to include media decisions in one's prototype lesson. We added a survey assessing their perceptions of their ID competencies at the beginning and end of the course. Weekly project submissions and the final project were assigned an equal percentage, 35%, of the final grade, to signal to students an equal importance for weekly work and final project. Class and text feedback were added as a miscellaneous assessment item to solicit student comments on our teaching efforts and newly published text. This requirement also modeled to students the practice of formative evaluation of instructional materials. We made conscious decisions about improving the use of groups in terms of group membership and group task structure. We mixed up the groups early in the semester to promote discussion from people with different backgrounds, while grouping students with similar projects mid-way through the course. We also improved group tasks to guide their thinking and subsequent reporting back for class discussion. Another change asked all participants to sit in a circle to increase eye contact, participation, and change the traditional "teacher up-front/student as audience" roles.

A Mission Statement Workshop was implemented to help students understand a mission statement's rationale and features, along with a range of personal, institutional, and learning examples. A book chapter from Eisner (1994) on curriculum ideologies was assigned to help participants think about different ways to view curriculum. Six ideologies or viewpoints on curriculum were summarized by groups in class. Learning taxonomies were also used as a conceptual tool to help students sequence content from simple to complex. A panel discussion on assessment was held with campus experts. Four of the 16 projects were web-based and

questions were raised on how to sequence and assess learning on web sites. We experimented with the idea that students might try to demonstrate a teaching model they would propose in their prototype lesson and learn from the enactment. In Case 5 media was formally represented in our sequence before the Prototype phase to include its consideration in the Prototype Lesson. However, in practice, instructional media was addressed to varying degrees over the entire course. By Case 5 (Fall, 1997) instructional media questions had shifted from multimedia to web-based concerns. Using the Listserv, URL links to web-based teaching and other learning resources were suggested throughout the semester. The web site itself was used as an electronic access point for course learning tasks and existing links to other resources.

Only 5 of the 12 projects available for analysis had all components in place. Three lacked a literature review, two were missing instructional analysis in their prototype lesson, one project lacked a mission statement, and one project lacked an identification of a teaching model. However, 11 out of 12 projects exhibited a consistency of learning beliefs based on what students wrote in their mission statement and what was subsequently designed. Ten out of 12 projects achieved a coherence of ID components.

Case 6 (Spring, 1998, 23 teachers in a master's cohort). Design decisions in thie case were based on the fact that the participants were working teachers in an intact cohort program. We combined the teaching demonstration with the project's prototype lesson, and addressed Instructional Frameworks and Assessment together, since teachers worked with both on a daily basis. A KWL chart was used as a familiar and simpler tool to help teachers monitor their needs assessment progress than the charts we had used previously. Technology was an agreed-upon major theme for the teachers in their master's program and was discussed throughout the semester, particularly the scope and shape of the upcoming summer course in instructional technology. Shambaugh and Magliaro (1997) was adopted as the text along with a packet of supplementary readings. We mixed up group membership to include teachers from a range of grade levels, as they sat in approximately the same grade divisions, elementary, middle, and the high school. The purpose of this strategy was to encourage teachers to better understand each other's roles and challenges. Needs assessment, which was partly conducted as an on-campus visit to consult content and media experts, was another opportunity in which teachers talked with each other and came to better understand the differences they faced in their respective school.

Teachers pulled their mission statement from a teacher reflection paper conducted in a previous course. Two projects dealing with school district instructional technology support included their district's mission statement. One personal conference was held on the University campus, a needs assessment visit to conduct research and talk with University content and media experts. We had these teachers demonstrate a teaching model they would propose in their prototype lesson and learn from the enactment. The course web site was introduced to the teachers in the first class meeting using the high school's computer lab.

Nine of 13 projects had all required components in their project documents. Ten projects used the KWL strategy as a means to track their needs assessment progress. All projects did not bring forward information on teaching from their previous course in educational psychology. Two special education teachers included more detail than the other teachers on learners in their learner profile. Six out of 13 had incorrect or missing task and/or instructional analyses in their prototype lessons. Nine of the 13 projects exhibited a consistency of learning beliefs across their projects, while 11 of 13 appeared coherent across ID components. Six out of 13 projects were based on state learning standards. Three projects

merged their instructional approaches, assessment, and media in their lesson sequence. All projects addressed instructional media, but with minimal details. One teacher remarked, "It would take me forever to do this for all my units." For some, needs assessment was viewed as time consuming and challenging.

Case 7 (Summer 1997 off-campus, 15 students). Case 7 involved another master's cohort, a group of health and physical education master's students from across the country. They met with us over one week during a summer session to get introduced to the course, and we provided comment to their draft submissions via email.

Cases 8-16 Solo Teaching

Case 8 (Fall 1998, 10 students). Cases 1-7 had been co-taught. Case 8 was the first delivery of the course taught solo by this researcher. The institution was the same, as the first instructor was on research leave. The design for the course remained the same as Case 8, as I was also completing my dissertation. One difference was the availability of an Internet-ready classroom, which was used to show the online web site and also refer to online references and resources.

As with the other cases, students resisted conducting research during their needs assessment and preferred to rely on their existing knowledge. Problem selection for their ID project remained a challenge. One international student refused to hand in "draft" work, until at the end of the course I asked him why this was the case, he replied that in his country he could not do so and that draft work was inferior and not worthy of my review. He produced his draft submissions and I credited him with having done the work. This student cued me into the cultural difference of "draft" submissions and of instructor-student relationships.

The major outcome from this solo teaching was having students record their design decisions regarding teaching strategies, assessment options, and media/technology use on their sequencing plans. Rather than submitting just descriptive summarizes of their proposed choices, I had them "map" these decisions along their schedule to visualize how these decisions would play out over time. I still received mixed results in terms of identifying project goals on their sequence plan and not seeing how they were addressing their goals in their design sequence.

Cases 9-16 were delivered at another institution, a land-grant and a comprehensive-research doctoral granting university. The course was still configured as a master's level instructional design course. Summary of the major changes across design, implementation, and evaluation stages of the developmental cycle are noted in Table 4.

Case 9 (Fall 1999, 8 students). As my first teaching assignment in a new institution, the course design for Case 9 remained the same as for Case 8. And as with previous cases, students experienced hallenges in responding to weekly design activity due dates and handing in draft work.

Students resisted needs assessment analysis as well as project selection. The room was small and did not have any Internet connections. To simplify my first teaching of this course in a new setting, I did not use a web site. Email, however, was used to respond to student questions and provide reminders.

A new development was an increased number of second-language learning projects (3 out of 8) and technology projects (3 out of 8). Second-language acquisition became a research

focus for all of these cases, as many of the students in the course were international students. Students also commented on the amount of work needed to hand in weekly assignments. They were not used to this expectation from a new professor. They also provided the lowest rankings to the preliminary ID model task and the self-evaluation task, perhaps owing to not being used to this sort of expectation in a course. In addition, a concurrent enrollment with a web-based ID course provided anxiety for the 4 students enrolled in this course.

Case 10 (Fall 2000, 17 students). The major design decision was chunking the ID phases by categories: foundations ("setting the stage"), instructional problem identification, design formulation, design implementation, and revisiting/evaluation.

The classroom was too crowded for 17 students and no Internet capability was used, except for computer-based presentations and email. I used a "Design A Lesson" activity as a means for students to introduce themselves and to reveal the vocabulary used by them as educators. For the first time, I shared my personal learning principles and mission statement. I used an in-class activity where students paired up and prompted each other to discuss "What/Who/Where" options for needs assessment. One student commented that this activity felt "artificial" while another pair commented on how helpful it was to begin looking at options and to use someone else to "bounce ideas off of." Four out of the 17 students were late in submitting their needs assessment findings.

Six of the 17 projects focused on instructional technology, but with minimal details on its actual use across an intervention. Students commented on the 10-minute limitation for their teaching demonstrations, as only one course session was allotted to these (Election Day and personal conference limited the available time).

Case 11 (Fall 2001, 20 students). The major change was to add a new form of participation – the online reflective web site, which consisted of a cycle of activities for each ID phase. This cycle included an initial perception of the phase after reading the text chapter, answers to questions regarding the chapter, a presentation (Flash file), link to the course web board for peer critiques, a link to the relevant design activity(ies), and ending with a reflective question on student perceptions of the ID phase. The overall cycle of activity involved classroom, text, online responses, and design activity.

Students provided mixed performance on developing a strategy to gather research in a needs assessment ID phase. Ten out of 15 projects available for analysis revealed a deficiency in needs assessment as required by the design activity.

Four out of the 20 projects were technology project. Students commented that there were "too many things to do," with the addition of the reflective online activities. These provided me with a deeper view of what students were thinking about an ID phase, reactions to the text explanations, although unless prompted to do so, students did not freely critique their peers' work.

Case 12 (Fall 2002, 20 students). For the first time, the project outline items identified specific design activities, so that the connection could be made between draft work (design activities) and completed ID project. For the first time the Teaching and Assessment design activities were combined as one design activity. The online reflective prompts were continued for a second year. A web board was added.

The in-class activities were organized by collaborative groups based on their project type (mathematics, literacy, web delivery, second language, and technology). Tight scheduling limited the length of presentations by students during their teaching demonstrations.

Twelve out of 20 projects involved instructional technology. Students liked the web board over the online activities. The web board provides a means to post student work and to critique each other's work. Students commented favorably, however, on the design and features of each.

Case 13 (Fall 2003, 16 students). The major change in this case was to replace the online reflective web site with a Wiki, or collaborative web pages ("CoWebs"), which enabled students to post draft work and receive critiques from peers, from which revisions would be made. Three weeks were assigned for the prototype demos.

Three sets of scenario-descriptions and revisions were tried out. The first asked students to post an initial vision for their ID projects prior to a needs assessment, the second asked them to post a new set of goals for their project after a needs assessment, and the third asked students to post their selection of media and technology use. Each of these submissions to the CoWeb pages were reviewed by peers in their work groups, and the students made revisions based on these suggestions. The goal was to decrease the review time traditionally experienced by designers (Shambaugh, 2003; 2004).

Seven out of 16 projects were technology projects. The Wiki site improved the needs assessment content, breadth of research, and identification of project goals. All of the students produced a succinct instructional problem statement, the first case where this occurred. All of the projects were actual events students would be implementing and these choices contributed to clear problem statements.

Case 14 (Fall 2004, 13 students). The Wiki site was not used in this case, however, the scenario activities were retained and used during the needs assessment ID phase to improve the quality of research and decrease the revision time during this time-consuming phase. Only one personal conference was held at week 6.

An in-class activity prompting students to identify an instructional problem and response was used to assist student thinking. In the past the instructional problem was assigned out-of-class, the rationale being that this prompt required thinking time. However, an in-class prompt and peer feedback helped students begin clarifying what the specific instructional need was. Scenario-descriptions of their intended project outcomes helped students to redefine their initial vision and motivated them to conduct needs assessment based on a clearer scope of the options.

Only 2 of the 13 projects were technology-related. Students asked that more debriefing time with peers in-class be used and to hear the status of others' projects. Four of the 13 students commented that the course helped them learn more about themselves in terms of developing organizational skills and attitudes, and an appreciation of the iterative nature of designing. One student was disappointed that program evaluation was not given sufficient time in class and confusion between formative and summative forms of program evaluation. The deletion of the second personal conference aggravated this issue as one-on-one briefings about program evaluation used to occur during these conferences.

Case 15 (Fall 2005, 18 students). Owing to professional demands, both personal conferences were deleted from the syllabus. Three weeks were still needed for teaching demonstrations. The web board was still used. A webquest was used as a mid-term exam, facilitated by a technology-ready room which was used for the course.

The Teaching and Assessment design activity was modified in mid-course in terms of a table in which teaching strategies were identified in one column and how students were

assessed was recorded in the second column. The Teaching Demonstration and Prototype design activities were separated.

Sixteen out of the 18 students had teaching experience, which reflected in their choice of projects and reflected on their design decisions. Specifically, these teachers identified a problem and settled on a course of action early. Ten projects were technology focused. Students gave the lowest end-of-the-semester ratings to the midterm exam, which had students in-class search online for definitions and examples of ID terminology.

Case 16 (Fall 2006, 17 students). No design changes were made for Case 16. Weather cancelled one session, while a power outage required a 4th class session for teaching demonstrations. The web board provided options for losing a class session. Groups were used extensively in this case to support the 5 international students who had just arrived in the United States. A technology-ready room supported computer-based presentations, media use, and online resources.

Eleven out of the 17 students had teaching experience. Six of the 17 projects were technology-focused. The teaching demonstrations addressed specific teaching strategies used in their projects, while their Prototype submissions documented the major teaching strategies proposed in their projects. This clarity improved the quality of presentations and separated the two activities, which until Case 15 had been merged into the same Design Activity.

DEVELOPMENTAL RESULTS – PARTICIPATION STRUCTURES

Overview. The previous section documents each course delivery by design decisions, implementation, and evaluation. Over the 16 deliveries different data sources were used to extract these developmental descriptions and frequently the data sources evolved to serve the needs of the students. For example, Likert-scale items and open-ended items on an end-of-the course self evaluation changed over time making comparisons across the cases problematic. The value of case descriptions when taken over time is that a more trustworthy set of conclusions can be drawn by the impact of design decisions on student performance, and reactions of students to teacher-developed learning tasks. One of the features of the course is the ongoing evolution of co-participation structures, those forms of activity in which learning takes place by both instructor and students. Table 2, earlier in this report, identifies the participation structures by case. A second way to report results of developmental research is to summarize the use of each of these participation structures.

Three structures have remained in place across the 16 deliveries: in-class activities, Design Activities, and the use of a text. A co-teaching ended with Case 8, instructor-to-instructor email ceased. Visually from Table 2, one can see that the use of online features were increasingly used; namely, the use of a web site for information and resources, the use of a Wiki to speed up the design review process, and the web board to post student work and receive critiques. Thus, blended learning, while using a web site in earlier cases (4-7), became a standard teaching option from Cases 11 forward.

In-class activities. Classroom activities were used to introduce, reinforce, or provide practice for students across each main topic in the course. The course assessment plan usually assigned these activities collectively as 10% of the course grade. Failure to show up for class and perform these classes resulted in a letter “drop” (e.g., from an A grade to a B grade).

These were typically used in two ways: to introduce key points for that ID phase being discussed, and/or to provide practice for Design Activities. Classroom activities were designed as "jump-start" exercises in which students directly experienced the nature of what was asked in the out-of-class Design Activities.

The sequence of a class session could vary, but would following this sequence:

(1) Summary of what students posted to the web board.
(2) Warm-up activity to introduce students to the next ID phase.
(3) Mini-lecture/presentation.
(4) Jump-start activity to help students record thinking on paper; usually organized around random groups, early to promote meeting students, and later organized around content-specific groups, to provide peer feedback on similar projects.
(5) Scenario-descriptions where students record design decisions and peers critique resulting in an immediate design-review cycle and subsequent revisions.
(6) Explanation of the next Design Activity.

The 15 week semester was overall divided up into five sections to conceptually break-up the course. These sections included "Setting the Stage," which included three weeks for foundational knowledge about design, ID models, and learning theories. The second stage, "Instructional Problem Identification," provided three weeks for needs assessment. "Design Formulation" covered four weeks and examined sequencing issues, teaching, media/technology, and assessment decisions. "Design Implementation" covered three weeks and involved time for students to present teaching strategies that they have proposed in their projects. The final three weeks involve program evaluation, a course debrief involving revised personal ID models, and student evaluation of the course and their learning.

Design activities. Student learning was further assisted through specific learning tasks, which are organized by task rationale, task procedures, and task assessment. Over time, these modified in terms of their detail but have stabilized in terms of 15 activities which when completed produce an ID project. These Design Activities include: Initial Intent Statement, Preliminary Personal ID Model, Mission Statement, Instructional Problem and Needs Assessment Strategy, Revised Intent Statement, Instructional Sequence, Instructional Framework and Assessment Plan, Teaching Demonstration, Prototype, Program Evaluation, Revised Personal ID Model, Self Evaluation and Course Evaluation, and Final ID Project. Over the 12 years the overall format added task rationale and a reflective question designed to help us to learn more about the thinking process of each student. Students would receive feedback on the submission in writing and sometimes on the webboard where the submission was posted.

Text. Textbook use did not vary substantially, as this researcher and co-instructor wrote and published a textbook for this course. The book was organized by ID phase and 30 design activities with supporting text, reflective questions, scenario-stories, and references. The book was visually designed with font size/choice, line spacing, text organization, and summary tables to support novice learning of instructional design. The text was designed as a "tour" through the ID process phases using Design Activities to experience and think about design decisions.

Personal conference. One-on-one conferences with students were used in 13 of the 16 cases, and were designed as personalized assessment meetings. Conference 1 was scheduled

around week 6 of a 15-week semester. Its purpose was to discuss project choice, mission statement, preliminary ID model, and needs assessment strategy. A second conference was scheduled around week 12 and its purpose was to help students make final ID decisions, revisions to the document, and complete the project.

F2F/Email. Email consisted of electronic communication between the two instructors during cases 1-7, frequently totally up to 500 queries, replies, and discussions. Face-to-face discussions between instructors during cases 1-7 usually consisted of several meetings prior to a course and one meeting prior to each class session. Email between instructor(s) and students also occurred and varied considerably over the 12 years. As online capabilities improved over the years, most of the email exchanges between instructor and student reduced in amount and dealt mostly with scheduling problems. Questions on tasks moved to online web boards. Personal conferences between instructor(s) and students were used across cases 1-13. These provided one-on-one formative evaluation of student performance and concerns.

Web site. A website was used for seven cases. Cases 3-6 used a website for informational purposes, but was particularly useful for Case 7 which involved an off-campus cohort of students scattered across the United States. Cases 11-12 field tested a "reflective" web site rather than as an online source for class materials and information. The site consisted of a reflective cycle of thinking activities organized by major topic and used Flash files to provide animated prompts and explanations for major topics. The purpose of this reflective structure was to learn more about students' initial reactions to an ID phase and to see how these perceptions evolved and contributed to their ID project decisions. The strategy was used for 2 years to provide some evidence on its veracity. On a pragmatic level, the additional activities proved too much for some students to handle during a semester. However, on a cognitive level, what students wrote provided some insight on the different views students had on the ID processes, particularly on how the phases relate to each other, which I believe is important for ID process understanding. The connections between the ID phases seems critical for one to use the process, although novice understanding of the process is centered on the ID phases themselves, which is how they are configured in the text and Design Activities. The iterative nature of revising the output of each ID phase is a new experience for students who are accustomed to the culture of the college classroom to more bounded and finite assignments. This reflective use for a web site merits future consideration and a reconfiguration of the technical features to take advantage of improving software and online systems.

Wiki. Cases 13-14 field tested an online "wiki," or a set of collaborative web pages which posted draft student work and required students to provide feedback on iterative design activities. The collaborative (CoWeb) pages were visually spartan and required little coding; however, students are accustomed to more interface detail. More direct instruction and experience in class sessions are needed to acquaint students with this simple online tool. Since the use of this tool, blogs have been used in some settings. Again, this is another strategy that merits reconsideration. As with the reflective online activities, the bigger issue is giving students more to do, and the course has always had plenty of steady activity configured into the course (Shambaugh, 1993, 1994).

Web board. Cases 12-16 used a web board, which provided for threaded discussions, archiving of course materials, and posting of student work and peer critiques. The primary purpose of the webboard is to post course materials and student work. Asynchronous peer critiques are possible with appropriate activity instructions. A classroom management value is that students see what other students do. In courses where there is a right answer this would

be an obvious problem as students could wait to see what was posted and submit that response. However, in this course there are no right answers, just appropriate responses to student needs. The same people tend to post first and the same people post last or even late. As the system provides a time stamp to the posting late work is automatically recorded. In my assessment system late work earns 50%. Pedagogically, the web board acts as a course portfolio. The files and structure are archived weekly and the final archive record stores what students did. Frequently I distribute CDs of their work so students have a copy of what happened in the course.

METHODOLOGICAL ISSUES

Implications of developmental research will be discussed, including improvements for student learning, methodology for research, and how iterative inquiry provides a basis for how such results might be archived and retrieved and "mined" for individual and institutional needs. The chapter provides guidelines on the use of developmental research in terms of identifying a study focus, study procedures, and integrating teacher research into one's responsibilities.

Attributes and Limitations

Van den Akker (1999) has characterized research evaluating educational interventions as providing answers that are frequently "too narrow, too superficial, or too late to do any good." Developmental research addresses these issues of meaningfulness, timeliness, generalizability, and usefulness in four ways:

(1) Developmental research can involve collaborators in the analysis of practical problems and the testing of designed solutions in actual practice. These collaborators may include researchers, designers, content experts, teachers, *and* students.
(2) Developmental research uses a structured approach, consisting of design and development, implementation, and evaluation stages, to systematically collect and evaluate data. Developmental research frequently occurs over multiple cycles to provide more trustworthy results.
(3) The developmental research cycle provides a structure and path for ongoing course development.
(4) Developmental research can include whatever appropriate mix of quantitative or qualitative analyses is needed. As such, developmental research can be regarded as an integrated approach in which multiple research techniques might play a role.

Methodological Considerations

Figure 3 outlines the types of documentation that might be useful to study one's teaching. The documentation is categorized in terms of course design decisions, course implementation, and course evaluation.

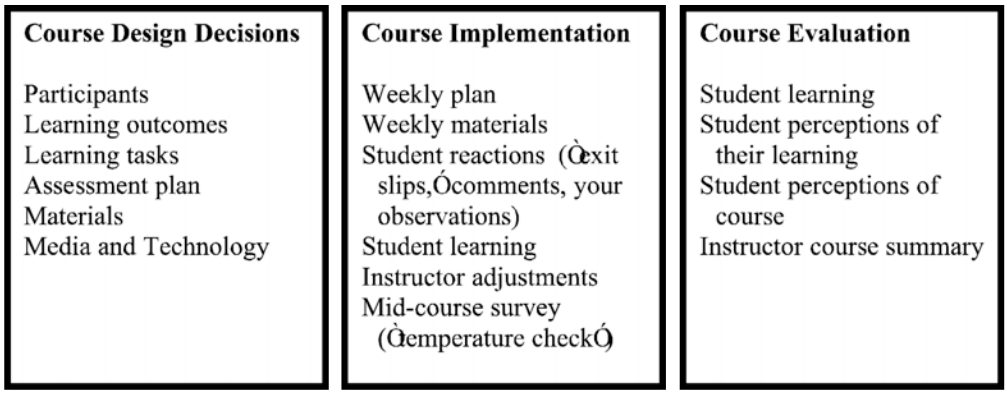

Figure 3. Systematic Documentation of Teaching.

Below are guidelines to keep in mind when conducting developmental research of one's teaching.

- *Identify the research objectives for the developmental research*. These objectives will include the design objectives for the artifact, innovation, or intervention; the implementation objectives, or what occurs during instruction; and the evaluation objectives, which can include what students learn, as well as their perceptions of their learning and your teaching.
- *Develop IRB materials for each course*. If you are planning on disseminating your results, develop IRB materials, as required by your institution. Once developed, this activity becomes relatively easy to accomplish each semester.
- *Identify the data sources for each phase of the developmental research cycle.* Determine what data you need to answer the questions and how *specifically* each data source contributes to your understanding of the research objectives.
- *Document data collection and management procedures*. Determine how each form of data will be collected and stored. A 3-ring notebook works well in storing data analysis artifacts, a strategy that separates the original data from the analysis and provides a means to track the analysis sequence from data source to data reduction to data reporting. Digital files of student artifacts are optimal because they reduce the storage space requirements and provide a ready-made artifact that can be analyzed electronically. Keeping a procedural summary of how each data source is analyzed will be critical as some data sources will change over time, as teaching decisions must also change.
- *Analyze data to address research objectives*. One caution in data analysis during the implementation stage of developmental research is to remain descriptive in terms of teaching actions, how students reacted, and what adjustments were made. Remaining descriptive helps to keep premature interpretation from entering the data reduction documents. The subsequent analysis artifacts will vary depending on the analysis method chosen, but typically will include survey results; categorical analysis of open-ended student responses, notes and interviews; structured summaries, and tables (see Miles and Huberman, 1994, for examples). This data reduction provides

an analysis of the original data and allows a condensed view of the data sources. Scrutiny on this level of analysis may reveal that some further analysis is needed, such as coding of structured summaries to reveal themes as well as to identify exceptions and differences (Spradley, 1980). The analysis method may also look for contrasts, comparisons, and exemplars. The point here is that a data reduction strategy should be planned so one has a system of moving data from its original source to a more manageable form.

- *Use care in analyzing across cases*. An across-case analysis reports the changes in design decisions, implementation, and evaluation of the intervention. One should attempt to compare differences across cases but be cautioned about "averaging or filtering" out the differences inherent in each course delivery. As Huberman and Miles (1998) have commented, "each case has a specific history–which we discard at our peril–but it is a history contained within the general principles that influence its development" (p. 194).
- *Address validity and limitations of the study*. A source for bias in developmental research is the large amount of data, which may lead to missing important information or overweighting some findings due to focusing on a particular and large set of data. Personal involvement increases the possibility that recorded observations highlight particular incidents while ignoring others. The use of journals records observations or design decisions that would otherwise be lost. Personal involvement also implies a danger in being selective and overconfident with some data. One suggestion is to check descriptions and analysis of each case with students and peer review outside of the course, or with peers or co-instructors.
- *Write up the results*. Dissemination necessitates the need to transform developmental research findings to a publication audience and format. Students also appreciate this information at the beginning of a new course because your values and expectations are articulated and public – something that does not often happen in classrooms.
- *Final guideline*. If one chooses to conduct developmental research for research purposes, we encourage faculty to use the findings to improve their teaching. To ensure that developmental research "pays off" over time the design decisions must incorporate results from the evaluation stage of a previous cycle or iteration. The caveat here is to start small. Small steps allow for retreat and regrouping, as well as adaptation by both the students and the instructor. It is through the repeated iterations of this cycle that the research gathers strength, validity, and reliability.

IMPLICATIONS

Openly studying teaching enables one to model teacher inquiry for students and that one is willing to learn alongside students. One comes to better understand the content from a student's point of view, what they know and learn, and what is relevant to them. Such a stance underscores the importance of student participation in the process and the evidence that specific feedback is considered and included in the design decisions. At the beginning of each semester you can share what you have learned and what students have said about the course, as well as how to be successful in the course. In other words, data from students is

shared with students up front. Results from ongoing developmental research expand teaching beyond presentations and work sheets. Student and instructor participation expands to include new forms of participation (Wenger, 1998), such as classroom activities (mini-lectures, jump-start activities), online activities, personal face-to-face conferences, textbook, and e-mail. A challenge is to analyze the implementation data as it accumulates weekly, so students might benefit from written comments and teaching adjustments during the course.

Conducting this type of inquiry forces one to become more systematic in design, collection, management, and analysis of data (Shambaugh and Magliaro, 2001). Being more systematic in describing teaching forces one to be clear about learning beliefs and the underlying theoretical basis for teaching. Over time one becomes more practiced in being systematic with course development. In developmental research, as Reeves (2000) cautions and encourages, "Expect to work very hard. Be patient and persevere. And enjoy the challenge and reward of a career worth having for its contributions to the greater good" (p. 26).

CONCLUSION

The goal for developmental research is to seek an understanding of how an educational artifact, process, or intervention addresses educational goals (Reeves, 2000). As Shulman (1986) has advocated, "Both our scientific knowledge of rules and principles ... and our knowledge of richly described and critically analyzed cases combine to define the knowledge base of teaching" (p. 32). Developmental research provides a methodology to help designers and teachers to build a personalized knowledge base for teaching. Studying one's teaching over time not only contributes to one's research portfolio but also to a discipline's pedagogical knowledge base. Developmental research suggests, too, a long-range potential. Developmental research can contribute to improvement of educational interventions, using models and other processes, courses, and media/technology artifacts, as well as adding to the knowledge about this development through generalized instructional frameworks and design principles that can be re-used and shared. Developmental research provides a vantage point for collaborators to talk about their roles, whether these roles be pragmatic (design, teaching) or knowledge-building (research). We encourage readers to consider developmental research as a systematic tool to study their teaching and to take under consideration that inquiry into teaching will prove invaluable to your professional development as well as the development of your students.

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