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**A CONCERNS-BASED ADOPTION MODEL STUDY OF UNIVERSITY
INSTRUCTORS ENGAGED IN FACULTY DEVELOPMENT FOR
ENHANCING LEARNING WITH TECHNOLOGY**

by

James W. Julius

A Dissertation Submitted to the Faculty of
San Diego State University and the University of San Diego
in Partial Fulfillment
of the Requirements for the Degree
Doctor of Education

Dissertation Committee:

Marcie Bober, Ph.D., San Diego State University
Viviana Alexandrowicz, Ph.D., University of San Diego
Cathie Atkins, Ph.D., San Diego State University

May 2007

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by

James W. Julius

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DEDICATION

This dissertation is dedicated to my family. Without the incredible support of my wife, Corie, to undertake this adventure in learning, it simply would not have been possible. I am grateful to my wonderful daughters, Zuleika, Rosalie, and Natalia, for their constant love and affection, laughter and grace. The warmth and joy of home and family sustained me throughout the last five years. I look forward to hearing about the rich, deeply meaningful experiences my daughters will have when they enter into higher education.

Most ideas about teaching are not new, but not everyone knows the old ideas.

Euclid, c. 300 B.C.E.

Lectures were once useful; but now when all can read, and books are so numerous, lectures are unnecessary.

Samuel Johnson, 1799

ABSTRACT OF THE DISSERTATION

A Concerns-Based Adoption Model Study of University
Instructors Engaged in Faculty Development for Enhancing
Learning with Technology

by

James W. Julius
Doctor of Education

San Diego State University and the University of San Diego, 2007

For over a decade, theorists have suggested that higher education institutions are in the midst of a shift from an emphasis on student access to instruction to student success in learning. Digital technologies are one “lever” increasingly touted as a means to improve teaching and learning in higher education. Because serious efforts at technology integration not only require competence with the technologies, but also often result in changes to instructional methods, colleges and universities are urged to consider faculty development needs.

This study detailed how instructor change unfolded in response to a faculty development program intended to enhance the use of instructional technologies at a large public university in the southwestern United States. The program was designed to enable faculty to adopt the innovation of using advanced technologies: (a) for instructional design/planning/delivery and (b) as a tool supporting students’ ability to research, organize, visualize, manage, evaluate, and communicate information.

The study was grounded by the Concerns-Based Adoption Model (CBAM), first proposed by Hall, Wallace, and Dossett in 1973. CBAM is a widely-used framework that allowed the researcher to assess faculty response to the innovation in three different ways:

- concerns about the innovation (assessed via the Stages of Concern Questionnaire),
- levels of use of the innovation (assessed via the Levels of Use interview), and
- quality of the implementation of the innovation (assessed via the Innovation Configurations methodology).

From the first two measurement strategies, the researcher generated overall CBAM profiles for faculty participants. These profiles represented a range of faculty change patterns and informed selection of a sample group for Innovation Configurations assessment and intense retrospective interviewing based on the Critical Incident Technique, developed by Flanagan in 1954, for triangulating and clarifying the CBAM findings.

Findings from this study will be useful for launching and sustaining future faculty development efforts, and thus point to strategies that can improve the undergraduate experience. CBAM studies are most often conducted at the K-12 level; this study also provides recommendations for the use of the methodology in higher education.

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CHAPTER 1

INTRODUCTION

Though the educational milieu is rapidly changing, most undergraduate instructors teach in the lecture-oriented, didactic instructional style which has prevailed for centuries. Barr and Tagg's (1995) seminal essay on undergraduate education included the following questions: "Do students find in our colleges a coherent body of experiences that help them to become competent, capable, and interesting people? Do they understand what they've memorized? Can they act on it? Has the experience of college made our students flexible and adaptable learners, able to thrive in a knowledge society?" (p. 25) Though Barr and Tagg theorized that higher education institutions were in the midst of a shift from an emphasis on student *access to instruction* to student *success in learning*, this shift has been slow in coming. Systemic change in higher education and adoption of innovative practices at the individual faculty level are challenging to achieve.

BACKGROUND TO THE STUDY

In 2002, the American Association of Colleges and Universities (AACU) published a report entitled *Greater Expectations*. Authored by a broad national panel of undergraduate educational leaders, the premise of the report was clear: Deep changes are necessary in undergraduate education to significantly improve the quality of student learning (American Association of Colleges and Universities, 2002). Table 1 reprises the many challenges that face undergraduate education—both external and internal.

The Greater Expectations study also makes recommendations for changes to practices in undergraduate education in a number of areas; among them are curriculum, faculty expectations, and classroom practices. Table 2 illustrates the breadth and depth of the transformations the report's authors deem necessary for improvement to occur.

What the *Great Expectations* report clearly illustrates are the wide gaps between the optimal learning experience for undergraduates and the realities of the situation. Complicating matters, effective teaching (let alone fulfilling the faculty expectations and

Table 1. Challenges Facing Undergraduate Education

External Pressures	Barriers to Quality Student Learning
<ul style="list-style-type: none"> • Changing demographics of college attendance • New enrollment patterns • The information explosion • The technological revolution • A stricter regulatory environment • New educational sites and formats • The changing nature of the workplace • The global nature of major problems, requiring enhanced international cooperation • Renewed emphasis on civic responsibility and the development of communal values • Decreased state funding for public colleges and universities 	<ul style="list-style-type: none"> • The fragmentation of the curriculum • Professors prepared as scholars, not teachers • Exclusive definitions of quality • A dearth of meaningful assessment • The heavy financial burden on students • Demands of personal and family life upon students

Note. Adapted from American Association of Colleges and Universities (2002).

classroom practices described in Table 2) is but one dimension of university life for which faculty are held responsible. Most faculty are expected to conduct and publish research and provide service to their community, in addition to maintaining a teaching load. Faculty also have little control over who enrolls in their classes—and neither their academic training nor the typical course structure necessarily enables them to diagnose and attend to students' unique learning needs. Institutions vary, of course, but not all provide the support—logistical, practical, conceptual, and financial—that faculty need to be successful.

Buckley (2002) summarizes the situation:

Faculty have been trained in critical inquiry, but to a large extent epistemologies are contingent on content area and do not provide much guidance about how people learn and how to teach more effectively. Most faculty were trained as researchers, with little formal training in teaching or in the cognitive development of learning. Faculty cultures often do not encourage or reward faculty development in teaching, so most faculty teach the same way that they were taught. (p. 32)

Table 2. Recommended Changes to Undergraduate Education Practices

Curriculum	Faculty Expectations	Classroom Practices
<ul style="list-style-type: none"> • Prepares all students for successful careers, enriched lives, and engaged U.S. and global citizenship • Develops self-directed, integrative, intentional learners who are empowered, informed, responsible, and thoughtfully reflective about their education • Is based on a practical liberal education in which students learn and apply their learning in multiple ways to complex problems • Is characterized by a diversity of perspectives • Is informed by technology and develops information literacy • Sets high standards of performance, but without prescribing a standardized path. 	<ul style="list-style-type: none"> • Hold themselves to high standards of teaching • Hold their students to high standards of intellectual work that require strong commitments of time and attention • Set clear, interrelated goals for their courses, academic programs, and student learning • Accept responsibility for, and teach to achieve, the goals • Design coherent curricula and employ teaching practices to help all students achieve the goals • Regularly assess their own and student success, and use the results to improve learning • Individually and collectively assume responsibility for the entire curriculum • Embody life-long learning by engaging in professional development to improve teaching. 	<ul style="list-style-type: none"> • While teaching knowledge, also ask students to apply it • Stress inquiry and engagement with unscripted and contested problems, including those drawn from real life • In an intentional way, employ the diversity of the student body as a learning tool • Develop and value collaborative as well as individual achievement.

Note. Adapted from American Association of Colleges and Universities (2002).

Learner-Centered Undergraduate Education

The call for reforming undergraduate education is echoed by many who advocate for a more learner (or student)-centered approach to undergraduate teaching and learning (see, for example, Biggs, 1999; K. A. Smith, Sheppard, Johnson, & Johnson, 2005; Weimer, 2002). The well-known *Seven Principles for Good Practice in Undergraduate Education*

(Chickering & Gamson, 1987) provide insight into the everyday practices that characterize this approach. Learner-centered instructors:

1. encourage contact between students and faculty,
2. develop reciprocity and cooperation among students,
3. encourage active learning,
4. give prompt feedback,
5. emphasize time on task,
6. communicate high expectations, and
7. respect diverse talents and ways of learning.

As the AACU report so aptly details, there are many reasons why institutions of higher education have been slow to embrace these principles and encourage their adoption. Institutions must attend to many areas of undergraduate education in order to effect change. The sections that follow explore three in greater detail: assessment and accountability, epistemology, and demographics, with some attention to the potential impact of technology on these areas.

ASSESSMENT AND ACCOUNTABILITY

Popular reports of quality in higher education (such as the *U.S. News and World Report* rankings) generally do not attend to the aspects of the undergraduate experience represented by Chickering and Gamson's *Seven Principles*. In his examination of more in-depth measures such as the National Survey on Student Engagement (NSSE) and the Collegiate Learning Assessment (CLA), Mathews (2005) reports: "Those groups that do measure the weight of an undergraduate education do it quietly, and often decline to disclose their findings without the permission of the universities that would prefer to keep their failings to themselves" (p. 49). Furthermore, Mathews says, "the most damning fact is that there are so little data about student learning compiled at all by higher education" (p. 49).

Accrediting agencies are, however, beginning to require evidence of achievement related to student learning outcomes. The increasing importance of assessment and accountability in higher education accreditation is raising awareness among administrators and faculty of the importance of curricular design based on appropriate student learning outcomes. These outcomes must be aligned with formative as well as summative assessment

processes in order for the effectiveness of the curricula to be evaluated. Instructional strategies must then be reconsidered in order to enable students to complete assessments successfully. This process of learning outcome definition, curriculum redesign, implementation of appropriate assessment, and revision of instructional approaches can present a challenge. For universities steeped in notions of academic freedom, this process may seem awfully prescriptive. For faculty rooted in the “Instructional Paradigm” (Barr & Tagg, 1995), with its focus on didactic teaching activities rather than principles of learning, this process may require rethinking, and relearning, what it means to teach.

At the course level, an emphasis on formative assessment, or assessment *for* learning (as opposed to summative assessment, assessment *of* learning), is an important aspect of learner-centered teaching. Giving students feedback on their learning prior to an exam is certainly a challenge in the large courses which characterize much of the undergraduate experience, particularly in research universities. However, as Sperber (2005) says, “A college education in the twenty-first century should center on process learning, and not on product acquisition and regurgitation” (p. 143).

Technologies such as online assessment tools, online gradebooks, and electronic portfolio systems hold some promise of helping educators and institutions with the administrative tasks associated with collecting, managing, reporting, and analyzing assessment data in order to attend to student learning needs and continuously refine the curriculum. At present, however, most faculty and institutions are not collecting data with the intent to foster the “process learning” advocated by Sperber (2005).

EPISTEMOLOGY

Terms such as “learner-centered,” “process learning,” “active learning,” and “engaged learning,” are all facets of the pedagogical stance known broadly as *constructivism* (see Brooks & Brooks, 1993), which is increasingly advocated by those calling for undergraduate reform. Epistemologically, constructivists emphasize the personal, social, and active nature of knowledge construction. While *information* may be freely shared, *knowledge* is particular to an individual who has engaged in a meaning-making process. Constructivists thus place a premium on the active engagement of novice learners under the guidance of an expert, whereas the traditional objectivist or positivist model views the role of the instructor

as a transmitter of essential bits of knowledge to receptive learners. Student inquiry, problem-based learning, cooperative learning, attention to metacognition, and individualized instruction are examples of classroom pedagogies which are learner-centered and align with constructivist theory. Additionally, advocates for the use of technologies in education typically emphasize the opportunities for empowerment that technologies provide to students as learners, and their facilitative role in helping instructors move from the “sage on the stage” to the “guide on the side” (see, for example, Bates & Poole, 2003; Laurillard, 2002; Sandholtz, Ringstaff, & Dwyer, 1997).

While constructivism’s roots in philosophy and psychology may appeal to some faculty, the growing body of literature on how people learn may provide a more compelling argument for others. From their research on adult learning, Halpern and Hakel (2003) have determined that “it would be difficult to design an educational model that is more at odds with the findings of current research about human cognition than the one being used today at most colleges and universities” (p. 38). For students to retain skills and knowledge, and be able to transfer those skills and knowledge into novel contexts, Halpern and Hakel recommend that instructors:

- facilitate students’ active processing of information presented;
- facilitate students’ considering, interpreting, and representing information in a variety of modes/conditions;
- consider students’ prior knowledge; and
- consider student beliefs about knowing.

Though not presented under the name of constructivism, these recommendations clearly align with a learner-centered epistemology.

LEARNER DEMOGRAPHICS

The increasing diversity of undergraduates is one more reason why a teaching-centered approach to undergraduate education is less effective than it used to be. “One size fits all” won’t work in the 21st century. “Even as college attendance is rising, the performance of too many students is faltering. Public policies have focused on getting students into college, but not on what they are expected to accomplish once there” (American Association of Colleges and Universities, 2002).

A growing segment of the college student population is made up of non-traditional learners, who often are attending school on a part-time basis while also holding down full-time jobs and caring for families (American Association of Colleges and Universities, 2002). In terms of course content, these students are typically looking for practical educational experiences which match with their current needs, not abstract information which they will be expected to regurgitate. In terms of delivery, many of these students are interested in the possibilities offered by distance education approaches facilitated through technology (American Association of Colleges and Universities, 2002).

The current generation of traditional-age undergraduates, known as the *net generation*, or *digital natives*, also offers a challenge to the efficacy of traditional instructional approaches. Growing up with computers, the Internet, and cell phones as an integral part of their lives, today's college students exhibit predispositions distinct from their predecessors. Research indicates that these students tend to be oriented toward images rather than text; prefer active rather than passive learning; take a random, trial-and-error approach to problem-solving rather than a more linear one; prefer multi-tasking and constant social connection; and take a participatory and collaborative approach to creative endeavors, freely sharing and repurposing ideas and materials (J. S. Brown, 2000; Frand, 2000; Oblinger, 2003). These predispositions are at odds with a passive, information-transfer approach to education. The net generation's experiences with technology do not automatically prepare them to use academic technologies effectively, however.

LEARNER-CENTEREDNESS

In short, undergraduate institutions face many pressures and challenges in moving to a more learner-centered educational paradigm. Whether these challenges are societal, such as changing learner demographics; political, such as the accreditation and accountability movements; or epistemological, such as theories aligned with constructivism and cognitive science, all point to the importance of change in undergraduate education. As Laurillard (2002) sums up:

Teachers need to know more than just their subject. They need to know the ways it can come to be understood, the ways it can be misunderstood, what counts as understanding: they need to know how individuals experience the subject. However, they are neither required nor enabled to know these things. (p. 3)

Technology, Faculty Development, and Change in Higher Education

Digital technologies have been one “lever” (Chickering & Ehrmann, 1996) increasingly touted as a means to improve teaching and learning in higher education. As Gregorian (2005) argues, “The new technologies stand to deliver unheard-of benefits to seekers of information, instruction, knowledge, and community” (p. 91). To date, however, the impact of technology in colleges and universities has been much more significant on business operations than on the academic enterprise. Running an educational institution without the benefit of technologies for organizing, processing, and communicating information is certainly unthinkable. For many instructors, however, technology use is primarily at this administrative level, for record-keeping and communicating (Zemsky & Massy, 2004), rather than for instruction. Even much of the research which nominally is about effectiveness of technology in teaching and learning is focused instead on administrative issues (Ives, McWhaw, & De Simone, 2005, p. 73).

TECHNOLOGY IN HIGHER EDUCATION

As David Staley (2004) pointed out, technology in education is not a new phenomenon; language, books, and chalk are all technologies. Though the construct “technology” is now typically interpreted as referring to digital tools (and, indeed, the term is so defined for this study), it is helpful to “look at technology inclusively; that is, view digital technologies as part of the larger ‘information ecology’ of the classroom, which has long housed technologies of many varieties” (p. 20).

Within the classroom, the integration of digital technologies into the infrastructure of learning spaces has enabled an increased use of Microsoft® PowerPoint and other presentation-oriented technology in higher education. Outside the classroom, the use of the Internet and web-based technologies as an enhancement or replacement for traditional face-to-face course delivery has become commonplace. An important example of this type of technology is the Learning Management System (LMS, also known as Course Management System), such as Blackboard™ or WebCT. Though proponents of instructional technology envision uses for these technologies outside of the traditional, lecture-based educational model, these are not inherently disruptive technologies. They are most commonly used as

management tools, increasing the efficiency of teacher-centered instructional practices (Gillespie, 1998; Society for College and University Planning, 2006; Zemsky & Massy, 2004).

INNOVATING WITH TECHNOLOGY IN HIGHER EDUCATION

What, then, might make digital technologies so powerful in the teaching and learning enterprise? Advocates point to the unprecedented power and control afforded to learners by features of these technologies. The ability to access realms of information, communicate across the globe, and harness computer power for creativity, simulation, and solving authentic problems brings new learner-centered possibilities to the academic enterprise.

The transition to learner-centered instructional approaches—in particular, those featuring advanced and innovative technologies—is both strategic and tactical. As Newman and Scurry (2001) noted in the *Chronicle of Higher Education*:

[T]hose institutions skilled in the use of technology to improve learning will soon be seen as more dynamic and effective than their less engaged competitors. Therefore, institutions and faculty members viewing themselves as excellent at teaching now must excel in the use of technology as well, if they are to remain leaders. How should the institution support faculty members as they make that transition? (p. B7)

Institutions taking a proactive approach to these issues are implementing faculty development programs designed to address issues of both pedagogy and technology. As Laurillard (2002) stated in her book on university teaching and effective uses of technology, “Innovation is at the core of a university’s competitive advantage, in both research and teaching” (p. 227-8). Laurillard additionally advocated that institutions of higher education have feedback processes in place to help innovators refine their practice, and to facilitate the diffusion of innovations through knowledge sharing.

This study, then, is about detailing how change unfolds—specifically, how university instructors respond to a faculty development program designed to increase the use of technology to facilitate learning. It goes beyond traditional evaluation, which tends to look at participants’ reactions to training experiences, how much they learn, and in what ways they apply new skills and knowledge. Results will be both local (feedback that can inform future faculty development efforts) and generative—contributing to the larger body of knowledge

about change in higher education faculty engaged in development processes regarding teaching with technology.

STUDYING FACULTY CHANGE: CBAM

One tool useful for this purpose is the Concerns-Based Adoption Model, or CBAM (Hall & Hord, 2006). CBAM was designed to systematically measure how instructors adapt to change—in this case, faculty adoption of advanced technologies: (a) for instructional design, planning, and delivery, and (b) as a tool supporting students' ability to research, organize, visualize, manage, evaluate, and communicate information. According to Anderson (1997), CBAM is “arguably the most robust and empirically grounded theoretical model for the implementation of educational innovations to come out of educational change research in the 1970s and 1980s” (p. 331). CBAM is “widely known and has been applied throughout North America, Western Europe, and Australia by both education researchers and practitioners” (p. 332) in a variety of educational contexts.

CBAM assessment measures examine “the affective and behavioral dimensions of change when [instructors] attempt to put new instructional methods and curriculum materials into practice” (Anderson, 1997, p. 332). The affective dimension is evaluated through the Stages of Concern Questionnaire (SoCQ), a 35-item assessment resulting in evaluation of an individual's concerns among seven distinct stages that fall into three distinct groups: self-focused, task-focused, and impact-focused. The behavioral dimension is evaluated through the Levels of Use assessment, an interview protocol which identifies the nature of an individual's use of a change, and through the Innovation Configurations component, which involves the creation of a checklist or profile to assess the degree to which an individual's implementation of an innovation matches the intent of the change leaders (Horsley & Loucks-Horsley, 1998).

CBAM has been applied to many innovations in education. In fact, Slough and Chamblee's (2005) recent meta-analysis of articles attending to *technology in education* revealed 16 distinct CBAM studies appearing in refereed journals between 1995 and 2004; unfortunately, however, nearly all related to K-12 teachers or student learners. Also disappointing was that 10 employed only the SoCQ. Slough and Chamblee, worried that the model was being compromised, called for the use of the entire CBAM process in evaluating

educational innovations related to technology. They concluded that “while studying CBAM as a theoretical change model is much needed, the application of CBAM to specific innovations is warranted” (p. 1037). This author has located several other recent higher education studies featuring CBAM as the methodology for exploring faculty development targeting technology to improve teaching; these are explored in depth in Chapter 2. However, none of these studies used all three CBAM components, and none examined instructor perceptions of the effects of the faculty development process *in addition to* CBAM-measured instructor change.

Situating this Study

This study took place at a large, urban, Carnegie-classified research university (high research activity) institution¹ in the southwestern United States. Compared to other universities, this one is ahead of the curve in terms of the sophistication and number of technology-equipped classrooms, which include at least one computer, document camera, DVD/VCR, and video data projector. Many instructors make use of the Blackboard learning management system, though very few of its courses are offered through distance education. Instructors receive instructional and technological assistance from Instructional Technology Services (ITS), the Center for Teaching and Learning (CTL), the Library, departmental and college-level staff, and a grant-funded faculty development initiative (FDI) focused on technology and teaching.

The FDI is one of four programs funded by a 2004 multimillion dollar grant from a large, local telecommunications corporation. The overarching goal of the FDI is to develop the skills, knowledge, and dispositions key to students’ success in the 21st century workforce. A major strategy for achieving this goal is to offer focused professional development opportunities to instructors participating in its fellowship program, which began in 2005-2006. For 2006-2007, the FDI provided its 21 faculty fellows with extended professional development centered around a complex innovation—specifically, using

¹ See <http://www.carnegiefoundation.org/classifications/index.asp?key=798> for information on the Carnegie classification.

advanced (and pedagogically sound) technologies to enhance student learning. Faculty began with a four-day summer workshop which included demonstrations on learning and technologies along with ample hands-on practice. Over the course of the summer, faculty worked collaboratively *or* individually to develop a technology-infused project for classroom implementation in the fall; they were supported by a team of academic staff specializing in instructional design and learning technologies.

STATEMENT OF THE PROBLEM

In general, faculty development in higher education is not well documented in the literature. Research on the instructor change process that underlies faculty development programs designed to increase student learning through improved use of instructional technologies is particularly rare. Though many institutions of higher education have implemented such programs, the body of literature on these programs is small. Within the literature that does exist, systematic approaches to examining the impact of these programs are rare. And within the literature which does have a systematic approach, grounding of the approach within a theoretical framework is even less common.

The second year of the FDI faculty fellowship program presented an opportunity to study the impact of the program, with regard to: (a) fellows' concerns about teaching with technology; (b) fellows' level of use of instructional technology; (c) the quality of fellows' implementations of instructional innovations which make use of technology; and (d) perceptions of fellows regarding the change process and its impacts on themselves and students.

PURPOSE OF THE STUDY

This study focused on faculty receptivity to change. It employed a mixed methods approach to assess the impact and efficacy of a multifaceted intervention designed to increase faculty use of technology for enhancing student learning. Participants were drawn from those engaged in a faculty development program designed around this intervention, which began with a four-day workshop in May 2006. The intervention centered on the facilitation of a complex innovation—specifically, using advanced technologies: (a) for instructional design, planning, and delivery, and (b) as a tool supporting students' ability to research,

organize, visualize, manage, evaluate, and communicate information. The study is grounded by the Concerns-Based Adoption Model, a framework that allowed the researcher to assess faculty “response” to the innovation in three different ways:

- concerns about the innovation (assessed via the Stages of Concern Questionnaire),
- levels of use of the innovation (assessed via the Levels of Use interview), and
- quality of the implementation of the innovation (assessed via the Innovation Configurations methodology).

Data from the Stages of Concern and Levels of Use assessments enabled the researcher to generate CBAM profiles for faculty participants. These profiles informed sample selection for IC assessment and intense retrospective interviewing. Based on the Critical Incident Technique (Flanagan, 1954; Lambrecht, 1999), the interviews probed faculty perceptions of key moments in the change process, both as learners involved in the summer workshop and follow-up consultations, and as instructors implementing the innovation during the fall 2006 semester.

Findings from this study will be useful for enhancing future local faculty development efforts, and thus point to strategies that can improve the undergraduate experience. Additionally, CBAM studies are most often conducted at the K-12 level; this study can potentially lead to expansion of the model in the postsecondary environment.

RESEARCH QUESTIONS

The study was organized around the innovation of using advanced technologies: (a) for instructional design/planning/delivery, and (b) as a tool supporting students’ ability to research, organize, visualize, manage, evaluate, and communicate information. Five research questions guided the investigation:

Research Question 1: How do participants’ concerns about the innovation change over the course of their participation in the FDI fellowship?

Research Question 2: How do participants’ uses of the innovation change over the course of their participation in the FDI fellowship?

Research Question 3: To what extent, and in what ways, do *concerns* about the innovation differ by participant group?

Research Question 4: To what extent, and in what ways, do *uses* of the innovation differ by participant group?

Research Question 5: What are the relationships among participants' CBAM change profiles (based on SoCQ and LoU data), participants' perceptions of the impact of the faculty development program (as revealed in retrospective interviews), and evidence of the impact of the FDI program (as given by the IC assessment)?

DEFINITION OF TERMS

The following is a list of key terms used in the study.

Concerns-Based Adoption Model (CBAM) – An applied research framework developed at the University of Texas in the 1970s that focuses on strategies for measuring, interpreting, and facilitating affective and behavioral change as instructors make use of educational innovations.

Critical Incident Technique (CIT) – A strategy for qualitative data collection and interpretation which focuses on capture detailed behavioral descriptions in the context of key real-world situations and occurrences (Flanagan, 1954).

Innovation Configurations (IC) - Behavioral dimension of the CBAM, focusing on the quality of an instructor's use of an educational innovation; assessed via the IC Map.

IC Map – A rubric developed by innovation leaders to describe the range of possible implementations of an educational innovation; the rubric is used to assess the quality of an innovation's implementation by individual educators.

Learner-centered instruction – A combination of a “focus on individual learners” with the “best available knowledge about learning and how it occurs” in order to have “teaching practices that are most effective in promoting the highest levels of motivation, learning, and achievement for all learners” (McCombs & Vakili, 2005, p. 1584).

Levels of Use (LoU) – Behavioral dimension of the CBAM, focusing on the extent to which instructors make use of an educational innovation; the construct consists of eight LoU and is assessed via the Levels of Use interview.

Stages of Concern (SoC) – Affective dimension of the CBAM, focusing on the concerns of instructors involved in implementing an educational innovation; the construct consists of a seven-stage model and is assessed via the Stages of Concern Questionnaire.

Stages of Concern Questionnaire (SoCQ) – 35-item questionnaire which is used to assess the relative intensity of educator concerns in each of the SoC.

CHAPTER 2

LITERATURE REVIEW

Chapter 1 described the call to institutions of higher education to move toward a learner-centered educational model. For colleges and universities to make this shift requires systemic changes as well as change at the individual faculty level. This study focuses on the change process in faculty engaged in an institutionally supported effort to build faculty capacity for designing effective learning experiences and environments through the use of technologies for teaching and learning.

This chapter, then, reviews the literature informing the study; within each section of it, the bounds of the literature considered will be described.

The first part of the chapter further develops the background for this study, and it includes three facets:

- A survey of the conceptual and research-based literature on effective teaching and learning in higher education.
- An exploration of the role of technology in effective post-secondary teaching and learning.
- A consideration of theories and models of faculty development, particularly those aimed at enabling higher education instructors to employ technology in the design, development, and delivery of learning opportunities for students.

The second section of the chapter presents background on educational change theories and models for instructor change regarding educational innovations—in particular, models that consider technology-related instructional innovation.

The third focal point of this chapter is an inquiry into the theoretical framework central to this study, the Concerns-Based Adoption Model (CBAM), and it also is organized into three distinct areas:

- Background on CBAM's history and development, including a detailed exploration of the central constructs of the model, and consideration of their reliability and validity.
- CBAM's general influence on faculty development models.
- CBAM-based research on faculty development for improved teaching and learning with technology.

The chapter closes by highlighting the ways in which this study builds on the recommendations of the relevant literature base, as well as the ways in which this study is innovative, going beyond the existing body of research.

IMPROVING LEARNING IN HIGHER EDUCATION

This section highlights the literature in three primary areas:

- learner-centered instructional practices,
- uses of technology to improve learning, and
- faculty development aimed at enabling instructors to become accomplished facilitators of student learning, particularly through effective use of technology.

Learner-Centered Teaching

Chapter 1 referenced the *Greater Expectations* report (specifically, the section that called for a change in the basic model of instruction in higher education), and introduced constructivist epistemology. Throughout the literature on higher education teaching and learning, terms such as *student-* or *learner-centered* (Gillespie, 1998; Herrington, Herrington, Oliver, Stoney, & Willis, 2001; McAlpine & Gandell, 2003; McCombs & Vakili, 2005); *constructivist* (Bates & Poole, 2003; Biggs, 1999; Comeaux & McKenna-Byington, 2003; Laurillard, 2002; McCombs & Vakili, 2005); and *higher-order learning* (McAlpine & Gandell, 2003) are all used to denote instructional design choices that move away from a focus on “students repeating, or miming, newly presented information” in the transmission model to an approach which “helps learners to internalize and reshape, or transform, new information” (Brooks & Brooks, 1993, p. 15). Compared to the transmission model, the roles of student and instructor in a *learner-centered* environment are less well defined (McAlpine & Gandell, 2003). The challenge of helping higher education faculty to understand and accept this new role is significant.

As learner-centered epistemologies have become increasingly well understood in the last 15 years, and with the publication of the seminal *How People Learn* (Bransford, Brown, & Cocking, 2000), there is growing recognition that teaching practices in undergraduate education—particularly the standard large lecture course—provide far from an ideal learning situation. Twigg (1999, p. 14) notes numerous challenges to learning in a typical large lecture environment:

- students exhibit a broad range of differences,
- students rarely participate actively,
- students rarely collaborate,
- student interaction with materials is inadequate,
- students receive little feedback, and
- student attendance is low.

As a result, Twigg says, retention of skills and knowledge suffers from three problems: “amnesia”—forgetting; “fantasia”—misunderstanding; and “inertia”—not knowing how to use the information (p. 14).

Richardson (2003) claims, “[B]ecause constructivism is a theory of learning and not a theory of teaching, the elements of effective constructivist teaching are not known” (p. 1629). However, a growing body of research documents approaches to college teaching which are more effective than the traditional transmission model. Summarizing Pascarella and Terenzini’s synthesis of research across three decades on how attending college affects students, Smith et al. (2005) declare, “A substantial amount of evidence indicates that there are instructional and programmatic interventions that not only increase a student’s active engagement in learning and academic work but also enhance knowledge acquisition and some dimensions of both cognitive and psychosocial change” (p. 88). These “interventions” are based on increasingly well-understood principles of learning. Halpern and Hakel (2003) describe “empirically validated principles” (p. 38) of adult learning which emphasize the active processing of information presented.

Haughey (2003) summarizes well the principles and interventions of learner-centered education:

Learning itself cannot be *designed*. It can only be *designed for* through the design of learning environments that catch learners' attention, incorporate their experiences, demand practice, follow their growing understanding, and provide feedback in order to avoid the cracks they didn't see and to help them avoid falling into new ones.

Research tells us that learning occurs best in an environment that is resource rich. It should support active and collaborative learning; incorporate authentic, real-world problems; and provide ongoing assessment. Fundamentally, learning is about moving from a state of disequilibrium and into a state in which we are searching for new resolutions, new meanings, and new connections. It is about

making connections -- both within our brain and among ideas -- through experiences with others and with the help of learning materials. (p. 1)

The learner-centered instructional approach, then, places instructors in a role significantly different from that of the didactic professor. As University of Michigan President Emeritus James Duderstadt stated, “Faculty members of the twenty-first century university will find it necessary to set aside their roles as teachers and instead become designers of learning experiences, processes, and environments” (Duderstadt, Atkins, & Van Houweling, 2002, p. 65). A faculty member with whom this author shared the quote confessed to being “profoundly shocked by the implications.” Clearly, this is a major shift, both in mindset and in practice, requiring thoughtful, strategic interventions by institutions of higher education.

Advocates of this instructional approach recognize that the preparatory path to a faculty appointment rarely attends to how people learn. Halpern and Hakel (2003) note that even those faculty who might most reasonably be expected to teach in this fashion do not: “We have found precious little evidence that content experts in the learning sciences actually apply the principles they teach in their own classrooms. Like virtually all college faculty, they teach the way they were taught” (p. 37).

Enhancing Learning with Technology

The introduction of technologies for teaching and learning has been described as an important “catalyst of innovation” (Zemsky & Massy, 2004, p. 60) or even a “catalyst for redesigning the whole teaching and learning environment” (Collins & Berge, 2003, p. 21). At the least, for many educators, the introduction of interactive technologies into the teaching environment causes them to more closely consider the processes of teaching and learning (Comeaux & McKenna-Byington, 2003).

Collins and Berge (2003) noted, “The important questions regarding technology-enhanced education are not those that focus on the technology, although those are important. The most important questions that should be asked are about what constitutes good teaching and learning” (p. 21). Such questions are multi-faceted and difficult to research. The literature most focused on application—actual classroom use and its impact—is oriented toward the K-12 environment.

IMPACT OF TECHNOLOGY ON K-12 TEACHING AND LEARNING

Measuring the impact of technology upon student learning is admittedly challenging, and technology advocates recognize the importance of developing a body of sound research (Thompson, 2005). Among the themes that emerged from an analysis of the research base on technology and teaching in K-12 schools were these (Cradler, McNabb, Freeman, & Burchett, 2002):

- Technology use is most effective when integrated into a well-articulated curriculum to meet specific objectives.
- When students are enabled to use appropriate technologies in problem-solving processes, students are likely to develop higher-order thinking skills.
- Students who use technologies to present and publish project results are likely to develop critical thinking skills.
- Students who use workplace technologies in interdisciplinary projects acquire important skills for career preparation.
- Effective technology integration often includes collaborative activities and formative feedback.

More recently, a report synthesizing the research on technology use in K-12 schools (Metiri Group, 2006) noted that while “advocates have over-promised the ability of education to extract a learning return on technology investments in schools, ... research now clearly indicates that the effective use of technology can result in higher levels of learning” (p. 2). What are “effective uses” of technology? Nearly a decade ago, an extensive national survey conducted by Hank Becker and associates at UC-Irvine indicated that the change process in K-12 teacher use of computers is closely tied to constructivist teaching practices:

Computer users were about twice as likely to report an increase in the frequency of constructivist practices (such as being taught by students, handling multiple simultaneous activities, assigning long projects, giving students more choice of tasks, and using interdisciplinary content). In addition, when asked what their reasons were for making these changes, most of the teachers who had changed most clearly towards constructivist practices indicated that their experiences with computers played at least a ‘moderate’ role in those changes.” (Ravitz, Wong, & Becker, 1999, p. 23)

The Apple Classrooms of Tomorrow (ACOT) research of the 1980s and 1990s (see: <http://www.apple.com/education/k12/leadership/acot/>) also made a strong case for the efficacy of technology use for learning when associated with constructivist teaching practices

(Sandholtz et al., 1997). However, a 2006 Metiri Group report suggests that “the real potential of technology for improving learning remains largely untapped in schools today ... [due to] four miscalculations on the part of educators” (p. 2):

- underestimating the significant systemic change in schools required;
- poorly documenting the effects of technology integration on students, teachers, and the school system;
- overestimating how long it would take for technology access to diffuse widely; and,
- underestimating the impact of rapid technological changes on budgets, time, staff learning needs, and curriculum.

Thus, though the research base suggests that teaching practices that integrate constructivist approaches with computer use show promising effects on student learning, leaders in schools expecting improvements in student learning as a result of investments in technologies must be attentive to facilitating and documenting systemic and individual change processes. Nearly 15 years ago, Cuban (1993) pointed out the cycles of enthusiasm and disappointment associated with the introduction of various technologies into education throughout the 20th century. The optimism of technology enthusiasts and educational reformers is hard-pressed to overcome ingrained cultural beliefs about teaching, learning, curriculum, and the role of the school, in Cuban’s view. Cuban noted that the traditional educational model is even more firmly entrenched in high schools than elementary schools.

THEORIZING THE IMPACT OF TECHNOLOGY ON TEACHING AND LEARNING IN HIGHER EDUCATION

Given the challenges inherent in moving to a learner-centered educational model in higher education, it is not surprising, then, that the impact of educational technologies in colleges and universities has been minimal (Cuban, 2006; Laurillard, 2002); it is, in fact, difficult to find exemplars of effective technology use in this setting (Trinkle, 2005). Some studies actually illustrate instances where technology has been proved detrimental to learning (Trinkle).

As mentioned briefly in Chapter 1, the technologies most readily appropriated by instructors in higher education – PowerPoint and the learning management system – are typically used to support the traditional transmission model of instruction, as vehicles for

delivering information more efficiently from instructor to student (Gillespie, 1998; Zemsky & Massy, 2004). Advocates of technology uses to improve undergraduate learning insist that nothing less than a *paradigm shift* in the faculty approach to teaching is required in order to realize the potential of educational technologies in higher education (Barker, 2003; Bates & Poole, 2003; Laurillard, 2002; Sibley, 2003; Society for College and University Planning, 2006; Twigg, 1999). Not clear, however, is whether this paradigm shift must occur independently of technology considerations (Zemsky & Massy, 2004), or, rather, the affordances that technologies present actually facilitate this shift (McCombs & Vakili, 2005). It is apparent, however, that technologies used apart from pedagogical considerations will generally not result in more effective student learning, but instead support the traditional instructional model, resulting in no significant difference in student learning.

Paradigm shift advocates describe several learner-centered uses for technology which they believe will measurably enhance student learning. These uses include:

- Providing more opportunities for practice with quick feedback (Society for College and University Planning, 2006; Twigg, 1999).
- Making a greater variety of instructional resources available to students, whenever and wherever they are needed (Society for College and University Planning, 2006; Twigg, 1999).
- Enhancing students' ability to identify, access, collect, organize, and integrate information (Newman & Scurry, 2001; Twigg, 1999).
- Providing individualized, interactive tutoring and skill-building (Newman & Scurry, 2001; Society for College and University Planning, 2006).
- Bridging classroom learning to authentic representations of real-world situations (Newman & Scurry, 2001).
- Connecting with fellow learners as well as the instructor outside of fixed times and places (Newman & Scurry, 2001; Society for College and University Planning, 2006).

McAlpine and Gandell (2003) acknowledged that many faculty "are struggling to determine the impact of the use of technology on student learning" (p. 281). They further noted that research on faculty uses of technology for teaching "rarely attends to the thinking that underlies professors' instructional decisions about the use of technologies" (p. 282). Whether one believes that technology use prompts faculty rethinking of instructional approaches, or that reconsideration of the instructional approach leads to effective uses of technologies for learning, it appears that faculty must have opportunities to be challenged,

informed, and supported in the shift to effective uses of technology to facilitate student learning.

Faculty Development for Enhancing Learning

According to Chism, Lees, and Evenbeck (2002), institutions of higher education are increasingly recognizing the need for a shift from “teaching as transmission of content” to “facilitation of learning,” and accompanying support of faculty (p. 34). This support can take many forms: faculty development committees and centers, mentoring programs, orientations and workshops, teaching portfolios, and increased preparation for teaching in graduate programs.

Not surprisingly, advocates call for faculty development methods reflect the learner-centered educational model (Buckley, 2002; Chism et al., 2002). At the K-12 level, research has long substantiated the limited value of “expert-led” workshops (Schrum, 1999) because they do not “build on prior knowledge; actively involve teachers in the learning process; acknowledge factors that inspire teachers to learn; attend to individual stages of development; or embed learning in authentic, collaborative contexts” (Valli & Hawley, 1999, p. 427).

Advocates of quality faculty development in higher education stress the importance of active engagement of faculty in processes that are constructive, reflective, and collaborative. Learning by doing (Koehler & Mishra, 2005), particularly through an authoring process (Buckley, 2002), is vital. Some suggest that such a process should be focused on learning theory and course design (Twigg, 1999) while minimizing training focused on technology (Buckley). Others advocate addressing specific technology proficiencies early on in the development process, prior to focusing on significant pedagogical innovations (Teclehaimanot & Lamb, 2005). It is important to involve innovative faculty and instructional designers (Buckley) who are able to effectively convey their knowledge and experience while remaining sensitive to the concerns, needs, and change processes of participating faculty (Chism, 2004a, 2004b). Opportunities for feedback from others as well as self-reflection are vital to effective faculty development (Collins & Berge, 2003). Buckley also emphasizes the importance of communicating institutional support for

faculty, especially in the form of incentives and rewards (Chism, 2004b), while soliciting faculty involvement.

Smith's (1992) analysis of faculty development practices in higher education led him to recommend a model which is neither top-down (driven primarily by administrative priorities) nor bottom-up (driven primarily by faculty interest), but rather one of partnership, with intermediaries playing a key role to find opportunities for satisfying both faculty and administrative interests. He further described various roles that faculty development specialists play, advocating that they fulfill a flexible and eclectic role as a negotiator and provider of various services, including diagnosis, training, counseling, collaborating, and providing information.

Faculty developers also play an important role as facilitators of faculty communities of practice (Wenger, 1998) when widespread, systemic change is desired. "Cultivating reflective practice" and "cultivating intentionality" among higher education instructors may occur best through collaborative group-oriented faculty development practices, resulting in a supportive community of thoughtful teachers which will function well beyond the time and space constraints of a workshop (Chism et al., 2002, p. 36).

In short, in the shift to a learner-centered model of higher education, "faculty members will be challenged to play a variety of roles as teachers, coaches, consultants, mentors, and designers of [collective] learning experiences to serve the lifelong learning needs of their students" (Duderstadt et al., 2002, p. 68). The ones who will assist in this challenge, faculty developers, could be described in much the same way.

Faculty Development for Enhancing Learning with Technology

According to Gillespie (1998), interest in new technologies leads many instructors to seek help with enhancing teaching and learning. More recently, Collins and Berge (2003) noted that the increasing pressure or opportunity for faculty to teach online courses leads many faculty to look for assistance with course design.

As faculty developers focus on playing the various roles mentioned above, and in particular as designers of learner-centered instructional approaches, it is important to

consider key objectives and methods from the literature on faculty development for enhancing learning with technology.

Laurillard (2002, p. 226) spoke directly to the objectives of an instructional technology faculty development program, e.g.:

- raising awareness of current teaching practice and use of new technology in participants' fields;
- elaborating an understanding of how students learn through different media;
- developing faculty expectations of, and critical approach to, new technology;
- developing faculty formative evaluation skills for improving course design; and
- increasing the likelihood that faculty will make their own contribution to the field.

These objectives focus on change within *individual* faculty; however, another program objective may be to facilitate change more broadly within the university. In this regard, the ACOT studies from the early 1990s are instructive because constructivist approaches to K-12 teaching were not widespread at the time. Recognizing that "the addition of technology to classrooms significantly increased the potential for systemic change" (Yocam & Wilmore, 1994, p. 1), ACOT project faculty developers took a constructivist approach, finding the highest-impact components included:

- facilitation of small-group collaboration among teachers;
- situating workshops in technology-rich classrooms;
- acknowledging and building on teachers' prior knowledge;
- focusing on hands-on, project-based learning opportunities for teachers;
- including time for experimentation, planning, and reflection;
- requiring participation of collaborative teams committed to sharing with additional colleagues; and
- providing additional support beyond the workshop.

It is important to note the discomfort which ACOT researchers reported that participating teachers often felt at the outset of these learning experiences (Ringstaff & Yocam, 1994). This discomfort and even resistance mirrors that of many students (Gillespie, 1998); as faculty emerge with a greater understanding of the value of learner-centered instructional environments, they may be more prepared to anticipate and address the reactions of their students.

Other aspects of a comprehensive faculty development model may include the provision of just-in-time trainings and resources related to both technology and learning (Chism, 2004b); providing opportunities to learn about key aspects of student-centered learning, such as development of activities and assessments aligned with well-conceived learning outcomes (Collins & Berge, 2003; K. A. Smith et al., 2005; Twigg, 1999); using electronic communication methods to create an active faculty community providing mutual support and sharing resources (Haughey, 2003); fostering departmental initiatives focused on discipline-specific innovation (Haughey, 2003; Trinkle, 2005); having early-adopter faculty share effective practices at events and lead summer workshops (Neff, 1998; Trinkle, 2005); and utilizing students as guides for faculty in the use of technology (Haughey, 2003; Howland & Wedman, 2004; Trinkle, 2005).

Beyond efforts directly targeted at faculty, those focused on meaningful technology integration may also need to consider more systemic efforts, specifically: institutional support for participants in the form of release time and stipends; institutional respect for participants in the form of recognition in the tenure and promotion process; access to research on technology and learning; sustainable partnerships among various stakeholders; and assistance with documenting, evaluating, and communicating results of change efforts (Gillespie, 1998; Kopyc, 2006; Trinkle, 2005).

Finally, faculty developers, who “by definition intend to produce change in targeted faculty members” (Wedman & Strathe, 1985, p. 15), need to have an understanding of change models and change facilitator strategies, *as well as* tools for assessing change processes.

THEORIES AND ASSESSMENT MODELS RELATED TO THE CHANGE PROCESS IN EDUCATORS

This section highlights the literature on models of educator change, both in general, and with specific attention to technology innovation.

General Theories of Educational Change

Theories and models of change in educational settings became increasingly important to teacher educators and educational leaders during the 1960s and 1970s. This work developed out of a broad literature base on innovation and change. Ellsworth (2000), in his

review of educational change models, noted two underlying traditions or strands: *diffusion of innovations*, and *general systems theory* (p. xvii). Ellsworth fuses these into a “change communication model” (p. 32) of educational change, which allows for a focus on the roles and actions of individuals, situated within an understanding of the environmental context and the interrelated factors which may affect the adoption of a particular innovation. Within this model, Ellsworth incorporates key components from several of the most widely known educational change theories; these are described briefly below as a backdrop to the more detailed description of CBAM which follows.

From the work of Rogers (1995) comes the key notion of the *innovation*, which he defined as “an idea, practice, or project that is perceived as new by individuals” (pp. 10-11). Rogers is most well known for his categorization of innovation adopters within a normal distribution. The first half of the adopters of an innovation are divided into innovators (2.5%), early adopters (13.5%), and early majority (34%); the second half are grouped into late majority (34%) and laggards (16%) (Rogers, p. 262). A successful adoption represented as a cumulative process over time displays as an S-shaped curve that succinctly demonstrates the slow initial pace of adoption, the rapid growth in the use of the innovation once the early majority and late majority are adopting it, and a flattening in the adoption rate once the innovation reaches the laggards. Rogers proposed five attributes of innovations that significantly influenced the rate of innovation adoption: relative advantage, compatibility, complexity, trialability, and observability (p. 208). Although Rogers’ work is broadly applicable to innovation adoption in any organizational setting, it has often been applied in educational change research².

Another educational change theorist important to Ellsworth (2000) is Ely (1990), whose work focuses on the importance of *environmental conditions* in the change process in education, particularly in relation to the implementation of educational technologies. Ely identified eight conditions of change (pp. 300-303):

- “dissatisfaction with the status quo”

² See Sahin and Thompson (2006) and Padgett and Conceição-Runlee (2000) for examples of discussions of technology-oriented faculty development in higher education oriented around Rogers’ theory.

- skills and knowledge of the implementers
- access to the resources required for successful implementation
- time for implementers to “learn, adapt, integrate, and reflect”
- rewards and incentives
- clear expectations and encouragement for participation in the change
- clear support for change from key stakeholders and leaders, and
- evident leadership.

Ensminger, Surry, Porter, and Wright (2004) thoroughly investigate how Ely’s eight conditions for change relate to other change models and research on the adoption of educational technology innovations.

With many concepts closely related to those of Rogers and Ely, Fullan and Stiegelbauer (1991) focused on the facilitation of change within K-12 schools. Somewhat unique to their work is an emphasis on professional development; in particular, the characteristics necessary for its success (Fullan and Stiegelbauer, pp. 341-344):

- alignment with practical needs of teachers and schools, not abstract theories;
- integration with school culture and operation; and
- orientation towards action, aimed at developing an organizational culture that supports and enables lifelong learning.

For Ellsworth (2000), the greatest contribution of Havelock and Zlotolow (1995) is their focus on the critical role of the change agent in the change process. Their C-R-E-A-T-E-R model (Havelock & Zlotolow, p. 2) is oriented around change agent behaviors during an innovation’s implementation phases. For example, the *Care* phase requires change agents to be responsive to the concerns and desires of clients while the *Relate* phase emphasizes the importance of the change agent not only developing relationships with clients, but also facilitating engagement of the clients with one another. In the *Examine* phase, change agents are cautioned to take time to deeply understand concerns (noticed in the *Care* phase) within the context of the system, before deciding upon solutions. During the *Acquire* phase, change agents seek resources which may be useful in addressing the concerns and needs revealed from the *Examine* phase. The *Try* phase is when change agents will create potential solutions from the resources found in the *Acquire* phase, and pilot these solutions to select the most appropriate course of action. The *Extend* phase relates

strongly to Rogers' diffusion of innovations concept; the change agent must understand the different characteristics of potential adopters based on their preferences and place in the adoption process, and adjust their activities accordingly. Finally, the *Renew* phase emphasizes the importance of reviewing, reflecting upon, and evaluating, the change effort, and looking ahead to where the cycle may begin again. (Ellsworth, 2000)

In his review of these and other educational change models, Ellsworth (2000) also considered the Concerns-Based Adoption Model (see below for an extensive discussion). He considered this model to "offer the best framework for describing what is important to intended adopters and helping them through change" (p. 157). Further, he recommends "CBAM's validated instruments" to "keep your finger on the pulse' of change as it meets its intended adopters" (p. 241). Thus, while many theories and models of educational change are available, CBAM is seen as not only an excellent choice for focusing on individual change, but also as especially valuable due to its validated tools for assessing change at both the affective and behavioral levels.

Models of Educator Change Specifically in Response to Technology Innovations

Numerous models have been developed which focus on describing educator change processes in response to the introduction of educational technologies. The ACOT research mentioned earlier resulted in a five-phase model describing stages of educator change in response to the introduction of classroom computers (Sandholtz et al., 1997, pp. 37-46):

- Entry: educators have little experience and little desire regarding the use of technology in teaching and learning; focus is on simply getting started with the technology
- Adoption: educators begin using computers as they grow comfortable with the basics of technology operation; instructional strategies are supported, not altered, by computers
- Adaptation: student productivity shows significant gains as the educators facilitate greater use of computers in class for tasks such as writing and mathematics
- Appropriation: marks the point when educator use of computers is simply part of normal practice and does not require special effort
- Invention: educators try out new instructional methods and collaborations with students and other educators, facilitated by innovative uses of technology

As computer use has become more typical, others have created similar models, but with less emphasis on the entry phase. One example relating specifically to the practices of higher education instructors was put forth by Neff (1998, p. 10). Her model featured: personal productivity; lecture enhancement; interactivity (active engagement, but at a fixed time/place); and student-centered learning (with learning taking place outside the classroom, and “the instructor is now a coach, facilitator, counselor, and instructional designer”).

Somewhat similarly, Gillespie (1998, p. 43) suggested a progression of higher education instructors’ view of computers: first, as a unique content area; then, as a support tool for traditional instruction; next, as productivity tools; next, increasingly as useful for online and multimedia technologies; and finally, as a facilitator of communication between instructor and learners. While these models may be useful as a lens through which to view varied responses of educators to technology innovations, they do not have instruments associated with them which can be used to formally assess where instructors are in the change process.

The Technology Learning Cycle model (Howland & Wedman, 2004, p. 243) focuses more on the *personal response* of higher education faculty members to technology use. It also is a five phase model, though the authors specify that “TLC is not a linear model; rather it recognizes that individuals may be positioned in multiple phases concurrently in relation to different technologies” (p. 243). The phases include: *Awareness* – an interest and openness regarding new technology; *Exploration and Filtration* – selection of a particular technology to focus on; *Learning* – developing proficiency with the technology as well as pedagogical approaches associated with the technology; *Personal and Professional Application* – integration of technology into teaching and learning practice; and *Sharing and Reflection* – evaluation and deeper consideration of technology integration.

Another theoretical base from which researchers have studied educator response to technological innovations is self-efficacy beliefs. For example, Enochs, Riggs, and Ellis (1993) developed and validated the Microcomputer Utilization in Teaching Efficacy Beliefs

Instrument (MUTEBI), which is based on Bandura's theory of social learning³. This instrument facilitates measurement of instructors' capability beliefs with regard to technology.

Similarly, Lumpe and Chambers (2001) developed and validated the Beliefs About Teaching with Technology (BATT) instrument, which is based on Ford's Motivational Systems Theory⁴. Like MUTEBI, this tool also assesses instructor capability beliefs regarding technology, but with a greater emphasis on perceptions of contextual factors affecting adoption. Such measures may be useful when a change facilitator has specific concerns about self-efficacy beliefs of participants in a change process.

Finally, other instruments *without* distinct theoretical underpinnings have been developed to assess technology use in education without a particular theoretical focus exist; with repeated use, they can capture change over time. Examples include: TAGLIT⁵, enGauge⁶, and Flashlight⁷. These are typically aimed at practitioner uses, not for formal research.

THE CONCERNS-BASED ADOPTION MODEL

As earlier noted, the Concerns-Based Adoption Model (CBAM) offers a comprehensive methodology for examining behavioral and affective change that results from educational innovations—specifically, validated instruments for measuring change and a framework for contextualizing the results. CBAM is grounded in theory and has a rich history of implementation in research and practice; it is well-suited to this particular study. This section examined the history of CBAM and the development of its central constructs,

³ Bandura's social learning theory, first detailed in 1977, includes self-efficacy as a key construct; self-efficacy refers to an individual's judgment about his or her capability to achieve a particular goal. See <http://www.positivepractices.com/Efficacy/SelfEfficacy.html> for more information.

⁴ Ford's Motivational Systems Theory, first detailed in 1992, posits four components of motivation: personal goals, capability beliefs, context beliefs, and emotional arousal. See <http://www.ed.psu.edu/cshe/pubs/pdf/facultymotivation.pdf> for more information.

⁵ See <http://www.taglit.org/index.cfm?page=About>

⁶ See <http://ncrel.org/engauge/>

⁷ See http://www.tltgroup.org/programs/Flashlight/FL_Handbook/Home.htm

considers issues of CBAM's reliability and validity, appraises CBAM's influence on faculty development, and reviews the literature base of CBAM studies of technology innovation in education.

The Development of CBAM

CBAM's creators acknowledge the important influence of the work of Frances Fuller in the late 1960s (George et al., 2006; Hall & Hord, 2006). Fuller pioneered empirical research on the change process of preservice teachers, creating a developmental model of stages of teacher development. Her work revealed that student and beginning teachers typically initially have few specific teaching-related concerns, and then progress through stages on self-focused concerns, then task-focused concerns, and finally, concerns about impacts on students (Conway & Clark, 2003). Fuller's research caught the attention of her colleagues at the Research and Development Center for Teacher Education at the University of Texas-Austin in the 1970s (Hall, Wallace, & Dossett, 1973).

Most intriguing to them was change at the individual level—what happened to the individual adopter. Over time, the CBAM team developed three core constructs and associated diagnostic tools within the framework of the model. In the context of the model, these constructs predict, measure, describe, and explain the change process teachers experience when implementing an educational innovation, and how the change process is affected by the interventions of change facilitators (Anderson, 1997). Several key assumptions underlie CBAM: (a) change is a process, not an event; (b) change is accomplished by individuals; (c) change is a highly personal experience; (d) change involves developmental growth in feelings and skills; and (e) change can be facilitated by interventions directed toward individuals, innovations, and contexts (see Anderson, p. 333; Hord, Stiegelbauer, Hall, & George, 2006, p. 1).

Directly arising out of Fuller's work, the first CBAM construct to emerge was the Stages of Concern (SoC) (Hall, George, & Rutherford, 1978, 1979). This affective construct focuses on the feelings and concerns of individual educators involved with an innovation. The second CBAM construct to be developed was Levels of Use (LoU), which attends to the innovation-related skills, knowledge, and behaviors of individual educators (Hall, Loucks, Rutherford, & Newlove, 1975). Important to note is that while both SoC and LoU depict

typical developmental patterns or sequences, CBAM does not view these as strictly lock-step in nature. The third construct, Innovation Configurations (IC), grew from a realization that implementation of an innovation is variable. The IC thus describes ideal and less-than-ideal characteristics that the dimensions of an innovation may exhibit in practice (Hord, 1986). In addition to these constructs, CBAM research also addresses the change facilitator role, various interventions, and aspects of organizational culture within the context of educational change.

By the 1990s, school improvement theory and practice had shifted away from an individual focus to more of an organizational, systemic approach; however, CBAM continues to be widely used by researchers and practitioners in North America, Western Europe, and Australia (Anderson, 1997; George, Hall, & Stiegelbauer, 2006). Use of CBAM can enable not only information gathering and sharing during a change process, but also a common language for all involved (Horsley & Loucks-Horsley, 1998). Regarding the continuing use of CBAM, George, Hall, and Stiegelbauer (2006) note:

CBAM tools commonly have been used in federally sponsored research projects, dissertation research, evaluations, and many change programs. Active research on CBAM tools continues, as does the use of the CBAM framework and tools, along with learning from their application. Understanding teacher or individual change continues to be an important focus for thinking about and facilitating teacher development and school improvement. (p. 2)

STAGES OF CONCERN

As mentioned above, the Stages of Concern (SoC) construct focuses on individual feelings and concerns in response to an innovation. The notion of *concern* can be misunderstood as a pejorative term, as van den Berg and Ros (1999) describe concerns as “questions, uncertainties, and possible resistance that teachers may have in response to new situations and/or changing demands” (p. 880). However, it is not intended to convey a connotation of consternation; rather, “whenever something heightens our feelings and thoughts, we are registering *concern* about it” (George et al., 2006, p. 7). *Innovation* is not necessarily something new; rather, it is the “generic name given to the object or situation that is the focus of the concerns” (George et al., p. 7). In CBAM parlance, concerns are organized around seven stages that progress generally from unconcern, to self-focused concerns, to a focus on the task, and finally to a focus on impacts upon students (see Table 3). It is

Table 3. The Stages of Concern About an Innovation

Impact	6	Refocusing	The individual focuses on exploring ways to reap more universal benefits from the innovation, including the possibility of making major changes to it or replacing it with a more powerful alternative.
	5	Collaboration	The individual focuses on coordinating and cooperating with others regarding use of the innovation.
	4	Consequence	The individual focuses on the innovation's impact on students in his or her immediate sphere of influence. Considerations include the relevance of the innovation for students; the evaluation of student outcomes, including performance and competencies; and the changes needed to improve student outcomes.
Task	3	Management	The individual focuses on the processes and tasks of using the innovation and the best use of information and resources. Issues related to efficiency, organizing, managing, and scheduling dominate.
Self	2	Personal	The individual is uncertain about the demand of the innovation, his or her adequacy to meet those demands, and/or his or her role with the innovation. The individual is analyzing his or her relationship to the reward structure of the organization, determining his or her part in decision making, and considering potential conflicts with existing structures or personal commitment. Concerns also might involve the financial or status implications of the program for the individual and his or her colleagues.
	1	Informational	The individual indicates a general awareness of the innovation and interest in learning more details about it. The individual does not seem to be worried about himself or herself in relation to the innovation. Any interest is in impersonal, substantive aspects of the innovation, such as its general characteristics, effects, and requirements for use.
	0	Unconcerned	The individual indicates little concern about or involvement with the innovation.

Note. From *Measuring implementation in schools: The Stages of Concern Questionnaire* (p. 8), by A. A. George, G.E. Hall, and S. M. Stiegelbauer, 2006, Austin, TX: Southwest Educational Development Laboratory. Copyright 2006 by Southwest Educational Development Laboratory.

important to note that in the most recent revision of the official CBAM SoC manual (George et al., 2006), the authors say:

The emergence and resolution of Concerns about innovations appear to be developmental, in that earlier concerns must first be resolved (lowered in intensity) before later concerns can emerge (increase in intensity). The research suggests that this developmental pattern holds for most process and product innovations. However, this developmental pattern is not a certainty. (p. 8)

The 35-item Stages of Concern Questionnaire (SoCQ) is the primary tool for measuring the SoC construct. Developed over a three year period in the 1970s, it “was tested for reliability, internal consistency, and validity with several samples and 11 innovations” (George et al., 2006, p. 11).⁸ CBAM also allows for an open-ended statement of concerns to be collected in addition to the SoCQ. It is noteworthy that the SoCQ remained unchanged for nearly 30 years; in 2006, however, the SoCQ manual included the first revision to the SoCQ since its original development. Stage 0 items were replaced with Stage 0 items from the Change Facilitator Stages of Concern Questionnaire (Hall, Newlove, George, Rutherford, & Hord, 1991) to address issues of reliability of Stage 0 in the SoC research base.

Procedures for using the SoCQ are well defined, and the latest version of the CBAM toolkit includes updated software and other guidance to assist users in scoring, interpreting, and reporting SoCQ results (George et al., 2006; Southwest Educational Development Laboratory, 2006). SoCQ results are interpreted through several approaches—both for individuals and for aggregated groupings: examining the peak stage score (the highest stage), identifying the top two stages, and analyzing the entire profile of all seven stage scores.

Finally, in discussion of the SoCQ, it is important to reiterate the limitations described by the SoCQ authors (George et al., 2006, pp. 55-56):

- Use the tool to diagnose, not to screen or judge.
- Do not modify the statements on the questionnaire.
- Confirm the interpretation of the data with the respondents.
- Expect feedback.
- Base any empirical critique of the Stages of Concern on adequate samples and appropriate research methodology.

⁸ For more discussion on the validation process, see the *Validation of CBAM* section below, and for additional background on the development of the questionnaire, see George et al. (2006).

LEVELS OF USE

As mentioned earlier, while the SoC provides a means for examining affective responses of educators to an innovation, the LoU focuses on behavior patterns in its use. As with the SoC, the LoU is developmental. It describes the typical experiences of educators as they “learn about, begin to use, and gain increasing experience in the use of new curriculum and instructional practices. It is a theory of ‘change in practice’” (Anderson, 1997, pp. 346-347). In practice, LoU is not nearly as widely used as SoC. As Hall, Dirksen, and George (2006) noted, “All too often it appears that researchers and evaluators have paid limited attention to implementation” (p. 3).

Rather than simply assuming that implementers are using or not using an innovation, LoU identifies five distinct levels of use (levels III-VI) and three levels of non-use (levels 0-II). The CBAM research and development team defined these eight levels of use through a multi-year process of inductive data analysis based on interviews and observations of teachers implementing various innovations. In addition to the levels, the LoU framework also includes descriptors of key *decision points* which occur as an educator moves from one level of use to the next (see Table 4). As with the SoC, CBAM developers do not assume a strict step-wise conformity to the LoU for every innovation user. “The sequence of LoU is logical, but there is no guarantee that an individual will move through all Levels in a lock-step developmental fashion” (Hall et al., 2006, p. 11).

The LoU is determined through measurement of a variety of behavioral indicators related to the innovation. These indicators are grouped into seven categories (Hall et al., 2006, pp. 8-9):

1. Knowledge
2. Acquiring Information
3. Sharing
4. Assessing
5. Planning
6. Status Reporting
7. Performing

Table 4. The Levels of Use of an Innovation with Decision Points

LoU VI Renewal: State in which the user reevaluates the quality of use of the innovation, seeks major modifications or alternatives to the present innovation to achieve increased impact on clients, examines new developments in the field, and explores new goals for self and the system.

Decision Point F: Begins exploring alternatives or major modifications to the innovation presently in use.

LoU V Integration: State in which the user is combining own efforts to use the innovation with the related activities of colleagues to achieve a collective effect on clients within their common sphere of influence.

Decision Point E: Initiates changes in use of the innovation for the benefit of clients, based on input from and in coordination with colleagues.

LoU IVB Refinement: State in which the user varies the use of the innovation to increase the impact on clients within immediate sphere of influence. Variations are based on knowledge of both short- and long-term consequences for clients.

Decision Point D-2: Changes use of the innovation in order to increase client outcomes, based on formal or informal evaluation.

LoU IVA Routine: Use of the innovation is stabilized. Few if any changes are being made in ongoing use. Little preparation or thought is being given to improving innovation use or its consequences.

Decision Point D-1: Establishes a routine pattern of use.

LoU III Mechanical Use: State in which the user focuses most effort on the short-term, day-to-day use of the innovation with little time for reflection. Changes in use are made more to meet user needs than client needs. The user is primarily engaged in a stepwise attempt to master the tasks required to use the innovation, often resulting in disjointed and superficial use.

Decision Point C: Makes user-oriented changes.

LoU II Preparation: State in which the user is preparing for first use of the innovation.

Decision Point B: Makes a decision to use the innovation by establishing a time to begin.

LoU I Orientation: State in which the user has acquired or is acquiring information about the innovation and/or has explored or is exploring its value orientation and its demands upon the user and the user system.

Decision Point A: Takes action to learn more detailed information about the innovation.

LoU 0 Nonuse: State in which the user has little or no knowledge of the innovation, has no involvement with the innovation, and is doing nothing toward becoming involved.

Note. From *Measuring implementation in schools: Levels of Use* (p. 7), by G. E. Hall, D. J. Dirksen, and A. A. George, 2006, Austin, TX: Southwest Educational Development Laboratory. Copyright 2006 by Southwest Educational Development Laboratory.

Taken together, the LoU, decision points, and categories “provide a comprehensive operational definition of Levels of Use” (Hall et al., 2006, p. 9).

The CBAM creators developed a large chart with a descriptor at the intersection of each category and LoU; these descriptors are “key to understanding and determining a rating” (Hall et al., 2006, p. 10) for the Level of Use. Readers interested in this chart are referred to the Level of Use manual as it is very large and formatted as a three-page pullout.

Unlike the SoCQ, the CBAM tool developed for Levels of Use data collection is a semi-structured interview. “To measure an operationally defined phenomenon, it is necessary to document behaviors” (Hall et al., 2006, p. 17). Also in contrast to the SoCQ, which results in a percentile for each SoC—that is, each participant receives seven SoC scores—the LoU assessment results in the determination of one and only one Level of Use for each participant. This LoU assessment should always be viewed developmentally and not as a summative end state (Anderson, 1997).

In order to address the challenge of documenting behavior efficiently, the CBAM interview protocol (see Appendix C) is oriented around the decision points which define the transitions between LoU. LoU interview raters assign an LoU for each of the seven indicator categories described above; these category ratings are averaged to determine the overall LoU (see the LoU Rating Sheet in Appendix C). Procedures for addressing reliability and validity are in place, as is a process for certifying Levels of Use interviewers as qualified to conduct LoU interviews in research studies. However, shortened versions of the LoU interview may be used in regular conversational contexts within organizations as an informal means of assessing LoU (Hall et al., 2006).

INNOVATION CONFIGURATIONS

The third CBAM component, Innovation Configurations (IC), was developed after SoC and LoU when CBAM researchers engaged in large scale validation studies of the LoU recognized that great variation existed in understanding and implementation of the innovations being studied. Put simply, it was necessary to operationalize the possible implementations of the various parts of an innovation. (Hord et al., 2006)

Whereas SoC and LoU are developmental indicators of an instructor’s current state in response to an innovation, the Innovation Configurations (IC) component of CBAM is used

to provide a snapshot of how an innovation is being implemented in practice. Individual users of an innovation often modify or adapt it to fit their context in ways that may be idiosyncratic compared with the ideal of the change leaders. IC Maps (which are rubrics) provide a way to capture the extent to which each user has implemented the various aspects of the innovation in fidelity with the intent of the change leaders. Thus, IC helps to provide answers to two questions: “What does the innovation look like in practice?” and “Has quality implementation occurred?” (Roy & Hord, 2004, pp. 56-57).

While CBAM provides procedures for constructing and administering IC Maps, the IC Map itself must be created uniquely for each particular innovation; no generalized tool can adequately measure IC (as is possible with the SoCQ and the LoU interview). The specific nature of the IC Map means that, in addition to being used for research and evaluation, it can also be used as a means of communicating the vision of the change leaders, creating plans for access to needed resources, designing professional development, and setting goals for providing assistance or coaching to innovation users (Roy & Hord, 2004). Note that when IC Maps are used for evaluation, the focus is not on individual teachers, but rather on the success of the change process generally (Hord et al., 2006).

When individual users of an innovation are assessed on all three CBAM measures, CBAM researchers advocate combining the three dimensions to give a “composite ranking of implementation success” (Hord et al., 2006, p. 2).

Validation of CBAM

Validation of an instrument includes establishing an assessment instrument's reliability and content validity, and the ongoing process of determining an instrument's construct validity given the context of its use.

Reliability of an instrument refers to the degree to which it produces consistent results—internally, upon one administration, as well as across multiple administrations (Gable, 1986; Jordan & Hoefer, 2001). Common statistical techniques for establishing

reliability of a survey include: test-retest, equivalent/parallel forms, or internal consistency.⁹ An “acceptable” reliability coefficient (r or α , depending on the technique) is dependent on the situation in which it is determined. It should minimally be .70 according to Jordan and Hoefer (2001) and Hillway (1969), but Smith and Glass (1987) asserted that for “research purposes, moderate reliability [$r > .50$] is often sufficient” (p. 106) while for more exacting purposes, such as placement, r should be at least .90. Gable (1986) distinguished that it is “typical for good cognitive measures to have ... reliabilities in the high .80s or low .90s, where even good affective instruments frequently report reliabilities as low as .70” (p. 147). While establishing reliability is important, reliability does not imply validity—and it is the researcher’s task to establish both (Gable, 1986; Jordan & Hoefer, 2001).

Arguing for an instrument's validity is a more complex process than establishing reliability, but is the more important aspect of validation. Validity is described by Smith and Glass (1987) as the “correspondence between the construct and the indicator, and the ability of the measurement procedure to yield scores that represent the true amount of the indicator possessed by each individual” (p. 111).

The creators of instruments ... are responsible for establishing the validity of their instruments. When researchers use others’ instruments, they must present evidence that the instrument is valid for the research project. When researchers create new instruments for their projects, they must detail how they established the instrument’s validity. (Hittleman & Simon, 1992, p. 130)

It is important to note, as Gable (1986) does, that “the inferences regarding specific uses of a test are validated, not the test itself” and thus “the investigation of validity is an ongoing process” (p. 71).

Validity is established both judgmentally and empirically. Judgmental validation occurs during development of the instrument in a process beginning with an expert panel checking the conceptual definitions established in a literature review (this is also called face validity). The same panel should then review the operational definitions established as the means of sampling. This expert verification of the correspondence between conceptual and

⁹ See Gable (1986), Hittleman & Simon (1992), Jordan & Hoefer (2001), and Smith & Glass (1987) for further details.

operational definitions in an instrument establishes its content validity (Gable, 1986; Hittleman & Simon, 1992; Smith & Glass, 1987).

Empirical evidence for validity can be established through criterion and construct validity. Construct validity is the most encompassing form of validity (Jordan & Hoefer, 2001), and factor analysis is the technique typically employed to explore or to confirm clustering of items into constructs (Gable, 1986; Jordan & Hoefer, 2001).

CBAM VALIDATION

Primary CBAM documents from the Research and Development Center for Teacher Education at UT-Austin and the Southwest Educational Development Laboratory describe the initial processes of establishing CBAM's reliability and validity.

Stages of Concern

Chapter three of the SoCQ manual (George et al., 2006) contains a lengthy description of the process by which the SoC construct was conceived, tested, and refined, in accordance with the iterative development of the SoCQ in the early 1970s. CBAM developers administered a very large (195-item) pilot questionnaire to a sample of K-12 and college educators stratified based on experience with two innovations: teaming in elementary schools and using instructional modules in higher education (George et al., pp. 11-12). The CBAM team factor analyzed the data from 363 completed questionnaires, and correlated the results with findings from follow-up interviews. The process ultimately resulted in the 35-item SoCQ previously described, which was then administered to a stratified sample of 830 elementary, secondary, and college educators. Internal reliability coefficients for the stages of concern ranged from .64 for Stage 0 to .83 for Stage 2, with all but Stage 0 greater than .70. More than 130 participants completed a follow-up SoCQ two weeks later. Test-retest reliability correlations for this administration ranged from .65 for Stage 0 to .86 for Stage 1; again, all were greater than .70 but Stage 0.

Over the next two years, several follow-up studies explored the relationship between concerns data collected via the SoCQ and data collected from interviews. Correlation matrices, factor analytic procedures, and correlation between SoCQ results and data from other measures of concern were all used in establishing the validity of the SoCQ. Some argue

(Cheung, Hattie, & Ng, 2001) that factor analysis scores are underreported for the SoCQ; the only such scores provided in the SoCQ manual are from the initial testing of the large questionnaire prior to the development of the 35-item SoCQ. More often, internal reliabilities are the focus of SoCQ validation efforts; for example, George et al. (2006) reported the internal reliability coefficients from seven large-scale SoCQ studies (sample sizes from 214 to 1585). Stage 0 was generally the stage with the lowest reliability, with scores from .50 to .78. The other stages all scored above .70 with only a few exceptions on individual studies.

The revised SoCQ manual attempts to address validation problems with Stage 0; as mentioned previously, the current SoCQ (now known as Form 075) uses the Stage 0 items from the Change Facilitator Stages of Concern Questionnaire. To test the changes, the revised SoCQ was administered (in summer 2005) to a group of 185 elementary and secondary teachers who were novices learning about professional learning communities. The overall internal consistency reliability was .66 for Stage 0, which George et al. acknowledged “is low but higher than found in many studies using the previous items” (p. 22). Reliability was strongest among the questionnaires completed by elementary teachers (.75), followed by junior high (.68), and high school (.57), leading George et al. to comment, “This variation illustrates the extent to which scale reliability estimates depend on the sample of respondents as much as the items on a scale” (p. 22). This indicates a potential concern for the interpretation of Stage 0 in this study with college-level educators.

Levels of Use

Procedures for establishing reliability and validity of the Levels of Use procedure are quite different from the SoCQ, as the LoU assessment is interview-based. The LoU manual (Hall et al., 2006) features a validation study involving junior high science teachers. Ethnographers observed a stratified sample of these participants based on scores derived from LoU interviews. The ethnographers’ evaluations of the LoU were compared with the interview-based LoU, resulting in a .98 correlation coefficient.

Since that time, according to Hall and Hord (2006):

Levels of Use as a concept and way to describe individuals involved in change has been thoroughly researched. The concept is valid and translates across numerous nationalities and cultures. The process for measuring LoU using the

focused interview has been tested for reliability and validity. Levels of Use can be used with confidence and the resultant data trusted. (p. 175)

For LoU data to be reliable and valid and useful for research purposes, LoU interviewers must be certified (see Hall et al., 2006, p. 23, for an overview of the certification process), and LoU determinations must be made jointly by the interviewer and a second certified rater who independently reviews the interview recording.

In the LoU manual, Hall et al. (2006) noted that

a number of efforts have been made to revise, improvise, and modify the LoU interview protocol. Suffice it to say, despite the amount of effort to validate the changes made in these studies, none of the studies reviewed for this manual went to the extent and provided the rigor of the original studies done to validate LoU and the interview protocol. (p. 29)

Innovation Configurations

IC Maps are difficult to discuss in terms of statistical reliability and validity. As earlier noted, IC is a tool for examining the extent to which an innovation implementation conforms to the intent of the change facilitators. Hord et al. (2006) note that “IC Maps emphasize the concrete and more tangible operational forms of the innovation, thereby increasing the possibility of having reliable and valid information about use of the innovation” (p. 4). The CBAM IC manual specifies procedures for constructing and using IC Maps that provide rigor to the process and increase the likelihood that IC Map evaluations accurately reflect the extent to which a given implementation matches the ideal of the change leaders. There are limitations, however; for example, no formal research has been conducted to determine the reliability of IC Map evaluations conducted via interviews versus observation (Hord et al., p. 34). Hord et al. also note that IC Map data do not represent change and do not factor in contextual information which may have had an impact on the implementation of the innovation (pp. 34-35).

STUDIES QUESTIONING CBAM VALIDATION

Some researchers question the validity of CBAM, and in particular, the Stages of Concern construct. Mainly at issue are the specific seven stages—not the “general concept” of stages of concern. Several examples are provided here.

Jibaja-Rusth, Dresden, Crow, and Thompson (1991) investigated the internal consistency reliability of the SoCQ when administered to a small group of secondary science teachers being trained in a new curriculum (n of 15 to 25 at the three different administrations of the SoCQ). They found questionable alpha coefficients and were unable to confirm the reliability of the SoCQ for measuring its purported constructs. Not surprisingly, the scores for the awareness (Stage 0) construct were particularly problematic. Jibaja-Rusth et al. expressed concern about the reliability of responses of “naïve subjects” (p. 1) on pretests and called for reexamination of SoCQ data from existing studies, as well as for more longitudinal studies.

Bailey and Palsha (1992) examined the construct validity of the SoCQ in a study of early intervention professionals working with infants, preschoolers, and families. They found broad support for the concept of stages of concern, but factor analysis led them to advocate for a five- rather than seven-stage model. In the original SoCQ manual, Hall, George, and Rutherford (Hall et al., 1979) stated: “The standardization sample for the SoCQ consisted of adults serving as teachers or administrators in educational institutions, grades kindergarten through higher education. Utilization of the SoC with younger age groups or with other occupational groups is not warranted” (p. 57). It is important to note, then, that Bailey and Palsha’s participant demographics were substantially different from those for which the SoCQ was originally validated—which could, in part, explain their results.

Hall, George, and Rutherford (1979), in the original SoCQ manual, quite clearly indicated the potential peril in revisiting the seven-stage SoC model. They recommended that factor analysis *not* be performed on samples solely composed of innovation users. To be meaningful, factor analysis must be performed on a large stratified sample of users and nonusers (p. 58). Shotsberger and Crawford (1996; 1999) extended the work of Bailey and Palsha (1992) and provide another example of what may happen when this CBAM caution is ignored. Shotsberger and Crawford first examined the results of the standard CBAM SoCQ as well as a modified interpretation of the CBAM SoCQ based on a 5-stage model (eliminating Stage 0 and Stage 6); from there, they tackled results of a revised version of the SoCQ. Procedurally, questionnaires were administered to large groups (376 and 273, respectively) of secondary and middle grade algebra teachers undergoing training on a revised curriculum. They found that the reliability of the data under both the modified

interpretation of the original SoCQ and their revised version of the SoCQ improved upon the reliability of the standard 7-stage version of the SoCQ. However, confirmatory factor analysis was problematic and left them unable to confirm the validity of their 5-stage model. Ultimately, they recommended examining qualitative data in addition to concerns-based quantitative data when faculty developers want to adjust staff development to address teacher concerns.

Rogan, Borich, and Taylor (1992) described the “development and validation of *a Stages of Concern questionnaire*” (p. 44, emphasis added). They did not explain why they chose not to examine the CBAM SoCQ; rather, they began with a 50-item version of a Stages of Concern questionnaire which ultimately was reduced to 45. A factor analysis of the data collected with this version confirmed a three-stage (self/task/impact) model of concerns in line with Fuller’s original conception of Stages of Concern, though the researchers questioned whether these stages represented a developmental progression, or rather different dimensions around which concerns may be focused at any given time (p. 47).

In preparing for their own study, Cheung, Hattie, and Ng (2001) examined previous efforts in which the SoCQ was a central tool and found that in general “the authors simply applied the SoCQ without examining the reliability and validity of their own data” (p. 226). Their particular research focused on the adoption of a primary curriculum in Hong Kong, with survey results leading them to support the SoC concept, but with five progressive stages. They concluded that the SoC may be “culture bound and innovation specific” (p. 236). Indeed, as noted earlier, while CBAM has been widely used in North America, Western Europe, and Australia, CBAM’s developers have not represented it as universally applicable. CBAM advocate Anderson (1997) notes that Dutch and Belgian researchers have successfully revised the SoC for their context, showing “that the validity of CBAM classification schemes should not be taken for granted nor applied non-critically to any educational change and context” (p. 343).

CONCLUSIONS REGARDING THE VALIDATION OF CBAM

The studies described above, though technically sound, deviate in one or more substantive ways from prescribed CBAM procedures. By focusing on populations outside of

that upon which CBAM was originally validated, conducting factor analysis solely on innovation users, or using non-CBAM instruments, these studies have not built a compelling case for questioning the validation of CBAM. Generally, these studies are acknowledged but not explicitly refuted in the CBAM research literature. They are simply ignored as researchers continue to use CBAM, confident in its applicability for use in a variety of educational settings for both practitioner- and researcher-oriented data collection and analysis.

CBAM and Faculty Development Models

From its beginnings, CBAM—in particular, the SoC component—has been seen as a key component of instructor development efforts. Its role in faculty development can be descriptive, prescriptive, and, at a programmatic level, evaluative. Among the key concepts that CBAM developers have long articulated are these (Hall & Loucks, 1978):

- Staff developers need to be adaptive (attending to individual teachers' concerns through diagnosis and intervention), as well as systemic (attending to the effects of the implementation of the innovation).
- It is all right to have personal concerns – change is a personal experience.
- Change is a process - do not expect it to occur overnight.
- The change process is predictable and includes distinct stages.
- Teachers' concerns likely differ from those of the staff developers.
- Within any group a variety of concerns exist; needs and interests vary by stage of concern.

McCarthy (1982) suggested that participants be assessed on the SoC and faculty development efforts proceed according to results. For instance, educators in Stage 0 must be engaged at a personal level in order to raise awareness about an innovation; educators in Stage 1 must be given research-based information; educators in Stage 2 must be convinced of the application of the innovation to their personal situation; and educators in Stage 3 must be convinced of the application of the innovation to their professional lives. Sweeny (2003) focused on mentoring and collaboration as components of staff development, advocating that mentoring occur for educators in the task-focused Stage 3, and that educators in Stage 4 begin more collaborative activity.

Kember and Mezger (1990) applied CBAM in the context of faculty development for higher education instructors converting courses to a (non-Internet-based) distance education format. The training focused in particular on instructional design techniques that would result in sound student materials. In this context it was felt that the SoCQ would be inappropriate, so an instructional designer informally assessed the SoC of the curriculum writers. The development activities were matched with the SoC of participants, though Kember and Mezger note that when working with diverse groups this can be challenging. They additionally point out that instructors who seek out assistance are generally already at higher stages of concern; those at lower stages probably don't seek help. Furthermore, they believe that typical faculty development in the form of an occasional workshop or consultation session usually does not enable progression to a higher SoC.

Kember and Mezger (1990) focused on the consultative role of the instructional designer when considering CBAM-related faculty development interventions. They found that faculty passed through Stages 0 and 1 quickly – usually by the end of the first meeting between faculty and instructional designer. Stage 2 presented “a far bigger hurdle” (p. 64) for the instructional designer to select an approach particular to the personal concerns of individual faculty while helping the faculty adapt to the new approach for writing instructional materials. In Stage 3, an effective instructional designer acted as an advisor/colleague (similarly to the Stage 3 mentoring that Sweeny (2003) advocated), helping faculty focus on efficient use of the system. For Stage 4, the instructional designer became more of an evaluator and facilitator of student feedback, helping the faculty member move toward more innovative ideas. In Stage 5, the instructional designer's focus moved toward simply being a sounding board for ideas, and in Stage 6, the instructional designer worked with the faculty member as a co-change agent, altering the system.

More recently, Brzycki and Dudt (2005) studied results of a Department of Education Preparing Tomorrow's Teachers to use Technology (PT3) grant project through the lens of the SoC—though they tended to use the terms *Stages of Concern* and *CBAM* synonymously. They used the SoC as an interpretive framework rather than actually using the SoCQ to gather data. They found that a diverse approach to teacher educator development proved to more effectively address teacher educators who may have held a variety of concerns. Notably, they agreed that mentoring is a key strategy for the time management issue common

to Stage 3; they also suggested offering examples, models, and a “variety of workshop formats and incentive mechanisms” (especially tied to outcomes) “within a comfortable atmosphere” in order to “address various CBAM stages of concern” (p. 626). They also noted that although CBAM literature may downplay the likelihood of faculty reaching Stage 6 (refocusing), “in higher education, where independent thinking is highly valued, more users may reach this stage and reach it earlier” (p. 635).

Matthews (1993) noted further that assessing change facilitators during train-the-trainer activities can help ensure that faculty development participants’ needs are met. For this purpose, CBAM has expanded to include a Change Facilitator Stages of Concern Questionnaire (CFSocQ, see Hall et al., 1991), though this tool is only mentioned in passing in the 2006 revision of the core CBAM manuals.

CBAM Use in Studies of Technology Innovations for Enhanced Learning

As previously mentioned, CBAM, and particularly the SoCQ, has been used in numerous studies examining educator responses to technological innovations. The 2006 CBAM manuals include a non-comprehensive review of published studies and reports using the CBAM methodology. Of the 27 SoCQ studies reviewed, 12 focused on a technology-related innovation (George et al., 2006). Of the 69 LoU studies, 11 were technology-related (Hall et al., 2006). And of the 25 IC studies, 3 were technology-related (Hord et al., 2006).

While these studies contribute to the knowledge base of both technology integration and the use of CBAM, they unfortunately often display shortcomings as well. Slough and Chamblee (2005) conducted an analysis of the use of CBAM in refereed journal articles on technology integration published between 1995 and 2004. They found 30 articles describing sixteen unique studies. Fourteen of the studies used the SoCQ; ten of those used no other CBAM components. Three used LoU, two used IC, and just four were longitudinal studies. Most of the studies compared CBAM assessments done before and after training; follow-up after implementation was not common. As Slough and Chamblee note, “While all of the studies documented changes in user behavior, short-term changes are not always adopted changes” (p. 1037). They call for four areas for future research with CBAM and technology innovation: the use of the entire model; examination of change in higher-level concerns, not

just lower-level; documentation of long-term change; and study of CBAM's assumptions and use as a theoretical change model (p. 1037).

This section reviews three types of studies: first, studies which modified CBAM tools to focus more specifically on technology; second, CBAM studies associated with K-12 teachers and technology innovations; and finally, CBAM studies of faculty engaged with technology innovations in higher education. While these studies often provide useful ideas for the use of CBAM in these contexts, they also all too often display misunderstanding of CBAM concepts, misinterpretation of data, and conclusions about change processes which may not be warranted based on limited data.

CBAM MODIFICATIONS FOR STUDYING TECHNOLOGY INNOVATIONS

Some researchers have created CBAM-inspired instruments in an effort to focus more specifically on technology innovations in education. For instance, Martin (1989) modified the SoC into the Stages of Concern about Computing (SoCC) and created the SoCQ-inspired Computing Concerns Questionnaire for dissertation research; this instrument was later used by Atkins and Vasu (2000) and Adams (2002) for their own studies. This seems at best unnecessary, and at worst a violation of a basic premise of CBAM: "It might be tempting to modify some of the questionnaire items to better address a particular situation or need. Do not succumb to this temptation" (George et al., 2006, p. 55).

Rieber and Welliver (1989) and Marcinkiewicz (1994) developed a variation on LoU called Levels of Computer Use (LCU) (see Adams (2002) for an example of the use of this instrument). Originally conceived of as a six-level model, the researchers' desire to use a questionnaire eventually resulted in the reduction of the model to a distinction between simple *utilization* of computers in teaching and a more significant *integration*. As Newhouse (2001) noted, this may illustrate why the LoU authors insisted on the use of the interview for a valid assessment of the level of use of an innovation.

Moersch (1995; 1999; 2001) has promoted his Levels of Technology Implementation (LoTi) assessment as a blend of CBAM and ACOT research, and personal observations. Moersch (1999) believes that the use of the LoTi questionnaire can improve the efficiency, effectiveness, and accountability of technology-related staff development. While he does cite

an unpublished doctoral dissertation as demonstrating internal consistency reliability (Moersch, 2001), nowhere does he assert the validity of LoTi. This instrument seems more appropriate for practitioner use than for scholarly research, though see Rakes, Fields, and Cox (2006) for a recent example of a peer-reviewed published study which used LoTi. Newhouse (2001) believed that LoTi was also in violation of the CBAM creators' insistence on the use of interviewing rather than self-assessment to determine the level of use of an innovation.

CBAM AND K-12 TECHNOLOGY INNOVATIONS

Meanwhile, CBAM has been used in many studies of technology innovations in education. Several studies have been selected for review in this section as representative of K-12 CBAM studies on technology integration; this review is not intended to be comprehensive of all K-12 CBAM technology studies. One particularly rich study is examined in some depth; others are then reviewed more broadly, grouped into studies using multiple CBAM tools and studies that focused solely on the SoC. The review of each study highlights strong uses of CBAM, interesting questions, and questionable approaches to the CBAM methodologies.

Newhouse

Newhouse (2001) studied the implementation of a portable computer program at an Australian private girls' school in the mid-to-late 1990s. His study is noteworthy for its use of all three CBAM components. The article, though, illustrates just how much data can come out of a comprehensive CBAM study, and the challenge of sharing that data meaningfully within the confines of a single journal article.

The teachers were assessed twice with the SoCQ – once in 1995, early in the third year of the implementation of the program, and again in 1999. Aggregate peak score SoC data from 1995 is briefly discussed, and graphical group SoC profiles from 1995 and 1999 are compared. The profiles show relatively little change; Stage 0 concerns decreased somewhat while Stage 2 and 3 concerns increased somewhat. In fact, the 1999 data shows the “negative 1-2 split” (personal concerns more intense than informational concerns) which

CBAM's creators note often is a sign of doubt or resistance regarding an innovation (George et al., 2006), but Newhouse (2001) did not discuss that finding.

LoU interviews and IC assessments were apparently done one time, though it is not clear when. The LoUs for the group were presented, but aggregated IC findings were not discussed. The researcher reported creating six case studies of teachers to illustrate individual change; in the article, two cases are briefly discussed, with one focused on the earlier SoC data and the LoU, and the other focused on IC data. It is not clear how or why the researcher presented these two cases, nor how which data to share was determined.

Following the recommendation of CBAM researchers, Newhouse (2001) attempted to combine the SoC and LoU findings into an overall profile. He developed nine brief characterizations of the various Types of Response (ToR) of teachers to the portable computer program, but he does not explain just how the SoC and LoU led to the ToR categories, nor does he share findings regarding the ToR of the teachers in the study. One is left with the impression that Newhouse needed a larger forum than a single journal article to communicate all of his important work in this study.

K-12 Studies Using SoC Along with Other Assessments

A number of K-12 studies of technology integration employed the SoCQ in conjunction with other assessment methods; these studies offer both positive and negative examples of the use of CBAM.

Willis (2003) employed several approaches to develop in-depth characterizations of individual teacher change; however, she also attempted to develop conclusions about group responses based on limited data. Willis used both the SoCQ and LoU, along with additional assessment tools and qualitative data derived from the LoU interview, to compile in-depth data on seven PreK-12 teachers as they participated in a graduate course on teaching with technology. The data collected are not reported at all; only her broad conclusions are shared. Although there were just seven total participants in the study, she attempted to compare findings across subgroups such as elementary or secondary teachers and high or low initial skill levels. I believe that the study's findings are less important than this point:

This study extends the current research on [CBAM] and the process of change by focusing attention on the individual characteristics of teachers involved in a

training program ... Concerns were affected by the individual characteristics of the teachers and their classroom environments. (p. 139)

The mixed-method study of Wesley and Franks (1996) provides an additional example of the importance of focusing on individual instructors, using CBAM data to select a sample of participants for in-depth interviewing. They researched teacher adoption of two classroom-based computer technologies at an elementary school, and in particular examined the role of individual and collegial activities in moving teachers through the SoC. Of the 19 participating teachers, four with more advanced concerns profiles were selected for follow-up qualitative interviews. Wesley and Franks related voluntary activities of the four teachers to the various SoC. In fact, they suggest that “an expanded theoretical model is required to accommodate the role of teachers’ voluntary activities in the adoption of complex educational technologies” particularly in relation to “elevated early concerns” (pp 8-9). They noted that findings from their study were consistent with other concerns-based studies of technology innovation showing that teachers’ “early occurring concerns persisted at high levels even after ... elevation of later concerns” (p. 10). They offered an explanation that the multi-faceted nature of complex of technology innovations can result in persistent early concerns. They concluded that it is important to plan for a complex, cyclical developmental process when considering technological innovation, rather than expecting a straightforward linear progression.

Gershner and Snider (2001) studied a somewhat larger group of instructors and employed non-parametric statistics to examine the significance of change over time in CBAM measures, but their study and its reporting exhibits limitations. They used both SoCQ and LoU to study 49 middle and high school teachers (including 12 peer trainers trained separately) on the use of the Internet as an instructional tool. All participants completed pre-assessments at the beginning of the semester, but just 11 of the 12 trainers (and none of the other teachers) completed the post-assessments at the end of the semester. The investigators performed a Wilcoxon Signed Ranks Test on the average response of the 11 participants for each stage’s five questions, comparing the pre- and post- responses at each stage. Only Stage 0 was found to be significantly different, although their description of this finding is confusing: “the significant reduction in average awareness scores evidenced between the pretest and posttest indicates increased awareness concerns” (p. 294). If the score reduced,

this indicates *decreased* awareness concerns. The Wilcoxon Signed Ranks Test was also performed on the pre- and post- LoU results, finding a significant increase in the overall level of use. The investigators pointed out that the percentage of participants at LoU 0 had decreased from 43% to 25% while LoU 4 and 5 had increased from 8% and 5% to 13% each (p. 295).

While the use of the non-parametric Wilcoxon Signed Ranks Test to determine significant differences in pre- and post- CBAM results from a small sample is a helpful idea, Gershner and Snider (2001) overall leave an impression that they have not thoroughly understood the CBAM. For instance, they incorrectly refer to the study's innovation, the use of the Internet as an instructional tool, as the Innovation Configuration (p. 286). They do not note the significance of the fact that their data ultimately was collected exclusively from trainers and not the other participants in the training. They collected the SoCQ data in "whole group sessions" (p. 298) which raises concerns about the reliability of the data, and they stated that they "plan to explore an electronic form of the LoU to assess student changes in Levels of Use" (p. 298) which would violate two key premises of the LoU – that it is not a self-assessment, and that the target population for its use is educators.

SoC-Focused K-12 Studies

Several other K-12 studies of technology integration employed the SoCQ alone; again, these studies present understandings of CBAM which are both praiseworthy and puzzling.

Casey and Rakes (Casey & Rakes, 2002; Rakes & Casey, 2002) used the SoCQ on a large scale to determine teacher concerns about instructional technology; their study demonstrates the challenge of effectively representing the breadth of individual concerns and illustrating individual change with a one-shot survey. They recruited pre-K through 12th grade teachers from four email lists. Having gathered a large amount of data from 659 participants, they were able to correlate demographic data with SoCQ results. They determined that more time working with technology may mean "higher levels of concern" (Casey & Rakes, 2002, p. 130). This they considered to be a positive, though it is not clear that unspecified "higher levels of concern" should be thought of as desirable. Rakes and Casey (2002) presented all SoC data from this study as group average data, including the

SoC profile, first and second highest stages of concern, and the lowest stage of concern. This seems to miss the opportunity to present richer aggregated individual data, or to explore the averages of sub-groups within the large sample. Conclusions were drawn which seem strong given that all data is presented as the averages for the entire group, even though CBAM's premise is that change is unique to the individual. For example, Rakes and Casey (2002) declared, "These results indicate that the intense, personal concerns of teachers may have been sacrificed as emphasis has been placed on student achievement" (p. 10).

Mills (1999) also used the SoCQ in a one-shot study; while his data presentation is more comprehensive and illustrative of different subgroups within his respondent base, the inferences he draws regarding change are difficult to support. He administered the SoCQ to 65 teachers from four different elementary schools regarding the use of an integrated learning system which had been in place for nearly two years (nearly three years at one school). Mills followed the recommendation of CBAM researchers by presenting tables showing the frequency and proportion of the highest and second highest stages of concern, as well as the average profiles for each school, which are quite similar. Each school's average profile was discussed based on the guidelines for interpretation of profiles which the CBAM manual provides. However, some statements are problematic because they suggest an interpretation of the single administration of the SoCQ as representing change over time. For instance, of one school's profile, Mills said, "There appeared to be a progression from self concerns ... to task concerns" (p. 5). The total average profile is described as an "overall trend ... seeming to suggest an implementation where, on average, concerns for the innovation were evolving ..." (p. 6). Despite the qualifiers such as "seem" and "on average," it is still difficult to understand how so much change can be detected from a single snapshot of the SoC.

Liu, Theodore, and Lavelle (2004) used the SoCQ in a pre-post research design; their hypotheses and conclusions do not suggest a strong understanding of the SoC construct. They administered pre- and post- SoCQs to in-service teachers ($n = 23$) enrolled in a graduate online course about research methods, regarding concerns about "technological intervention in instruction" (p. 377). The mean differences for each stage between pre- and post-assessments were examined with t-tests, and significant increases were found on every stage, which support their odd hypothesis that the "students will have higher scores as measured by [the SoCQ] at the completion of a graduate online course compared to the beginning of that

online course” (p. 377). Typically, one would think (or hope) that the scores on the lower stages would decrease, while the scores on higher stages would increase. As important as change within each stage is any change in the relative intensities between stages. However, the mean scores themselves are not reported; only the t-test results, so the reader does not know which stages actually scored highest compared to the others. Thus, it is not clear why the authors conclude, “Based on the results of this study, more online instruction should be proposed for educational programs” (p. 379). If the result of the students’ experiences was to increase the intensity of all concerns, that is not necessarily a positive outcome. More information is needed to be able to draw any conclusions from this study.

Thus, while some K-12 CBAM-based studies provide examples of useful practices, they often also provide counter-examples in the use and interpretation of CBAM assessments in research.

CBAM AND HIGHER EDUCATION TECHNOLOGY INNOVATIONS

CBAM studies of higher education instructors implementing technology innovations are fewer, but also provide a similar mix of good and questionable practices.

For example, Nevin (2003) collected and analyzed pre- and post-SoCQ data appropriately, but her interpretation of the results is seriously flawed. She studied 21 special education faculty at Arizona State University who participated in an online workshop on the redesign of courses for increased web-based delivery of instruction. She conducted pre- and post- SoCQs on the group—using paired t-tests to compare the “before” and “after” raw scores for each stage (see George et al., 2006, p. 28); results indicated a significant difference only at Stage 6. She also conducted post-workshop focus groups and related the comments and themes to the SoCQ data.

Nevin’s (2003) interpretation of the results is confusing, however. The results indicate increased concerns at Stages 0, 1, 4, 5, and 6, and decreased concerns at Stages 2 and 3. Stages 0 and 1 remained the first and second high stages for both administrations of the SoCQ, but Nevin does not discuss this. Rather, she stated in regard to Stage 6 that “The pretest relative frequency of 38% was significantly higher [sic] than the posttest relative frequency of 73%. This pre-post decrease [sic] in relative concerns indicates that

participation in the online workshop ameliorated the participants concerns, as expected” (p. 3730). First of all, the pre-post change was an increase, not a decrease, in Stage 6 concerns. The data do not support the assertion the workshop has “ameliorated the participants concerns.” Secondly, the “relative frequency” terminology is incorrect; the percentiles may be interpreted as relative *intensity* of concerns – not frequencies. Third, the more reasonable—and desirable—conclusion regarding an increase in Stage 6 concerns is that participants have been enabled to focus on higher-level concerns, if indeed the intensity of these concerns is stronger than the intensities of lower-level concerns. In fact, later in the article, she does conclude that “personal concerns were alleviated while management, consequences, and redesign issues took on a higher relative intensity ... [and] these changes [were found to be] statistically significant” (p. 3732). However, the data she presented support neither her interpretation of the changes in concerns—Stage 0 and Stage 1 concerns are the highest, nor her statement that these changes were statistically significant—only the Stage 6 change was significant according to her own reporting.

Dobbs (2000; 2004) conducted a CBAM study interesting for its research design which involved different treatment groups for technology-related faculty development and the use of the SoCQ to explore outcomes. As with the previous examples, however, the study’s shortcomings regarding the understanding of CBAM are troubling. She examined the effects of three different training conditions on the SoC for 27 faculty and administrators who were beginning to be involved in instruction via interactive television. She did not explain why administrators were included in the study, which is a question since the CBAM was validated with classroom educators. Participants either received no training (control), nine hours of classroom-based training, or eighteen hours of laboratory experience in addition to the nine hours of classroom-based training. She performed an Analysis of Covariance to adjust for initial SoCQ differences when comparing between-group differences. While this seems a promising method for more accurately comparing post-SoCQ scores across groups, it seems statistically questionable for this study, given that each group represented a sample size of 9. She also provided an aggregate profile for each group based on the post-administration of the SoCQ. Taken together, the data show that in Stages 4, 5, and 6, the two groups which received training had significantly higher levels of concerns than the group

without training. This is potentially a positive result, indicating that training may have enabled faculty to increase their focus on impact-level concerns.

Dobbs (2004), however, presented some questionable understandings of the SoC. For instance, she indicated that the SoC profile “is a pictorial representation of the peak scores on each stage” (p. 190). This use of the “peak” terminology is inconsistent with the CBAM SoCQ interpretation manual, which uses “peak” to describe the one stage that has a higher percentile score than the others. Further, she stated that the chart of SoC profiles for each group

graphically illustrates the development, or lack of development, of each group through the Stages of Concern. ... The classroom and laboratory group progressed steadily through the Stages of Concern ... the classroom group made some developmental moves ... the control group results resembled the profile of the typical nonuser. (p. 192)

This reveals a fundamental misunderstanding in the use of the SoC which is related both to the use of ANCOVA and the “peak score” confusion. SoC profiles are to be interpreted holistically and in a manner that takes into account the relative position of each stage. While ANCOVA may have indicated significant differences on certain stages, an examination of the chart shows that the overall profile of the classroom and control groups are remarkably similar – both fitting the non-user profile which Dobbs (2004) ascribes only to the control group. One also quickly notes a “negative one-two split” in the classroom + laboratory group, and the fact that for all three groups, Stage 0 is the peak stage. The choice to use ANCOVA places the emphasis on stage-by-stage comparison of the post-SoCQ results of the groups, which may be a useful thing. However, it also makes it difficult to speak about “steady progress” or “developmental moves” because the focus is on between-groups comparisons of the post-SoCQ, not comparisons of individual groups’ pre- and post- SoCQs. As with the Mills (1999) study cited earlier, one must note that focusing on an SoC profile from one point in time does not effectively illustrate development. Additionally, a CBAM researcher must view the percentile scores for each stage as relative intensities which are most meaningful when compared with the percentiles for the other stages. Finally, given the small sample size in her study, Dobbs also seems to have missed an opportunity to examine individual concerns data (for example, through the correct peak stage analysis procedures) in addition to group means.

Very similarly to Dobbs (2004), Chen (1999) conducted a pre-post SoCQ study with different technology-related professional development treatment groups. Chen studied 53 university faculty and administrative staff in the process of adopting a new network system for using the Internet and file servers. A pre-SoCQ was administered to all participants. Three groups were formed based on peak stage concerns for concern-based interventions. A fourth, non-concerns-based group received a lecture as intervention. The post-SoCQ was given to all four groups after the interventions. ANCOVA was performed upon the results using the pre-SoCQ results as covariant, similar to the procedures of Dobbs (2004). Though the study is lacking in detailed reporting of results, Chen concluded that “concern-based intervention significantly raised participants’ concerns toward using the Internet and facilitated the adoption process” (p. 298). Without more explanation of which concerns were raised and how much, it is difficult to know whether this conclusion is warranted. It is also not clear (as with Dobbs) why administrative staff were included along with educators in this study.

Pamuk’s (2005) study provides an example of a use of CBAM similar to that described earlier in Brzycki and Dudt (2005), in that CBAM is used as an interpretive lens; this approach requires a strong understanding of CBAM concepts, which is not evident. Pamuk conducted a case study of mentoring support provided by a graduate student to a teacher education faculty member on the use and integration of educational technologies. The author attempted to relate his experiences with the faculty member to the CBAM. Although he did not use CBAM assessment measures, he described seeing the faculty member go “through [the] stages of concern” in “several instances” during one semester, and further that “as he moves from one step to another on the stages ladder described in the CBAM, he also jumped to the Level of Use, another dynamic of the model, as expected” (p. 1543). This represents a significant misunderstanding both of the SoC (one is not at a step on a ladder – one experiences varying intensities of all concerns) and the relationship between the SoC and the LoU (they are independent constructs).

In addition to these studies, a number of recent dissertations have been identified which used CBAM to study higher education instructors’ concerns about and uses of technology innovations. The largest group of these consisted of large scale studies of faculty and employed one SoCQ along with the collection of demographic information, in order to

provide recommendations for effective faculty development (Alfieri, 1998; Allehaibi, 2001; Edwards, 1997; Owusu-Ansah, 2001; Sells-Lewallen, 2000; Toms, 1997). Three studies were identified which used a pre-post design to examine the effects of faculty development; two of these relied solely on the SoCQ (Dell, 2004; Dobbs, 2000), and one used the SoCQ, LoU, and an additional technology use inventory (Poplos, 1999). Finally, two studies of faculty were located in which qualitative data were presented within the CBAM framework by relating findings to the SoC and/or LoU (Constantino, 2003; Shafiei, 2005).

CONCLUSION

This study was intended to examine the change process in higher education faculty who have engaged in professional development intended to improve teaching and learning through innovative uses of technology and learner-centered teaching practices considered vital for improving undergraduate education. Faculty are thus engaged in a significant change process.

As detailed in this chapter, the CBAM is a well-established framework, grounded in change theory and used for numerous studies of K-12 and higher education teacher responses to educational innovations. CBAM includes assessment tools which have been found reliable and valid for measuring affective and behavioral responses of educators. Within the body of CBAM literature are many studies focusing on technology-related innovations, and thus CBAM is an appropriate choice as the central framework for this study.

It is worth noting, however, that the majority of CBAM-based studies of technology innovation rely heavily on the SoCQ and typically provide only a snapshot of educator concerns, or perhaps a simple pre- and post- training set of data. These studies sometimes exhibit questionable scholarship, including misuse or misunderstanding of CBAM concepts, misinterpretation of data, and overly strong conclusions based on limited data. Qualitative follow-up to confirm and extend CBAM findings is rare.

As Anderson (1997) said,

CBAM theory and procedures could be used to generate more comprehensive pictures of organizational change across the individuals within an organization than has typically been the case. The strategy would be to look less for central tendencies, and more for the distribution and patterns and linkages between individual responses across the organization. This approach would lead us to a

better understanding of the nature and extent of organizational change without losing sight of the individuals. (p. 363)

Accordingly, this study employed comprehensive use of the CBAM model and explored the relationships among the SoC, LoU, and IC. This study may prove innovative in that participants were grouped according to “change patterns” based on examination of both pre- and post- SoCQ and LoU data on an individual basis. These change patterns were further explored via in-depth, retrospective interviews with a sample representing each change pattern group, enabling both the examination of faculty perceptions of the change process in greater depth, and elucidation of the CBAM-based findings.

CHAPTER 3

METHODOLOGY

Both the research and practitioner communities have long argued that advanced technologies can positively affect teaching and learning in higher education; Gillespie (1998), for example, referenced a literature base on the instructional benefits of computers that dates back to 1960. Since the mid-1990s, however, many institutions of higher education have taken an advocacy position—and provided funding to support the increased use of technologies for teaching and learning (Moore, Moore, & Fowler, 2006). Claims for the utility of these technologies are also increasing. For example, in a recent report for planners on trends in higher education, the Society for College and University Planning (2005) argued that, “Evidence for the efficacy of implementing learning technology is now indisputable. Information technology is now easy to use and clearly increases students’ active learning and engagement with course material” (p. 6). Because serious efforts at technology integration not only require competence with the technologies themselves, but also lead to substantive changes to teaching approaches and practices, colleges and universities are urged to consider faculty development needs (A. H. Brown, Benson, & Uhde, 2004; Moore et al., 2006).

As detailed in Chapter 2, there is a good deal of theory about instructor change generally and—more specifically, approaches to higher education faculty development programs that lead to increased student learning through improved teaching and use of instructional technologies. However, the impact of such programs on faculty are but rarely studied and thus not particularly well understood. As important, some of the few studies that have been conducted feature instruments that lack validation or any sort of rigorous testing. This study is one of the first to more directly and systematically examine the impact of a faculty development initiative by employing a mixed methods approach based on an established model for understanding instructor affective and behavioral change in the process of implementing an educational innovation.

This chapter explicates the methodology for this study, and includes the following:

- a description of the study participants,

- an explanation of the data collection instruments and methods for the study, most of which come from the Concerns-Based Adoption Model,
- the timeline for the data collection procedures, which were spread out over nearly nine months,
- the data analysis procedures used in the study, and
- a concluding discussion of the study's limitations and delimitations.

STUDY PARTICIPANTS

This section reviews the faculty development initiative (FDI) in which study participants were involved, the selection process by which FDI fellows were chosen, and the recruitment process by which participants became involved in the study itself.

Faculty Development Initiative (FDI)

As described in Chapter 1, the FDI is a grant-funded program at a large, public, urban university in the southwestern United States. The FDI has as its primary goal the development of students' skills, knowledge, and dispositions seen as key to their success in the 21st century workforce. FDI staff work closely with colleagues from campus groups including the Center for Teaching and Learning, Instructional Technology Services, the College of Education and the Library. The FDI faculty fellowship program, which began in 2005-2006, is the primary component of the FDI; FDI faculty fellows engage in activities centered on innovative uses of information and communication technologies (ICT) to improve teaching and learning.

The initial activity of the 2006-2007 FDI fellows was a four-day summer workshop in May, immediately after the spring semester ended (See Appendix I for a detailed schedule of the four days). The first two days of the workshop consisted of presentations and hands-on activities designed to expose faculty to a variety of instructional technologies. The last two days included additional presentations focused on tools and techniques associated with online learning. But the primary focus of the last two days was to help faculty focus on a portion of their curriculum which might be enhanced through an innovative use of technology. Thus, faculty were offered small group or one-on-one consultative opportunities to more deeply explore a particular technology, formulate learning outcomes, and devise assessment strategies. From the close of the workshop through August, fellows could continue to receive

one-on-one support from the same university staff with expertise in learning technologies and instructional design who had been involved in the four-day workshop.

The FDI awarded fellows two \$1,000 stipends tied to milestones for reporting on the development, implementation, and assessment of the fellows' innovations. The first stipend was given after fellows presented (in August) the design of the curricular innovation they had developed during the summer, and planned to use with students during the fall. The FDI awarded the second stipend after fellows reported (in early January) on the results of their implementation of the innovation with students. For both of these milestones, fellows were expected to present at a public poster session as well as submit written documentation to the FDI.

FDI Fellowship Selection

Participants for this study were recruited from the 23 instructors selected to be 2006 FDI fellows. While the fellowship was open to all instructors at the university (see Appendix G), and over 50 applied, five clearly-delineated priorities or conditions informed the faculty selection process:

- A teaching focus on undergraduates—with an eye to the skills that we tend to associate with the “modern” workplace. Ideally, the workshop appeals to those with a particular interest in integrating principles of learning, digital know-how, and other “21st century competencies” into and across the undergraduate curriculum.
- Faculty teaching general education foundations classes—often considered the second tier of the undergraduate curriculum. [Note that the 2005 fellowship was largely organized around the first general education (GE) tier (communication and critical thinking).]
- Faculty teaching large classes in SMART (technology-rich) classrooms. The FDI leaders believe that these teachers face unique pedagogical challenges that its workshops comprehensively and systematically address.
- Clusters of faculty from a single discipline—offering unique opportunities for collaboration and community-building.
- Tenured or tenure-track faculty—the idea being that curricular change is more likely when led and supported by “permanent” faculty who are better situated to effect change.

According to FDI staff, each selected applicant fulfilled at least one or two of these priorities. Each provided a sound professional and pedagogical rationale and indicated already using some technology (e.g. Blackboard or PowerPoint) in his or her courses. As

Tables 5-8 illustrate, the pool chosen represented diverse faculty ranks and disciplines, and the courses in which the fellows focused on implementing an innovation were also representative of a broad cross-section of course characteristics.

Table 5. 2006 FDI Faculty Fellows Ranks

Professor	Associate Professor	Assistant Professor	Lecturer
6	5	6	6

Table 6. FDI Faculty Fellow Course Enrollment

< 30	30-50	51-75	76-100	101-150	151+
5	5	5	0	4	4

Table 7. FDI Faculty Fellow Course General Education Status

GE first tier (Communication and Critical Thinking)	0
GE second tier (Foundations)	8
GE third tier (Explorations)	6
GE (American Institutions)	1
Non-GE, lower division undergraduate	1
Non-GE, upper division undergraduate	6
Non-GE, graduate	1

These tables illustrate the fulfillment of the various priorities described above for selection of fellows. Nearly all FDI fellows teach at the undergraduate level; over a third teach GE foundations courses, with another third teaching other GE courses. Nearly all (21 of the 23) teach courses in technology-enhanced classrooms with over half of those courses enrolling more than 50 students. With regard to faculty clusters, three sub-disciplines were represented by more than one participant. Finally, about three-fourths of the FDI fellows were tenured or tenure-track faculty.

Table 8. 2006 FDI Faculty Fellow Disciplines

Discipline	Discipline Total	Sub-discipline	Sub-discipline Total
Business Administration	1		
		Information Decision Systems	1
Engineering	1		
		Construction Engineering	1
Humanities	10		
		Africana Studies	1
		Chicano/a Studies	1
		History	1
		Linguistics	1
		Philosophy	3
		Religious Studies	1
		Rhetoric and Writing Studies	1
		Women's Studies	1
Professional Studies	6		
		Child and Family Development	1
		Communication	2
		Criminal Justice Administration	1
		Recreation, Parks and Tourism	2
Sciences	3		
		Computer Science	1
		Geology	1
		Physics	1
Social Sciences	2		
		Economics	1
		Sociology	1

Recruitment and Participation

All 23 of the 2006 FDI fellows were sent an email letter inviting their participation in the study (see Appendix H), along with the informed consent document for their review and signature. The researcher followed up with a phone call or personal visit to answer any questions they might have had. Participants were offered a series of \$10 gift card incentives for completing the pre-assessments, post-assessments, and final interview. 17 of the 23 fellows indicated an initial willingness to participate and signed the informed consent document. Two of the 17 terminated their participation in the FDI fellowship during the summer (for personal reasons); the remaining 15 participated in all three administrations of the Stages of Concern Questionnaire, and with one exception, in both pre- and post-Levels of Use interviews.

DATA COLLECTION INSTRUMENTATION

CBAM tools were used for most data collected during the study. In addition, demographic data were gathered initially through a survey, and qualitative data were acquired via interviews conducted after all other data were collected. Each of these tools is detailed in the subsections that follow.

Demographics

In addition to the demographic data available in the FDI documents and through university information systems, the researcher collected contextualizing background information via a web-based questionnaire (see Appendix F). From these sources, the demographic items on which the researcher ultimately focused were:

- Age
- Gender
- Higher education teaching experience (years)
- Discipline
- Rank
- Typical enrollment for the course considered for technological enhancement
- Self-rated technology competence
- Self-rated importance placed on various uses of technology for teaching and research

- Self-rated teaching style

CBAM Assessments

As discussed in Chapter 2, the Concerns-Based Adoption Model (CBAM) is a well-established multidimensional model that characterizes educational change as a process of individual instructor responses to an innovation. The literature base of peer-reviewed research making use of the CBAM is broad, spanning many different innovations in both higher education and K-12 settings. Within that base, many researchers have examined the use of CBAM to study staff development initiatives regarding teaching with technology, though these studies primarily targeted K-12 environments. In an analysis of this literature base, Slough and Chamblee (2005) called for more research using all three of the primary CBAM components (Stages of Concern, Levels of Use, and Innovation Configurations)—not merely the Stages of Concern. This research did indeed accomplish this, allowing the researcher to develop a more comprehensive understanding of the participants' affective *and* behavioral responses to the innovation, defined as: *the adoption of advanced technologies (a) for instructional design, planning, and delivery; and (b) as a tool supporting students' ability to research, organize, visualize, manage, evaluate, and communicate information.* The constructs and instruments of CBAM were examined in depth in Chapter 2, and are briefly reviewed here.

STAGES OF CONCERN QUESTIONNAIRE

The Stages of Concern (SoC) construct illustrates the affective dimension of change. It consists of a seven-stage continuum, generally but not strictly developmental, ranging from self-focused, to task-focused, to impact-focused, concerns (see Table 3, p. 34). “The model developers hypothesized that concerns change, as users become increasingly familiar with and skilled in using the innovation” (Hall et al., 1978, p. 4). The SoC are measured using the 35-item Stages of Concern Questionnaire (SoCQ, see Appendix A); respondents rate each statement on an 8-point ordinal scale regarding how true the statement is about themselves. The Stages of Concern may also be assessed through analysis of open-ended statements; however, Newlove and Hall (1998) recommend the *Open-Ended Statement of Concern About an Innovation* for practitioner use, not research (p. 2).

The SoCQ was developed in the early 1970s through an iterative process of expert contributions, expert review, and factor analysis (George et al., 2006). Subsequent testing of the SoCQ on 830 teachers and professors in 1974 demonstrated alpha coefficients for internal reliability ranging from .64 to .83. Test-retest correlations performed on follow-up responses of 132 teachers from the original group ranged on the seven scales from .65 to .86, leading Hall, George, and Rutherford (1978) to conclude that the SoCQ was a reliable instrument (p. 7). Over the next several years, a “series of validity studies were conducted, all of which [sic] provided evidence that the SoC Questionnaire measures seven separate constructs identifiable as the Stages of Concern as they have been conceptualized” (Hall et al., 1978, p. 9). Though several researchers have raised questions regarding the validity of the SoCQ (see Bailey & Palsha, 1992; Cheung et al., 2001; Jibaja-Rusth et al., 1991; Rogan et al., 1992; Shotsberger & Crawford, 1996), Hall and Hord (2006) remain confident that “although the SoCQ was developed several decades ago, it continues to be seen as a reliable and valid measure” (p. 148).

For this study, participants responded to the SoCQ three times—prior to the workshop, at the end of the summer development process, and at the end of the fall after implementing their innovation in a course. The SoCQ was administered using the SurveyMonkey.com web-based survey tool (see Appendix A), which enhanced the convenience of distributing and collecting the survey, and enforced the requirement that each question be answered before the survey was complete. As a result, all participants provided usable data on the SoCQ on all three administrations of the SoCQ.

LEVELS OF USE INTERVIEWS

While the SoCQ focuses on the thoughts and feelings of educators implementing an innovation, the Levels of Use (LoU) assessment “describes the behavior of individuals as they become more familiar and more skilled with using [it]” (Loucks, Newlove, & Hall, 1976, p. 2). The LoU provides an eight-level continuum (see Table 4, p. 37), with each level representing “a behavior that is characteristic of the innovation user at a particular stage of development” (Loucks et al., 1976, p. 2). The LoU assessment results in the identification of a single Level of Use measure for each innovation user.

The LoU is established through an interview process administered by a trained interviewer. Loucks, Newlove, and Hall (1998) described this process as a “focused interview” that “employs an interview guide with a list of objectives and questions but gives the interviewer latitude within the framework of the interview guide” (p. 2). CBAM developers note the importance of careful training for LoU interviewers, even specifying a three-day training for those working on rigorous studies (Hall & Hord, 2006). The developers of the LoU focused interview process recognized the challenge of using a self-report to develop a complete assessment of an individual’s behavior, and thus built a protocol that includes questions “about various independent yet related behaviors that contribute to establishing an individual’s overall Level of Use” (Loucks et al., 1976, p. 3). See Appendix C for the Levels of Use interview protocol and rating sheet.

Regarding reliability and validity, Loucks et al. (1976) found that the LoU interview questions resulted in responses with a high degree of correlation; “therefore, it can be assumed with a high degree of certainty that [the LoU interview questions] measure what they purport to measure, Level of Use of the Innovation” (p. 3). Loucks et al. also presented a process to be used with multiple LoU raters (who evaluate the LoU based on the interview transcript) to establish interrater reliability.

For this study, a team of certified LoU interviewers from Colorado State University led by Dr. Kay Uchiyama conducted the interviews by phone. The team also rated the interviews using the specified LoU rating process, described in more detail in the *Data Analysis* section below. The use of certified interviewers enhances the reliability and validity of the LoU ratings; the fact that they are external to the university enhances their objectivity and reduces potential bias.

INNOVATION CONFIGURATIONS MAPS

The third CBAM component, Innovation Configurations (IC), is used (like LoU) to describe the behavior of educators involved in implementing an innovation. Whereas the LoU describes the extent to which an educator is using an innovation, IC is used to examine the “differing forms that innovations take with individual users” (Hord, 1986, p. 12). Conceptualizing IC requires that change leaders (often faculty developers) be able to

articulate the desired outcomes of faculty development activities, as well as anticipating the range of actual outcomes that may occur.

As change leaders consider the various dimensions or components of the innovations, they form descriptions of ideal, acceptable, and unacceptable ways for each of the dimensions to be implemented. The result is an evaluation rubric—or, in the language of CBAM, an IC Map. In addition to “precisely identifying quality and measuring fidelity” (Roy & Hord, 2004, p. 57) of innovation implementations, IC Maps may also be useful in the change process as a tool to facilitate agreement among trainers about the desired outcomes of the faculty development process. In the context of research, expert development of and agreement about the IC Map may be considered akin to establishing face validity of the instrument. Multiple change leaders should also be involved in the assessment of innovation implementations, and interrater reliability established.

The IC Map used in this study was based on a draft of a rubric prepared by an assistant to the Dean of Undergraduate Studies for outcomes assessment with the FDI fellows. Though the development of the original rubric was not completed, it provided an excellent start on an IC Map as it captured the dimensions of change as envisioned by FDI leaders. The researcher modified or added some of the innovation components, updated the language, and reformatted the rubric to be consistent with the IC Map formatting guidelines provided by Hord et al. (2006). The researcher then refined the IC Map based on feedback from instructional design experts from Instructional Technology Services, the College of Education, and the FDI program. The researcher used the final IC Map (see Appendix D) to evaluate selected participants based on their final reports and presentations.

The IC Map for this study includes eight innovation components grouped into three dimensions; four possible variations are described for each component. The first dimension, *Learning Sciences*, describes the degree to which an FDI fellow’s project displays evidence of sound pedagogy. The components of *Learning Sciences* are *Project Design*, *Curricular Connections*, *Student Learning Outcomes*, and *Assessment*. The second dimension, *Digital Know-How (Instructor and Student)*, describes the extent of instructor and student technological proficiencies which the project requires, and is represented by two components: *Information, Technological, and Visual Literacies*, and *Effective Use of Real-World ICT Tools*. The third dimension, *Key (Student) Competencies*, describes various

student behaviors which may be brought to bear in the project; its two components are *Inventive Thinking* and *Effective Communication*.

Retrospective Interviews

In February, interviews that were semi-structured and retrospective in nature were conducted with a purposeful sample of the study participants. Based on the Critical Incident Technique (CIT) (Flanagan, 1954), these interviews probed faculty perceptions of key moments in the change process, both as learners involved in the summer workshop and consultations, and as instructors implementing the innovation in the fall (see Appendix E for the interview protocol). These interviews were intended to reveal benefits of and barriers to the faculty development process, and its perceived effects upon both faculty and students, across a cross-section of study participants.

CIT is intended to capture detailed behavioral descriptions in the context of key real-world situations and occurrences. CIT is a method recognized as valid and reliable (Fisher & Oulton, 1999) for quickly collecting and analyzing rich qualitative data (Angelides, 2001; Fisher & Oulton, 1999). It is a common needs assessment strategy, useful for conducting gap analyses in public education (Angelides, 2001; Twelker, 2003), vocational education (Redmann, Lambrecht, & Stitt-Gohdes, 2000), library and information management (Fisher & Oulton, 1999), organizational development and occupational training (Davis, 2006; Stitt-Gohdes, Lambrecht, & Redmann, 2000), and health care (Urquhart et al., 2003).

Flanagan (1954), in the original conception of CIT, emphasized its use as an evaluative tool for measuring effectiveness. He specified five steps in CIT research:

- Determine aims;
- Develop plans and specifications;
- Collect data;
- Analyze data; and
- Interpret and report findings.

Though the use of CIT is no longer restricted to use in evaluation—Angelides (2001), for example, promoted CIT as an appropriate method of naturalistic inquiry—Flanagan's basic steps remain a key reference for practitioners of CIT.

For this study, the aims are described above: to elucidate the findings from the CBAM-based research by probing participant perceptions of key moments in the change process. Analysis of this information provided insight into aspects of the FDI program that particularly affected the faculty development process.

CIT data may be gathered through direct observation, interviews, and focus groups. Because the CIT research was done retrospectively with few participants, individual interviews made the most sense for this study. The interview protocol was adapted with only slight modifications from a critical incident interview protocol developed, piloted, and employed by Lambrecht (1999) for a study of critical incidents in the teaching and learning of business technology (see Appendix E).

DATA COLLECTION PROCEDURES

The data collected for this study was confidential, but not anonymous. Because it was necessary to track individual data across the three administrations of the SoCQ, participants were required to provide an identifier on each survey. An identifier was also needed to enable post hoc analysis to construct comprehensive profiles and examine the relationships across the SoCQ, LoU, and IC assessments for individual faculty.

The remainder of this section describes the timeline for data collection, as well as specific procedures associated with the CBAM instrumentation, CIT interviews, and demographic data.

Timeline

Table 9 describes the data collection activities in relation to the FDI fellowship activity schedule. The Stages of Concern Questionnaire was administered three times—prior to the May workshop, at the end of the summer when the innovation had been developed but not yet implemented, and then again after the fall semester implementation had been completed. The Levels of Use interviews were conducted twice—prior to the May workshop, and following the fall semester. The Innovation Configurations assessment and retrospective interviews were done just once, in January and February.

Table 9. FDI Fellowship and Data Collection Timeline

Date	FDI Fellowship Activity	Research Activity
March 6, 2006	Invitation sent out by FDI to faculty to apply for FDI fellowship	
April 2006	Selected FDI fellows notified	
May 2006 (prior to May 22)		Obtained informed consent Pre-assessment: Stages of Concern Questionnaire #1 Levels of Use Interview #1
May 22-25, 2006	Summer Institute (presentations, hands-on workshops)	
Summer 2006	FDI fellows worked with consultants and possibly with other fellows on their innovation	
Late August 2006	FDI fellows presented their planned innovations	Stages of Concern Questionnaire #2
Fall semester 2006	FDI fellows implemented innovations with students	Post-assessment at end of semester: Stages of Concern Questionnaire #3 Levels of Use Interview #2
Early January 2007	FDI fellows presented their findings about implementing their innovations	Analysis of CBAM data Emergent groups determined based on CBAM profiles Faculty sampled from groups for Innovation Configurations assessment and final retrospective interviews Innovation Configurations assessment
February-March 2007		Retrospective interviews

Stages of Concern Questionnaire

Participants completed the Stages of Concern Questionnaire (SoCQ) (see Appendix A) three times. The first was prior to the faculty development workshop (late

May), providing baseline information. The second was at the end of the summer (late August), at the time when participants presented the “project” they devised through support from the workshop and follow-up consultation. Because the SoCQ captures the affective dimension, the August data was key to the examination of how concerns of the faculty participants changed following training and curriculum revision *but prior to* classroom implementation. The third administration of the SoCQ occurred at the end of the fall semester, following the implementations of the innovations.

The SoCQ was administered electronically through the SurveyMonkey.com website, to make it as convenient as possible for the faculty and for data collection purposes. The electronic administration also made it more likely that participants completed the SoCQ independently, openly, and completely.

Levels of Use Interviews

The Levels of Use (LoU) interviews were conducted twice—prior to the workshop (mid-May) to establish a baseline and again at the end of the fall semester (November/December). Because the LoU is behavioral, a late summer interview would not likely have yielded useful data, since at that time the faculty had not yet implemented their project in their course. The LoU interviews were conducted via phone, by a team of interviewers from Colorado State University certified in the Levels of Use methodology. See Appendix C for the LoU interview protocol.

Innovation Configurations Assessment

The Innovation Configurations assessment involved a purposeful sample of participants from groups that emerged through analysis of the SoCQ and LoU data. Four categories characterizing different change processes were determined, and one study participant from each category was selected for IC assessment. The IC assessment was done initially in January, using the IC Map (see Appendix D) and based on participants’ final poster presentations at the FDI open house event. The researcher also obtained the written reports of the participants which were used to review the IC Map ratings as determined from the poster presentation session.

Retrospective Interviews

Following the final FDI fellow reports in January, semi-structured retrospective interviews based on the Critical Incident Technique (CIT) were conducted with the same faculty sampled for the IC assessment. The aim of these interviews was to elicit critical information about key moments in the faculty change process—as well as perceived barriers to and benefits of the FDI faculty development program.

As mentioned earlier, the interview protocol is based on one found in Lambrecht's (1999) study of educational practices in the development of business-related technology skills. The interviews were conducted by an interviewer independent from the researcher and the university to try to minimize bias and enhance the openness of the interviewees. The interviewer selected holds a doctorate in education, with a concentration in educational technology, and has prior experience interviewing instructors about instructional innovations with technology.

In order to further minimize bias, the interviewer was not informed about the change groupings, or from which change groups the participants were selected. The audio from each interview was recorded so that the researcher could “monitor interviewer reliability by examining the questioning process used by the interviewer” (Redmann et al., 2000) and transcribe the interview. In addition to instructions regarding the protocol, the interviewer received tips from articles on CIT interviewing (Redmann et al., 2000; Stitt-Gohdes et al., 2000) in order to most effectively enable interviewees to tell their stories comfortably and completely, hopefully avoiding the “post hoc rationalization that often accompanies retrospective accounts” (Urquhart et al., 2003, p. 67).

Demographic and Existing Data

For purposes of this study, some existing data sources were also accessed. These included:

- information publicly available about faculty and courses,
- information publicly available regarding the FDI program,
- communications to faculty and FDI fellows, and
- FDI program records.

Additional demography was gathered via survey questions appended to the first administration of the web-based SoCQ (see Appendix F).

DATA ANALYSIS TECHNIQUES

Initial descriptive analysis of the CBAM data followed the procedures specified in the CBAM literature. The researcher also conducted inferential analyses using non-parametric techniques. With the small pool of participants involved in this study, he could not assume a normal distribution of the population or the homogeneity of variance within it required to use parametric statistics.

The study was organized around five research questions regarding the innovation of using advanced technologies: (a) for instructional design/planning/delivery and (b) as a tool supporting students' ability to research, organize, visualize, manage, evaluate, and communicate information. Table 10 synthesizes the various analytical techniques and associated sources of data for this study, showing how each analysis relates to a research question, and, overall, how the various data analyses relate to one another. This table may be useful to refer to while reading in detail about each research question in the sections which follow.

Research Question 1: Change in Participants' Concerns About the Innovation

How do participants' concerns about the innovation change over the course of their participation in the FDI fellowship?

The researcher analyzed the participants' SoC data through several descriptive approaches, as well as inferentially through appropriate statistical procedures.

DESCRIPTIVE ANALYSIS

The SoCQ was scored by "summing the responses to the five items on each scale and referring the totals to a percentile table" (Hall et al., 1978, p. 7). Hall et. al (p. 29) described three ways to represent the percentile data; each provided a unique level of insight into the data and proved extremely useful for this study. The interpretive procedures resulted in rich descriptive data useful for understanding the concerns of the faculty participants at and across each of the three SoCQ measurements.

Table 10. Data Analyses

Data Source	Analytical Technique	Presented as	Representing	Performed for	Enabling a closer look at	Which addresses
SoCQ	Peak stage (descriptive)	<ul style="list-style-type: none"> • Frequencies • Group mean 	The primary concerns of participants, and of the group overall	Each of the three SoCQ administrations	How the primary concern of participants changes over time	RQ1
	First and second high stages (descriptive)	Matrix of frequencies	The top two concerns of participants, and of the group overall	Each of the three SoCQ administrations	How the top two concerns change over time	RQ1
	Profile (descriptive)	<ul style="list-style-type: none"> • Individual graphical profiles • SoC profile pattern group frequencies • Group average graphical profile 	Overall “profile” of concerns of participants and the group as a whole; patterns of concerns into which participants fall	Each of the three SoCQ administrations	How overall concerns change over time	RQ1

Table 10 (continued)

Data Source	Analytical Technique	Presented as	Representing	Performed for	Enabling a closer look at	Which addresses
SoCQ	Kruskal-Wallis one-way ANOVA (inferential)	Tests of significance	Changes within each Stage of Concern across administrations of the SoCQ for the group	Each stage of concern	Whether or not (and where) there are significant differences in each stage across the three administrations of the SoCQ	RQ1
	Descriptive examination of the SoCQ data grouped by demographic factors	Frequencies of the SoCQ profiles of emergent participant groups	Concerns of different emergent participant groups	Different participant groups identified	Whether or not (and where) there are differences in primary concerns across different groups	RQ3
LoU	Level of Use (descriptive)	<ul style="list-style-type: none"> • Frequencies • Group mean 	The primary levels of uses of participants, and of the group overall	Each of the LoU administrations	How participants' Level of Use changes over time	RQ2
	Wilcoxon Signed Ranks (inferential)	Tests of significance	Pre-/post-changes in the Level of Use for the group	Pre- and post-LoU data	Whether or not there are significant differences in the Level of Use between the pre- and post-LoU interviews	RQ2

Table 10 (continued)

Data Source	Analytical Technique	Presented as	Representing	Performed for	Enabling a closer look at	Which addresses
LoU	Descriptive examination of the LoU data grouped by demographic factors	Frequencies of the LoU profiles of emergent participant groups	Levels of Use of different emergent participant groups	Different participant groups identified	Whether or not (and where) there are differences in Levels of Use across different groups.	RQ4
SoCQ and LoU	CBAM profile formation (descriptive)	Frequencies of participants in different change patterns	The different categories of responses to the innovation	Each participant, based on post-assessment SoC and LoU data, and data regarding change over time in SoC and LoU	Types of responses to the innovation	RQ5
IC	IC assessment (descriptive)	Individual faculty profiles	The achievement level of faculty representing different CBAM profiles (see next item)	Subjects sampled from the CBAM change patterns (see next item)	The extent to which implementations of the innovation met the intentions of the change leaders	RQ5

Table 10 (continued)

Data Source	Analytical Technique	Presented as	Representing	Performed for	Enabling a closer look at	Which addresses
Retrospective interviews	Constant comparative technique to identify codes and themes	Key themes extracted from interview data	Experiences and perceptions of subjects through the change process, both during the faculty development process and the implementation (teaching) process	Subjects sampled from the CBAM change patterns	How perceptions of faculty regarding the change process match up with evidence about change provided by CBAM profiles and IC results	RQ5

SoCQ Peak Stage Score Interpretation

The first method for representing SoCQ data is *peak stage score interpretation*, identifying the highest stage score. The analysis provided each participant's highest stage score, as well as a cumulative group profile showing the frequencies of individuals with high scores in each stage. The group peak stage was determined by calculating the mean scores on each stage for the group and identifying the highest mean. Group average data provided a big-picture view of the data, complementary to examining frequencies.

The frequencies and group averages were compared across administrations of the SoCQ to develop a sense of how the primary concerns of the group changed over the course of the FDI fellowship.

SoCQ First and Second High Stage Score Interpretation

The second way to represent SoCQ data is the *first and second high stage score interpretation*. Looking at both the first and second high stage scores helps “develop additional insight into the dynamics of concerns” (Hall et al., 1978, p. 32). Hall et. al suggest presenting the data in a matrix format (p. 34, reprised in Table 11) to clearly depict the distribution of individual highest stage of concern in relation to second highest stage of concern.

This format conveys a great deal of information. For example, one learns that Stage 0 was the peak stage for 19.8% of the participants, with Stage 3 the second highest stage for 28.1% of them. For this study, due to the small number of participants, the researcher felt the data presentation improved by presenting frequencies rather than percentages. The researcher also found it useful to add a row for total occurrences of the second-high stages. Finally, the researcher also found it clearer to leave blank the cells where the first and second high stages would be identical, rather than filling those cells with a 0 value (see Tables 15-17). The researcher compared matrices generated for each administration of the SoCQ to give a deeper indication of the changes in participants' top concerns than would be obtained from just looking at the peak stage scores.

Table 11. Sample Percent Distribution of Second Highest Stage of Concern in Relation to First Highest Stage of Concern

Highest Stage of Concern	0	1	2	3	4	5	6	Row Total Percent	Row Total N
0 Awareness	0.0	9.4	21.9	28.1	15.6	3.1	21.9	19.8	32
1 Informational	0.0	0.0	50.0	0.0	0.0	0.0	50.0	1.2	2
2 Personal	27.8	27.8	0.0	5.6	11.1	0.0	27.8	11.1	18
3 Management	6.7	3.3	20.0	0.0	10.0	0.0	56.7	18.5	30
4 Consequence	10.0	5.0	35.0	10.0	0.0	30.0	10.0	12.3	20
5 Collaboration	9.1	0.0	36.4	0.0	36.4	0.0	18.2	6.8	11
6 Refocusing	6.1	6.1	24.5	20.4	40.8	2.0	0.0	30.2	49
Total									162

Note. From *Measuring stages of concern about the innovation: A manual for use of the SoC questionnaire* (p. 34), by G.E. Hall, A. A. George, and W. L. Rutherford, 1979, Austin, TX: Research and Development Center for Teacher Education, University of Texas. Copyright 1979 by University of Texas.

SoCQ Profile Interpretation

The third way to represent SoCQ results is the *profile interpretation*. The researcher plotted individual and group average SoC data on graphs to provide visual profiles of the relative intensity of the SoC. Conceptually, desirable change over time is represented by the shape of the profile changing from a wave peaking in the early self-focused stages, to a wave peaking in the middle (task-focused concerns are most intense), to a wave peaking at the end (impact-focused concerns). In practice, CBAM developers have identified a variety of profile patterns for which they provide interpretive guidance (George et al., 2006; Hall et al., 1978). For example, Hall and Hord (2006, p. 151) cited a 2000 study of over 700 teachers in which the SoC profiles developed for each teacher were, with but few exceptions, categorized into one of six subgroups.

For this study, the researcher wished to detail the change process in each participant. Therefore, the researcher examined each participant's three SoC profiles and characterized the participants according to the CBAM guidelines for SoC score and profile interpretation.

Furthermore, the researcher examined how each participant's profile changed over the course of the FDI fellowship. The researcher grouped participants into profile change subgroups based on patterns in change over time in the SoC profiles. Examining the frequencies of faculty profile patterns across administrations of the SoCQ, as well as the overall group profile graph generated for each administration of the SoCQ, provided the most comprehensive view into how faculty concerns changed over the course of the FDI fellowship.

INFERENTIAL ANALYSIS

The researcher used the Kruskal-Wallis (nonparametric) One-way Analysis of Variance by Ranks to test whether changes in the SoC were significant at the three different administrations of the SoCQ. This test was performed once for each of the seven Stages of Concern. To prepare the data for analysis, participants' raw scores from the SoCQ results (for each stage from all three administrations of the SoCQ) were ranked and mean ranks determined; it was on that transformed data that the Kruskal-Wallis analysis was based.

The following example—testing for significant differences on Stage 1 concerns among the pre-, mid-, and post- administrations of the SoCQ—illustrates the process. First, all participant scores (for Stage 1 across the three administrations) would be ranked. The mean ranks for the pre-, mid-, and post- administrations would be calculated, and then the Kruskal-Wallis test performed. The process would then be repeated for each of the remaining Stages of Concern.

The researcher utilized the post-hoc analytic procedures described in Siegel and Castellan (1988, pp. 213-214) when the Kruskal-Wallis test revealed a significant difference across a stage's measurements, to identify significant differences specifically between the pre- and mid-, mid- and post-, and/or pre- and post-administrations. This revealed, for that Stage of Concern, which particular differences between administrations of the SoCQ were significant.

Research Question 2: Change in Participants' Uses of the Innovation

How do participants' uses of the innovation change over the course of their participation in the FDI fellowship?

The Levels of Use CBAM assessment focuses on the extent to which a participant is using the innovation. Descriptive and inferential analysis of the Levels of Use data acquired in May and December helped address the question of change over time in participants' LoU.

DESCRIPTIVE ANALYSIS

The Colorado State team of certified interviewers analyzed the LoU interviews according to CBAM-specified procedures. For each interview, the analysts used the LoU rating sheet (Loucks et al., 1976, p. 42) to tally statements that fell at particular Levels of Use across several categories of information. The Level of Use assigned for a particular interviewee represented the category of statement most frequently mentioned in the interview. Loucks et al. provided guidelines for the rating process, including training exercises for raters and strategies for ensuring interrater reliability. The Colorado State team followed this rating process for both rounds of LoU interviews, resulting in descriptive numeric data (frequencies) regarding the LoU for all participants, as well as a group mean LoU.

The researcher compared the number of participants in each Level of Use from the pre- and post-assessments, as well as the group average data, to obtain information about change over time in the Level of Use of the innovation. As with the SoC data for Research Question 1, the researcher examined how each participant's LoU changed over the course of the FDI fellowship. The researcher grouped participants into LoU change subgroups based on emergent patterns of change.

INFERENTIAL ANALYSIS

The researcher used the Wilcoxon Signed Ranks test, the non-parametric equivalent of the paired samples t-test, as the most appropriate means of assessing whether changes in the LoU were significant between the pre- and post-LoU interviews.

Research Question 3: Differences in Concerns by Participant Group

To what extent, and in what ways, do concerns about the innovation differ by participant group?

The researcher determined several different ways to classify the participants based on emergent demographic and contextual information about the FDI fellows. Because of the small size of these groupings, the SoC data was examined descriptively for potential areas of difference in participant demographic groups across the three administrations of the SoC.

Research Question 4: Differences in Uses by Participant Group

To what extent, and in what ways, does use of the innovation differ by participant group?

As with Research Question 3, the LoU data was examined descriptively for potential areas of difference according to various participant demographics across the pre- and post-LoU interviews.

Research Question 5: Relationships Among Data from CBAM Assessments and Retrospective Interviews

What are the relationships among participants' CBAM change profiles (based on SoC and LoU data), participants' perceptions of the impact of the faculty development program (as revealed in retrospective interviews), and evidence of the impact of the FDI program (as given by the IC assessment)?

CBAM CHANGE PROFILES

The initial step in addressing this question was to examine the data and change patterns in the Stages of Concern and Level of Use for each individual faculty participant. The researcher determined overarching change categories based on a side-by-side examination of the SoC and LoU change patterns identified for each participant. The researcher selected one member of each overarching change category for additional participation in the form of the IC Map assessment and the retrospective interview.

INNOVATION CONFIGURATIONS ASSESSMENT

The CBAM Innovation Configurations assessment uses an IC Map to reveal the extent to which participants' implementation of the innovation matched the intent of the change leaders. For this study, the researcher evaluated the innovation implementations by gathering information at the final FDI poster session which was open to the campus

community. At this session, the researcher informally interviewed participants and examined participants' final poster presentations and reports, which FDI fellows created according to specific guidelines that the FDI staff provided (see Appendix G). The researcher used the IC Map developed for this study (see Appendix D) to rate the work of each faculty participant on several criteria for several possible levels of achievement.

Because it did not have a corresponding pre-assessment, the Innovation Configuration information was not intended to demonstrate change over time in the quality of participants' implementation of the innovation. Rather, the SoC and LoU data suggested varying types of participant change, and the IC assessment illuminated how (and in what ways) participation in the FDI fellowship enabled FDI fellows to implement an innovation as intended by change leaders. Further, the IC assessment provided information which allowed the researcher to further explore the interpretation of the SoC and LoU data and the overarching change categories.

QUALITATIVE INTERVIEW ANALYSIS

As described earlier, a trained specialist not involved in the faculty development process conducted interviews with a purposefully selected subset of the participants. The interviews followed a semi-structured framework (see Appendix E) based on the Critical Incident Technique (CIT) (Flanagan, 1954; Lambrecht, 1999). The goal was to probe faculty perceptions of key moments in the change process, both as learners involved in the summer workshop and consultations, and as instructors implementing the innovation in the fall. These interviews revealed both benefits of and barriers to the faculty development process, as well as its perceived impact on (and perhaps, value to) both faculty and students.

The interviews were recorded digitally and transcribed. CIT data analysis involves identifying themes emerging from data, sorting interviews according to their themes, and comparing results across interviews. The researcher and his dissertation supervisor employed the constant comparative technique to develop codes that related both tangentially and directly to behaviors and attitudes associated with the SoC and LoU. The researcher applied these codes to passages from the transcribed interviews using the HyperRESEARCH™ software for qualitative analysis. The researcher then grouped the codes into themes to better characterize the overarching ideas within each interview and across the four interviews.

The trustworthiness of this process can be addressed through the notions of perspective, peer debriefing, and triangulation. Regarding perspective:

The researcher should always be open to different possibilities by continually seeking alternative explanations of his/her interpretations. Each emerging theme should be examined from different angles, different perspectives and different points of view for the purpose of developing a richer understanding of it. In this way, the findings of the inquiry are most likely to be determined by the respondents and conditions of the inquiry and not by the values of the researcher. (Angelides, 2001, p. 439)

Peer debriefing involved “probing questions by somebody [in this case, the faculty advisor for the dissertation] who is asked to play the role of devil’s advocate after the collection and analysis of a critical incident ... [to] give the opportunity to the researcher to turn back to his/her own thinking and find possible biases and mistakes” (Angelides, 2001, p. 439). The researcher achieved triangulation of methods as described by Miles and Huberman (1994) by comparing results from the CIT analysis with results from the CBAM analysis.

EXAMINING RELATIONSHIPS AMONG CBAM PROFILES, IC RESULTS, AND INTERVIEW ANALYSES

For each of the participants selected for the final stage of participation, the researcher compared key themes emerging from his or her interview with the participant’s CBAM change profile information and the Innovation Configurations assessment data. This analysis was intended to determine to what extent the data provided by the CBAM assessments “fits” with the contextual information provided in the retrospective interviews. More specifically, it depicted how well the IC assessment actually captured what the FDI fellows accomplished, as revealed in the interviews, and how well the interviews reflected the CBAM change profiles formed from SoCQ and LoU data. In addition, it depicted the relationship between the CBAM change profiles and the Innovation Configuration assessment data.

Limitations/Delimitations

This study is clearly bound by limitations that the researcher cannot fully control and is ethically bound to identify.

NOT EVALUATIVE OF THE FDI

The study was not an evaluation of the faculty development program. The researcher did not focus on student learning nor characterize the effectiveness of faculty development in such terms. Rather, he sought to examine how change unfolds when university instructors are engaged in faculty development for enhancing teaching with technology. With this in mind, he examined the change process for faculty over a period of slightly over seven months, comparable to (or better than) many other CBAM-based studies of instructor change regarding teaching with technology. Change is a process, and ideally this process would be examined over as long a period as possible.

NOT EVALUATIVE OF FACULTY

It is important to note that the December measurements of the SoC and LoU were not to be considered some sort of final assessment of faculty. They simply were the ultimate assessments in the context of this study. The change process will, in fact, continue, and it would be desirable to continue periodic assessments in order to have ongoing data about change. In no sense should FDI fellows have the impression that the final round of data collection represented some sort of “final examination.” Such an impression could have resulted in biased responses resulting from participants’ desire to give “right” answers.

RESEARCHER INVOLVEMENT IN FDI

The researcher was involved in the design and delivery of the faculty development program; however, he limited his involvement to group activities and presentations. He refrained from individual consultations with study participants throughout the process, though he did work closely with FDI fellows who had declined to participate in the study. With the exception of the IC Map assessment, third parties who were not affiliated with the university conducted the interviews with participants in order to minimize bias and increase the reliability of the findings. The researcher chose to conduct the IC assessment, because it requires both a deep understanding of the IC Map as representative of the ideals of the change leaders, and the ability to appraise the implementation of an innovation based on all available information, including documentation and informal discussion.

EXPLORATORY NATURE OF THE STUDY

Finally, this study was meant to be exploratory in nature, revealing insights which can inform future faculty development efforts. With regard to its small number of participants and unique contextual factors, this study is similar to other in-depth CBAM studies. Though change should always be thought of as a process unique to each individual, this should not denigrate the potential contribution of this study within the literature on faculty development for improved teaching with technology, as well as within the larger body of CBAM literature. Findings from this study related to faculty change and innovation should provide both practical insights and opportunities for continued research.

CHAPTER 4

FINDINGS

This chapter presents the study's findings. After an initial discussion of the participant demographics, results pertaining to each research question are given.

PARTICIPANT DEMOGRAPHICS

As earlier noted, of the 23 FDI fellows, 17 agreed to participate in the study. As the summer progressed, two of the 17 decided not to continue as FDI fellows; thus, the SoCQ and LoU data collected in May that related to them was not considered for analysis. The remaining 15 participants, completed all three administrations of the SoCQ and the May LoU interview, and all but one completed the December LoU interview.

Based on the FDI application and publicly available data, the researcher gleaned critical information about each participant—including his/her gender, discipline, rank, and typical enrollment for course considered for technological enhancement. Additional information was obtained through questions appended to the first SoCQ (see Appendix F), specifically: age range, higher education teaching experience (in years), self-rated technology competence, self-rated importance placed on various uses of technology for teaching and research, and self-rated teaching style.

The demographic information shows that the participants represented a broad cross-section of university instructors. The fifteen participants included nine men and six women. Six participants were from fields in the humanities, four from sciences or engineering, three from professional studies and fine arts, and two from social sciences. Five participants were lecturers; of the others, two were full professors; five, associate; and three, assistant. Participant age ranges were fairly predictable, given the faculty rank distribution. Six participants were in the 51-60 age range, four between 41 and 50, and five between 31 and 40. Four participants had twenty or more years of teaching experience; the remaining eleven had between six and fourteen years of teaching experience.

The study participants were dealing with classes having various enrollment levels, though most were below 75 students. On their application to become FDI fellows, participants were asked to indicate on which course section they planned to focus during the fellowship. A review of these course sections in the university class schedule for fall 2006 revealed the following: three with fewer than 30 students, six with 31-50 students, two with 51-75 students, none with 76-100 students, two with 101-150 students, and two with 151-500 students.

The demographic questions included with the first SoCQ asked participants to indicate the degree to which they agreed or disagreed with a statement. Two of the three types of these questions were not useful for identifying different demographic groups among participants. First, participants were asked to consider the importance of various technologies and their uses in four statements such as "It's important for me to use technologies to communicate with and provide information to students outside of class (e.g., email, Blackboard, web conferencing tools)." Of the 60 responses to statements of technology importance, only one indicated any disagreement, and fewer than ten were uncertain, indicating that the participants placed a general feeling of importance on a variety of uses of technology.

Second, participants were asked the importance of different teaching styles in four statements such as, "I spend a portion of class time using such instructional approaches as whole- or small-group discussions, projects, and presentations." Of the 60 responses to the statements of teaching style, only three indicated disagreement and seven uncertainty, indicating that the participants had a general sense of the importance of various teaching styles.

Finally, the demographic items which did reveal distinctions among participants pertained to technology proficiency. For example, participants indicated their agreement with the statement, "I am proficient with the use of technologies for presenting information and modeling or demonstrating in the classroom (e.g., PowerPoint, web browsers, and discipline-specific software)." Five of the participants indicated strong agreement with at least three of the four statements of this type and were considered *high* self-rated technology proficiency. At the other end of the spectrum, four participants were designated *low* self-rated technology proficiency, indicating uncertainty or disagreement with at least two of these statements. The

other six participants fell somewhere in between and were considered *medium* self-rated technology proficiency.

RESEARCH QUESTION 1: CHANGE IN PARTICIPANTS' CONCERNS

How do participants' concerns about the innovation change over the course of their participation in the FDI fellowship?

The researcher administered the SoCQ three times, in May, August, and December 2006. Each administration was web-based (see Appendix A), delivered via Survey Monkey—a web-based subscription service (see: <http://surveymonkey.com>). The electronic format was convenient; as important, it did not allow participants to submit invalid or incomplete responses. To ensure longitudinal tracking, participants were asked to provide a unique identifier (the last five digits of their campus identification number). Survey Monkey enables response data to be downloaded in spreadsheet form to any computer for further analysis in Microsoft® Excel or SPSS®.

As detailed in Chapter 3, SoC data can be presented through several descriptive analytic procedures, as well as through inferential analysis of the differences between stages across the administrations of the SoCQ. Preceding that discussion, however, is a brief explanation of the reliability and validity of the uses of the SoCQ in this study.

SoCQ Validity and Reliability

Because of the small number of participants in this study, it was not possible to perform construct validity calculations such as factor analysis using the SoCQ data collected. Given Chapter 2's review of prior SoCQ validation activities which included instructors in higher education, and the previous uses of the SoCQ for similar purposes with a similar population, the validity of the use of the SoCQ in the context of this study is quite defensible.

To assess the reliability of the data collected in this study, the researcher analyzed raw data from the three administrations of the SoCQ in SPSS, using procedures to determine Cronbach's alpha. As described in more detail in Chapter 2, Cronbach's alpha is a measure of the internal consistency of responses to items intended to measure the same scale. Thus, Cronbach's alpha coefficients were calculated for each set of five questions intended to

measure a particular SoC (see Appendix B), for each administration of the SoCQ. The results are presented in Table 12.

Table 12. Reliability Coefficients for the Stages of Concern Questionnaire

Month	Stage of Concern						
	0	1	2	3	4	5	6
May	.59	.44	.72	.71	.70	.76	.53
August	.79	.58	.80	.50	.72	.83	.63
December	.27	.79	.66	.68	.71	.78	.75

As elsewhere noted, statistical experts have described .70 as an acceptable threshold for the reliability coefficient (Gable, 1986; Hillway, 1969; Jordan & Hoefer, 2001), though Smith and Glass (1987) argue that for "research purposes, moderate reliability [$r > .50$] is often sufficient" (p. 106). For this study, Cronbach's alpha was greater than .70 in 12 out of the 21 calculations, and greater than or equal to .50 in all but two of the calculations. Stages 4 and 5 reliability coefficients were consistently at or above .70, and Stage 2 alpha was at least .66. Stages 3 and 6 alphas were at or above .50, and Stages 0 and 1 each had one alpha coefficient each below .50, though not in the same administration of the SoCQ.

The analysis of Cronbach's alpha in SPSS details how the coefficient changes with the removal of particular questions from the calculation. Table 13 summarizes the results where question removal would result in notable improvement of Cronbach's alpha.

For this study's purposes, the researcher felt comfortable using all data gathered via the SoCQ for the descriptive and inferential analyses, with the caveat that low reliability scores on some stages at some administrations of the SoCQ would have to be kept in mind when interpreting analytical results. Considerations of Table 13 for this study are revisited in Chapter 5, as well as implications with regard to the SoCQ.

Descriptive Analysis

The 2006 SoCQ manual includes a pre-formatted Excel spreadsheet to assist researchers scoring SoCQ responses according to the CBAM-specified procedures. The

Table 13. Improvement in Cronbach's Alpha upon Removal of Questions

Month of Administration	Stage of Concern	α Before Question Removal	Question to Remove	α After Question Removal
May	0	.59	12	.82
May	6	.53	9	.73
August	0	.79	12	.92
August	1	.58	6	.68
August	3	.50	8	.63
December	0	.27	3	.60

researcher transferred the raw data from Survey Monkey into this spreadsheet, adjusting the parameters to fit the details of this study. With the data entered and the appropriate adjustments made, several calculations were automatically performed. For example, for each participant, the spreadsheet summed the raw responses for the five items in each scale and then converted each total via table lookup to a percentile.

These percentiles are presented for all three SoCQ administrations in several different ways within this chapter, as specified by CBAM procedures (George et al., 2006; Hall et al., 1978). Several aggregate views of the data are reviewed, including the peak stage, first and second high stage, and overall group SoC profiles. At the heart of this section is a detailed look at each participant's SoC profiles to develop an understanding of the varied individual change processes with regard to concerns. Further, these SoC profiles are grouped into change patterns, which the researcher developed from the data.

SoCQ PEAK STAGE SCORE INTERPRETATION

The first method for representing SoCQ data is termed *peak stage score interpretation*, which identifies the highest stage score. Table 14 shows the frequency of individuals with peak scores at each stage across the three administrations of the SoCQ.

Based on this data, the group peak stage for the May administration was Stage 1; for the August administration, Stage 0, and for the December administration, Stage 0. The total

Table 15. Frequency Distribution of Second Highest Stage of Concern in Relation to Highest Stage of Concern, May

Highest Stage of Concern	Second Highest Stage of Concern							Row Total
	0	1	2	3	4	5	6	
0 Awareness		3.5	0	0	0	0	0	3.5
1 Informational	0		2.5	2	2	2	0	8.5
2 Personal	0	0		0	0	0	0	0
3 Management	0	0.5	1.5		0	0	0	2
4 Consequence	0	0	0	0		0	0	0
5 Collaboration	0	1	0	0	0		0	1
6 Refocusing	0	0	0	0	0	0		0
Column Total	0	5	4	2	2	2	0	

Note: May SoC data includes two participants with tied peak stage scores; each tied peak stage is represented by a half-count (.5) in the frequency table at its intersection with the second-high stage.

Table 16. Frequency Distribution of Second Highest Stage of Concern in Relation to Highest Stage of Concern, August

Highest Stage of Concern	Second Highest Stage of Concern							Row Total
	0	1	2	3	4	5	6	
0 Awareness		0	0.5	2	0	1	1.5	5
1 Informational	0		0	0	0	0	0	0
2 Personal	0	0		0	0	0	0	0
3 Management	1	1	0		0	0	0	2
4 Consequence	0	0	1	1		1	1	4
5 Collaboration	0	0	1	1	0		1	3
6 Refocusing	0	1	0	0	0	0		1
Column Total	1	2	2.5	4	0	2	3.5	

Note: August SoC data includes one participant with tied second highest stage scores; each tied second-high stage receives a half-count (.5) in the frequency table at its intersection with the peak stage.

Table 14. Frequency of Highest Concerns Stage for All Participants, for Each Administration of the Stages of Concern Questionnaire

	Highest Stage of Concern							Total
	0	1	2	3	4	5	6	
Number of Participants, May	3.5	8.5	0	2	0	1	0	15 ^a
Number of Participants, Aug	5	0	0	2	4	3	1	15
Number of Participants, Dec	5	2	0	2.5	1.5	0	4	15 ^a

^aThe May and December SoC data each included two participants with tied peak stage scores; each tied peak stage is represented by a half-count (.5) in the frequency table.

number of participants with peak stage in the awareness and self stages (Stages 0-2) decreased from 12 in May to five in August, with a slight increase to seven in December.

While these first-blush analyses clearly suggest that the group's primary concerns moved from being concentrated in the lowest stages of concern in May to higher stages in August and December, closer examination reveals that this change occurred primarily between May and August.

SoCQ FIRST AND SECOND HIGH STAGE SCORE INTERPRETATION

The second way to represent SoCQ data is termed *first and second high stage score interpretation*. Tables 15, 16, and 17 represent the distribution of second high stages of concern in relation to the peak stage of concern for each administration of the SoCQ.

Table 15 reveals that Stage 1 concerns were extremely important in May; only one participant did not have Stage 1 as either the first or second highest stage of concern.

Table 16 indicates that by August, Stage 1 concerns diminished considerably—not just as primary concerns (from nine participants in May to none in August), but to the extent that in August only two participants indicated Stage 1 concerns as their second highest concern. Thus, whereas only one participant in May did *not* indicate Stage 1 concerns as the peak or second highest stage of concern, by August, only two participants *did* indicate Stage 1 concerns as peak or second highest. Impact concerns (Stages 4, 5, and 6) had become much more prominent by August.

Table 17 shows that a more complicated pattern emerged by December. The peak stage scores have reverted somewhat to lower stages compared to August, but the second-high stages continue the trend of increased concentration in the impact stages (4-6). Stage 6 in particular was much more prominent in December, with a highest or second-highest frequency of 8.5 compared to 4.5 in August and 0 in May.

Table 17. Frequency Distribution of Second Highest Stage of Concern in Relation to Highest Stage of Concern, December

Highest Stage of Concern	Second Highest Stage of Concern							Row Total
	0	1	2	3	4	5	6	
0 Awareness		0	1	1	0	0	3	5
1 Informational	0		0	0.5	0.5	0.5	0.5	2
2 Personal	0	0		0	0	0	0	0
3 Management	0	1	0		0	0.5	1	2.5
4 Consequence	0	1	0	0.5		0	0	1.5
5 Collaboration	0	0	0	0	0		0	0
6 Refocusing	1	0.5	0	1	1	0.5		4
Column Total	1	2.5	1	3	1.5	1.5	4.5	

Note: December SoC data includes two participants with tied peak stage scores and two other participants with tied second highest stage scores; each tied stage receives a half-count (.5) in the frequency table similarly to the previous two tables.

While the participant frequencies for peak and second-high stage scores provide an initial high-level indication of changes in the group over time from lower-level to higher-level concerns, a more complete picture of these changing concerns for the group is evident through the examination of the group profiles below (see Figure 1).

SoCQ PROFILE INTERPRETATION

The third way to represent SoCQ results is the *profile interpretation*. The overall group SoC profile for each administration of the SoCQ is reported first; then the SoC profiles of each participant are presented categorically (four in all), representing different patterns of change. In addition to representing results for all seven stages of concern, the graphical

profiles also allow a quick assessment of the *relative intensities* of the concerns between and among the different stages. This representation is thus far more informative than the peak and peak/second-high stage frequencies.

Group SoC Profiles

Figure 1 presents the group SoC profiles, determined for each administration of the SoCQ by averaging the raw scores for each participant at each page and then converting the resulting means to percentiles.

Figure 1. Overall group SoC profile for each administration of the SoCQ.

The overall profile indicates that, as a group, awareness (Stage 0) concerns remained consistent throughout the study, self- and task- concerns diminished over time, and impact concerns had little change across administrations except in Stage 6, where the December data indicates a “tailing up at Stage 6” (George et al., 2006, p. 40). The December combination of a high Stage 0 and tailing up of Stage 6 leads to an interpretation of the group lacking focus on this innovation due to the presence of competing innovations by the end of the study.

Individual SoC Profiles

Figures 2-16 represent the SoC profiles for each individual study participant—but grouped together by common characteristics of the changes over time in participant concerns. Analysis of the change patterns suggest that four fairly distinct groups emerged, characterized here as *positive change*, *idiosyncratic change*, *little change*, and *negative*

change. The labels “positive” and “negative” should not, however, be construed as placing a value judgment on the change; rather, they are interpreted within the CBAM framework, where the ideal developmental sequence is represented generally by the diminishment of concerns in Stages 0-3 and the elevation of concerns in Stages 4-6 (George et al., 2006, pp. 36-37).

Positive Change Pattern. Several participants in the study exhibited a change pattern similar to the CBAM ideal. Awareness, self, and task concerns (Stages 0-3) diminished, while impact concerns (Stages 4-6), if not elevated, at least became primary. The profiles for the three participants with this change pattern, characterized as positive change, are highlighted in this section.

Figure 2 describes a participant who was actively involved with the innovation throughout the study, as indicated by the low Stage 0 scores. Initially, the user indicated concerns related to information about the innovation; over time the self- and task- oriented concerns decreased while the impact concerns increased. By December, the participant fit the profile of “high refocusing concerns,” suggesting “that the respondent not only is concerned about obtaining other ideas about an innovation, but also already has other ideas ... that would either drastically alter or completely replace the innovation” (George et al., 2006, p. 43).

Figure 2. SoC profile for participant 7 for each administration of the SoCQ.

Figure 3 describes a participant for whom all concerns generally decreased over the course of the fellowship. Stages 2 (Personal) and 3 (Management) were primary in May, but by December had become much lower compared to other stages. Stage 4 (Consequence) became the high stage in both August and December, indicating a focus on the innovation's impact on students (George et al., 2006, p. 43).

Figure 3. SoC profile for participant 9 for each administration of the SoCQ.

Figure 4 describes a participant whose higher levels of concern moved from earlier to later stages over the course of the fellowship. Stage 0 concerns dropped from high to low, indicating a much-increased focus on the innovation. Stage 1-3 concerns also diminished, indicating less focus on personal and task concerns. Stages 4-6 became relatively more important as the other stages' relative intensities diminished; in August, Stage 5 (Collaboration) was the peak while in December, Stage 6 (Refocusing) was the peak. In combination with a relatively high Stage 1 and 5 in December, the final profile of this participant indicates a user interested in continuing to acquire more information and work with others in order to further improve upon the innovation.

Idiosyncratic Change Pattern. Four participants exhibited a “mixed” pattern whereby some change can be characterized as positive: the self-focused stages (1-2) diminished, while the refocusing concerns of Stage 6 emerged as primary. However, these participants also all exhibited high Stage 0 concerns in December. Additionally, three of the four exhibited high management (Stage 3) concerns, resulting in a W-shaped December SoC

Figure 4. SoC profile for participant 15 for each administration of the SoCQ.

profile. For all four of these participants, then, the *idiosyncratic change* profile suggests—with regard to *this* innovation—reduced self-focused concerns but potential frustration with its management and a lack of focus on it.

Figure 5 describes a participant whose concerns changed dramatically over the course of his/her participation in the faculty development program. The May SoC profile indicates an initial interest in more information and in collaboration (Stages 1 and 5). The August profile shows a substantive decrease in the intensity of Stage 1 and 5 concerns and the prominence of Stage 0, indicating that at the end of the summer, the participant was not focused on this innovation. The December profile shows that self-focused concerns (Stages 1 and 2) have considerably diminished from the beginning of the study, while Stages 3 and 6 have become prominent. Stage 0, while decreasing considerably from its August peak, remains one of the higher intensity stages. The combination of a high Stage 3 (Management) and Stage 6 (Refocusing) scores along with lower Stage 0-2 scores “indicates a person who has become frustrated with not having Management concerns resolved and has developed strongly held ideas about how the situation should be changed” (George et al., 2006, p. 54).

Figure 6 describes a participant whose self-focused concerns (Stages 1 and 2) diminished, while impact-focused concerns (Stages 4-6) increased. However, Stage 0 and 3 concerns remained very high throughout. The December combination of high Stage 3 (Management) and Stage 6 (Refocusing) scores suggests not only strong management

Figure 5. SoC profile for participant 3 for each administration of the SoCQ.

concerns, but also “strong ideas about how the change process should be different” (George et al., 2006, p. 44).

Figure 6. SoC profile for participant 11 for each administration of the SoCQ.

Figure 7 describes a participant whose concerns initially moved from an informational focus in May (high Stage 1) to a student impact focus (high Stage 4) in August. In December, the participant’s Stage 0, Stage 3, and Stage 6 concerns were the high concerns, which again (as with the previous participants) portends issues related to management of the innovation and ideas about adjustments to the change process.

Figure 7. SoC profile for participant 12 for each administration of the SoCQ.

Figure 8 describes a participant whose concerns have generally decreased overall. The May SoC profile primarily indicates an interest in more information, with the August profile showing a decrease in the intensity of all concerns, except for Stages 5 and 6. Interpretively, it seems that the participant became very interested in working with others on the innovation. The December profile shows a small rise in Stage 0, a continued lack of task-related concerns, and the continued importance of Stage 6. The combination of factors taken together leads the researcher to believe that the participant may be involved with competing innovations.

Figure 8. SoC profile for participant 13 for each administration of the SoCQ.

Little Change Pattern. Several participants in this study exhibited little change in the intensity of the stages relative to one another. In this group, Stages 1-3 generally remained high throughout the study--meaning that the participants' concerns remained focused on themselves and the management of the innovation throughout the FDI.

Figure 9 describes a participant whose primary concerns were associated from beginning to end with Stages 1 (Informational) and 3 (Management), revealing a desire for more information about the innovation and concerns about the logistics of its implementation. Across each administration of the SoCQ, the relative intensities of Stages 1-4 decreased slightly, while Stages 0, 5 and 6 increased. The relative position of the percentiles on each stage to one another changed little over the course of the study with the exception of Stage 5 (Collaboration), which moved from a position as the second lowest stage of concern to where it exceeded Stages 0, 2, 4, and 6 in intensity.

Figure 9. SoC profile for participant 1 for each administration of the SoCQ.

Figure 10 describes a participant whose concerns rose in intensity but whose profile of concerns relative to one another remained quite consistent. Stage 3 (Management) is one of the high stages throughout; Stage 1 (Informational) is a high stage in May and December; and Stage 5 (Collaboration) is also high throughout. The low position of Stage 4 throughout relative to the other stages suggests “minimal concerns about the effects of the innovation on students” (George et al., 2006, p. 53).

Figure 11 describes another participant whose profile of concerns relative to one another generally remained quite consistent throughout the study. Stage 5 (Collaboration) is

Figure 10. SoC profile for participant 4 for each administration of the SoCQ.

low throughout; Stages 1 and 4 are slightly higher than 2 and 3 in May and December. The August data were very similar to May and December for Stages 1-5, but Stages 0 and 6 were both very high in August (albeit with a slight “negative 1-2 split”) indicating a lack of focus on the innovation and perhaps a negative orientation to the innovation at that time. However, this negativity disappeared in the final SoCQ administration and the participant returned to a profile very similar to that of May.

Figure 11. SoC profile for participant 6 for each administration of the SoCQ.

Figure 12 presents a set of profiles somewhat different from any of the other participants. The concerns registered here were, with the exception of December's Stage 4,

uniformly high. It may be that the participant had unfocused concerns unrelated to the innovation; alternatively, he/she may simply have not attuned well to the SoCQ. According to the scores, though, Stage 0 concerns did diminish slightly after May, and were no longer the highest concerns—indicating a slight change over time. Also important to note is that this participant was the only one who did not actually implement an innovation in the fall; his/her rollout was scheduled for spring. Thus, it might be reasonable to expect less change over time with this participant than with the other participants, as the innovation would have seemed more distant to this participant—not only in December, but throughout the study.

Figure 12. SoC profile for participant 14 for each administration of the SoCQ.

Negative Change Pattern. Finally, the researcher found that some participants' concerns changed over the course of the study to an emphasis on Stage 0, with most or all other concerns decreasing in intensity over the course of the fellowship. This results in a December SoC profile most closely related to the "typical nonuser SoCQ profile" (George et al., 2006, p. 38). Further, two of these participant profiles have a *tailing up* of Stage 6, while the other two have a *negative 1-2 split*—both patterns indicative of doubt about or resistance to the innovation, especially in combination with the high Stage 0 scores.

Figure 13 describes a participant whose concerns changed quite a bit during the study. The May SoC profile indicates an interest in more information and in collaboration (Stages 1 and 5), while the August profile shows a dramatic decrease in the intensity of all concerns and the prominence of Stage 6. It appears, then, that this participant held ideas about doing

things differently at that point. The December profile shows a substantive rise in Stage 0 and the continued importance of Stage 6—leading the researcher to conclude that the participant had lost enthusiasm for and focus on this innovation.

However, the researcher also noted that if the December Stage 0 score had continued to drop from the August level, rather than dramatically rising, this participant's change pattern would have fit best in the *Positive Change* group, and if the Stage 0 score had risen but modestly, this change pattern would have best matched the *Idiosyncratic Change* group. While the researcher was readily able to determine the placement of most participants' change patterns into groups once the definitions of each group were decided, of all participants, this one was the most ambiguous. However, although this participant's December profile does not fit the non-user profile as well as the other participants in the *Negative Change* group, the high Stage 0 in December is the defining characteristic of this change pattern.

Figure 13. SoC profile for participant 2 for each administration of the SoCQ.

Figure 14 describes a participant whose concerns appear to have changed dramatically throughout the study. The initial high Stage 1 in May indicates a desire for more information about the innovation; by August, most concerns had diminished in intensity except for Stage 4, which was prominent at that time, suggesting a focus on student impacts of the innovation. However, the December results show that Stage 0 became by far the high stage which, along with the negative 1-2 split, indicates doubt about or resistance to the innovation (George et al., 2006, p. 40).

Figure 14. SoC profile for participant 5 for each administration of the SoCQ.

Figure 15 describes a participant who appeared to lose focus on the innovation as Stage 0 intensity became very high in August and December, while Stage 1 concerns (i.e. interest in more information about the innovation) dropped. The impact-related concerns remained very consistent throughout. The participant also exhibited a negative 1-2 split in December—suggesting someone no longer focused on the innovation and perhaps even resistant to it.

Figure 15. SoC profile for participant 8 for each administration of the SoCQ.

Figure 16 describes a participant who apparently remained unfocused on the innovation throughout the study. The profiles represent a non-user of the innovation; in fact,

the tailing up of Stage 6 suggests that the user “has ideas that he or she sees as having more merit than the proposed innovation ... any tailing-up of the Stage 6 concerns on a nonuser profile is a warning that the respondent might be resistant to the innovation” (George et al., 2006, p. 42). Even the one possible positive interpretation of these profiles—a Stage 1 score nearly as high as the Stage 0 score in May (indicative of an interest in acquiring more information about the innovation)—had disappeared in the August and December profiles. This change, along with the characteristics of the December profile in common with the other members of this group, is why this participant is classified as experiencing *negative* rather than *little* change.

Figure 16. SoC profile for participant 10 for each administration of the SoCQ.

Inferential Analysis

The Kruskal-Wallis (nonparametric) one-way analysis of variance was performed to test whether changes in the raw SoC scores were significant across the three different administrations of the SoCQ. For each SoC, the test ranks all scores across all administrations of the SoCQ in a single series; the ranks for each administration are averaged and the averages compared to determine whether the scores for the administrations are significantly different. Running this test in SPSS on the data for each SoC revealed significant differences only at Stage 1 among the three administrations of the SoCQ ($p < .05$; see Table 18). Post-hoc analysis in Excel following a procedure specified by Siegel and

Castellan (1988) identified significant differences in Stage 1 between the May and August and May and December administrations of the SoCQ ($p < .05$).

Table 18. Kruskal-Wallis Mean Ranks for Stage of Concern Scores by Administration of the SoCQ

Stage of Concern	Mean ranks for SoCQ administrations			<i>H</i>	Significance	Mean rank differences		
	May (M)	Aug (A)	Dec (D)			M vs. A	M vs. D	A vs. D
0 Awareness	23.33	21.97	23.70	.146	.930			
1 Informational	34.43	15.90	18.67	17.428	.000	18.53*	15.76*	2.77
2 Personal	29.53	19.73	19.73	5.590	.061			
3 Management	28.17	18.20	22.63	4.355	.113			
4 Consequences	22.30	24.50	22.20	.296	.862			
5 Collaboration	25.60	21.73	21.67	.885	.643			
6 Refocusing	18.60	21.70	28.70	4.675	.097			

Note. *H* = Kruskal-Wallis statistic. *df* = 2 for all Stages of Concern.

*Mean rank differences met .05 significance levels following procedures for Kruskal-Wallis multiple comparisons in Siegel and Castellan (1988, pp. 213-214).

Thus, only Stage 1 concerns exhibited significant differences among the administrations of the SoCQ. Specifically, the August and December Stage 1 scores were significantly lower than the Stage 1 scores obtained in May. Table 18 also depicts a drop in Stage 2 and Stage 3 scores from May to August and December, and an increase in Stage 6 scores from May and August to December—though both not at the .05 level of significance. All of these differences are evidenced on the group SoC profiles depicted in Figure 1.

RESEARCH QUESTION 2: CHANGE IN PARTICIPANTS' USES OF THE INNOVATION

How do participants' uses of the innovation change over the course of their participation in the FDI fellowship?

This research question is addressed through the presentation of descriptive and inferential analyses of the LoU data. Please see Table 4 (p. 38) for a full description of the Levels of Use.

Descriptive Analysis

As described in Chapter 3, each participant's Level of Use of the innovation was determined through the Levels of Use interview and rating process, both performed by a certified team from Colorado State University. Participants were interviewed twice, once in May prior to their attending the FDI workshop, and again in December after they had implemented their innovation. For each participant, the interviewer and a second member of the interview team independently rated the interviewee's Level of Use following CBAM-specified procedures (see Appendix C for the LoU rating sheet). The results, indicating that all participants were indeed users of the innovation throughout the course of the study, are displayed in Table 19.

Table 19. Levels of Use of the Innovation, May and December

Level of Use	Number of Participants	
	May	December ^a
0 Nonuse	0	0
I Orientation	0	0
II Preparation	0	0
III Mechanical Use	7	2
IVA Routine	2	4
IVB Refinement	5	7
V Integration	1	1
VI Renewal	0	0

^aOne participant did not complete the December LoU interview.

Further analysis of these results revealed three different categories of participant change based on LoU. Two participants remained at LoU III throughout the study. Four moved from LoU III to higher levels IVA and IVB over the course of the fellowship. The remaining eight participants who rated higher than LoU III in May (i.e. they were at LoU

IVA, IVB, or V) remained at the same LoU in December.¹⁰ In the CBAM LoU framework, users at or above Level IVA have at least established a routine use of the innovation; the fact that by the end of the study, only two participants did not fall into this category may be considered a positive outcome for the FDI.

On average, the group LoU for May was IVA (Routine), and for December, it was midway between IVA and IVB, suggesting group growth. Hall et al. (2006) note that innovation users often remain in LoU IVA for extended periods of time; the movement as a group beyond IVA may also be interpreted as a positive outcome for the FDI.

Inferential Analysis

The researcher performed the Wilcoxon Signed Ranks test, the non-parametric equivalent of the paired samples t-test, on the LoU data to assess whether changes in the LoU were significant between the pre- and post- administrations of the LoU interviews. In this test, which SPSS automates, the difference of each matched pair of LoUs is ranked; the sum of the positive ranks and the number of total differing matched pairs are used to determine significance. Table 20 displays the results, which reflect an overall increase in the LoU from May to December. This overall change consists of four increases (positive ranks) and no decreases in LoU. Though according to this test, the overall increase is not significant at the $p < .05$ level, the fact that no participants experienced a reduction in LoU is an important result for the FDI.

RESEARCH QUESTION 3: DIFFERENCES IN CONCERNS BY PARTICIPANT GROUP

To what extent, and in what ways, do concerns about the innovation differ by participant group?

Should researchers look for a relationships between demographic variables and SoC data? In this regard, CBAM researchers have said:

It is interesting that there have been no outstanding relationships between standard demographic variables and Stages of Concern data. Rather, as our

¹⁰ One participant who was rated at LoU III in May did not complete the LoU interview in December.

Table 20. Wilcoxon Signed Ranks Test (LoU Ratings Match Pairs)

		N	Mean Rank	Sum of Ranks
LoU(Dec) – LoU(May)	Negative Ranks	0 ^a	.00	.00
	Positive Ranks	4 ^b	2.50	10.00
	Ties	10 ^c		
	Total	14		

^aLoU(Dec) < LoU(May). ^bLoU(Dec) > LoU(May). ^cLoU(Dec) = LoU(May)

Note. Z=-1.857, p=.063

research unfolds, there is increasing support for the theory that interventions and conditions associated with the implementation effort are more critical variables than the user's age, sex, teaching experience, and so forth. As hypothesized in the Concerns-Based Adoption Model, the state of the user appears to be significantly more important than standard demographic variables in determining how the user will respond to an innovation. (George et al., 2006, p. 52)

However, as mentioned in Chapter 2, a surprising number of doctoral students have, in recent dissertation studies, examined data on SoC and demographics in order to recommend faculty development approaches for more effective teaching with technology. Given this researcher's interest in university-level faculty development, he opted to explore potential correlations between the Stages of Concern change patterns and the various demographic categories of the participants.

Tables 21 – 27 thus explore the potential relationship between demographic categories and the different SoC change patterns identified in this study. As the CBAM researchers suggested, the data from this study do not show evidence of a relationship between demographic factors and membership in one of the SoC change pattern groups.

To summarize the results regarding Research Question 3, concerns about the innovation do not appear to differ by participant group.

Table 21. Participant Gender by SoC Change Pattern

SoC Change Pattern	Participant Gender	
	Female	Male
Positive Change	2	1
Idiosyncratic Change	1	3
Little Change	2	2
Negative Change	1	3
Total	6	9

Table 22. Participant Discipline by SoC Change Pattern

SoC Change Pattern	Participant Discipline			
	Humanities	Professional Studies	Science/Engineering	Social Science
Positive Change	2	1	0	0
Idiosyncratic Change	1	1	2	0
Little Change	2	0	1	1
Negative Change	1	1	1	1
Total	6	3	4	2

Table 23. Participant Rank by SoC Change Pattern

SoC Change Pattern	Participant Rank			
	Professor	Associate Professor	Assistant Professor	Lecturer
Positive Change	0	0	1	2
Idiosyncratic Change	0	3	0	1
Little Change	1	2	0	1
Negative Change	1	0	2	1
Total	2	5	3	5

Table 24. Participant Course Enrollment by SoC Change Pattern

SoC Change Pattern	Participant Course Enrollment				
	< 30	31-50	51-75	101-150	151-500
Positive Change	1	1	1	0	0
Idiosyncratic Change	1	1	1	1	0
Little Change	1	2	0	0	1
Negative Change	0	2	0	1	1
Total	3	6	2	2	2

Table 25. Participant Age by SoC Change Pattern

SoC Change Pattern	Participant Age		
	31-40	41-50	51-60
Positive Change	2	1	0
Idiosyncratic Change	1	2	1
Little Change	0	1	3
Negative Change	2	0	2
Total	5	4	6

Table 26. Participant Teaching Experience by SoC Change Pattern

SoC Change Pattern	Participant Teaching Experience	
	6-14 yrs.	20+ yrs.
Positive Change	3	0
Idiosyncratic Change	3	1
Little Change	2	2
Negative Change	3	1
Total	11	4

Table 27. Participant Self-Rated Technology Proficiency by SoC Change Pattern

SoC Change Pattern	Participant Self-Rated Technology Proficiency		
	High	Middle	Low
Positive Change	1	1	1
Idiosyncratic Change	2	0	2
Little Change	1	2	1
Negative Change	1	3	0
Total	5	6	4

RESEARCH QUESTION 4: DIFFERENCES IN USES BY PARTICIPANT GROUP

To what extent, and in what ways, does use of the innovation differ by participant group?

As he did with the SoC in Research Question 3, the researcher examined the data for potential relationships between demographic categories and the different LoU change patterns identified in this study. Again, given the positioning of this study as an examination of the change process in higher education instructors engaged in faculty development, it was desirable to explore, at least descriptively, potential correlations between the Levels of Use change patterns and the various demographic categories of the participants. Tables 28 – 34 display the frequencies of various demographic categories by the different LoU change patterns identified in this study and previously described.

Examination of these tables, similarly to the tables relating demographic factors to the SoC, reveals on the whole, little connection between demographics and LoU. However, the data do suggest a connection between participant rank and LoU. Table 30 shows that while all participants who were lecturers started at LoU III in May, only one of the tenure-track participants was LoU III. The data also suggest a relationship between the self-rated technology proficiency and LoU. Table 34 reveals that all participants who rated themselves as highly proficient with technology were rated at LoU IVA or above in May, and all who rated themselves as low technology proficiency were rated at LoU III in May.

Table 28. Participant Gender by LoU Change Pattern

LoU Change Pattern	Participant Gender	
	Female	Male
Static LoU III	1	1
Growth from LoU III	3	1
Static LoU IVA+	2	6
Total	6	8

Table 29. Participant Discipline by LoU Change Pattern

LoU Change Pattern	Participant Discipline			
	Humanities	Professional Studies	Science/ Engineering	Social Science
Static LoU III	2	0	0	0
Growth from LoU III	2	1	1	0
Static LoU IVA+	2	2	3	1
Total	6	3	4	1

Table 30. Participant Rank by LoU Change Pattern

LoU Change Pattern	Participant Rank			
	Professor	Associate Professor	Assistant Professor	Lecturer
Static LoU III	0	0	0	2
Growth from LoU III	0	1	0	3
Static LoU IVA+	2	4	2	0
Total	2	5	2	5

With regard to Research Question 4, then, the data indicates that Levels of Use of the innovation do not appear to differ by participant group, with potential exceptions for groups defined by faculty rank (Table 30) and self-rated technology proficiency (Table 34).

Table 31. Participant Course Enrollment by LoU Change Pattern

LoU Change Pattern	Participant Course Enrollment				
	< 30	31-50	51-75	101-150	151-500
Static LoU III	0	2	0	0	0
Growth from LoU III	0	1	2	1	0
Static LoU IVA+	3	3	0	1	1
Total	3	6	2	2	1

Table 32. Participant Age by LoU Change Pattern

LoU Change Pattern	Participant Age		
	31-40	41-50	51-60
Static LoU III	1	0	1
Growth from LoU III	0	2	2
Static LoU IVA+	3	2	3
Total	4	4	6

Table 33. Participant Teaching Experience by LoU Change Pattern

LoU Change Pattern	Participant Teaching Experience	
	6-14 yrs.	20+ yrs.
Static LoU III	1	1
Growth from LoU III	4	0
Static LoU IVA+	5	3
Total	10	4

Table 34. Participant Self-Rated Technology Proficiency by LoU Change Pattern

LoU Change Pattern	Participant Self-Rated Technology Proficiency		
	High	Middle	Low
Static LoU III	0	1	1
Growth from LoU III	0	1	3
Static LoU IVA+	5	3	0
Total	5	5	4

RESEARCH QUESTION 5: RELATIONSHIPS AMONG DATA FROM CBAM ASSESSMENTS AND RETROSPECTIVE INTERVIEWS

What are the relationships among participants' CBAM change profiles (based on SoC and LoU data), participants' perceptions of the impact of the faculty development program (as revealed in retrospective interviews), and evidence of the impact of the FDI program (as given by the IC assessment)?

The intent of this question was to coalesce the data collected throughout this study to identify patterns of change, if present, representing the different experiences of the participants. This section first reviews how the researcher identified characteristic patterns of change as he revisited the CBAM data collected over the course of the study. Following that is an analysis of additional data collected for four participants, each of whom represented a unique change pattern. This rich data, derived from IC assessment and retrospective interviews, further informs the identified change patterns and provides a multifaceted answer to this research question.

CBAM Change Patterns

The initial step in addressing this question was to examine the data and change patterns in the Stages of Concern and Level of Use for each individual faculty participant (as earlier described in the subsections of this chapter tackling the results of Research Questions 1 and 2). Four change patterns related to the SoC emerged, and three patterns related to the LoU. Table 35 displays the numbers of participants associated with the intersections of these

change patterns and reveals no apparent relationship between the SoC and LoU change patterns.

Table 35. Participant LoU Change Pattern by SoC Change Pattern

SoC Change Pattern	LoU Change Pattern			Total
	Static LoU III	Growth from LoU III	Static LoU IVA+	
Positive Change	1	1	1	3
Idiosyncratic Change	0	2	2	4
Little Change	1	0	3	4
Negative Change ^a	0	1	2	3
Total	2	4	8	14

^aOne participant classified as “Negative Change” did not complete the December LoU interview.

Because: (a) no clear patterns emerge, and (b) the SoC change patterns describe a much wider variation in participant change than do the LoU change patterns, this researcher opted to focus on the SoC change patterns as the primary distinction for further analysis of the participants’ change process. The descriptions of the SoC change patterns drawn from the discussion of Research Question 1 are brought together in Table 36 to facilitate comparison of the distinctive features of each group.

The SoC change patterns feature distinctive characteristics with broad implications for understanding and nurturing instructor receptivity to change. To enhance what the CBAM-specific procedures had already revealed, the researcher opted to collect additional data from one participant representing each SoC change pattern via IC Map assessment and the retrospective interview. The selection of these participants was purposeful; in addition to consideration of the SoC change pattern membership, the researcher also took the LoU change pattern membership into account. The four selected participants had an identical LoU in December (IVB-Refinement); thus, differences found via use of the IC Map (assessing the *end-state* quality of innovation implementation) would be attributable more directly to differences in the SoC rather than the LoU. Additionally, two of the four participants had a May LoU of III, and thus were in the *Growth from LoU III* group, and the other two had a

Table 36. Defining Change Characteristics of SoC Change Patterns

SoC Change Pattern	Change in Stages 0-3	Change in Stages 4-6	Interpretation
Positive Change (3 participants)	General diminishing	Relative intensities become higher than Stages 0-3	Change approximates that of CBAM's idealized development: elevation of impact concerns and reduction of self- and task concerns
Idiosyncratic Change (4 participants)	Self-focused concerns (Stages 1-2) diminish; Stage 0 concerns high in Dec.; 3 of 4 have high task (Stage 3) concerns in Dec.	Stage 6 concerns emerge as primary	Reduced self-focused concerns but potential frustration with management of the innovation and potential lack of focus on the innovation
Little Change (4 participants)	Stages 1-3 remain the high stages throughout	Little change	Participant concerns remain focused on themselves and management of the innovation
Negative Change (4 participants)	Stage 0 becomes the highest; other stages diminish; 2 of 4 have a "negative 1-2 split" indicating higher personal concerns than informational	General diminishing; 2 of 4 "tail up" on Stage 6, indicating ideas about doing things differently	Profile resembles that of a nonuser; may also exhibit doubt about or resistance to the innovation

May LoU of IVB, and thus were in the *Static LoU IVA+* group. The researcher kept these distinctions in mind when analyzing the data from the CIT interviews (illuminating the change *process*).

Innovation Configurations Assessment

To assess the fidelity of participants' innovations to the ideals of the FDI, the researcher conducted Innovation Configurations (IC) assessment using an IC Map. To perform this assessment, the researcher considered information obtained about the

participants' innovations through informal interviews conducted during the January FDI poster session, as well as via examination of the materials that participants shared during that session.

The IC Map the researcher developed for this study, based on a draft rubric originally developed by the FDI, contained eight innovation components; each featured four levels of variation (see Appendix D). The innovation components were:

1. Project Design
2. Curricular Connections
3. Student Learning Outcomes
4. Assessment
5. Information, Technological, and Visual Literacies
6. Effective Use of Real-World ICT Tools
7. Inventive Thinking
8. Effective Communication

Each innovation component was rated on four levels of variation from a (highest fidelity to ideal implementation) to d (lowest fidelity). Table 37 shows that the IC assessment scores for each of the innovation components for the four participants varied considerably.

Table 37. IC Assessment Ratings for Participants Representing SoC Change Patterns

Participant SoC Change Pattern	Innovation Component Number								IC Group
	1	2	3	4	5	6	7	8	
Positive Change	b	a	a	a	a	a	a	a	High Fidelity
Idiosyncratic Change	b	b	c	a	c	c	d	c	Lower Fidelity
Little Change	c	b	c	b	b	b	b	b	Medium Fidelity
Negative Change	c	a	c	a	a	b	b	c	Medium Fidelity

Hord et al. discuss classifying participants based on IC scores as high, medium, or lower fidelity; the final column of Table 37 represents this classification. For this study, *high fidelity* was defined as at least 75% of the IC ratings of a; *medium fidelity* was defined as over 50% of the IC ratings of a or b; *lower fidelity* encompassed the remainder. Although all four of the participants were rated at a final LoU of IVB, their IC ratings varied widely. With a

larger number of IC ratings, one might expect to find a pattern of higher-fidelity IC ratings associated more often with higher LoUs (Hord et al., 2006).

The participant whose innovation was most clearly aligned with the ideals of FDI change leaders represented the SoC *positive change* pattern. The *positive change* SoC profile suggests the primacy of impact concerns; this is reflected in this participant's implementation of the innovation, with well-developed learning outcomes, a strong connection to the course curriculum, and rigorous engagement of students in various aspects of 21st century literacies as characterized by components 5-8 of the IC Map.

The remaining participants' SoC profiles and IC profiles are less clearly linked. Relationships between and among their SoC and IC data are better discussed in the context of the findings from their interviews, which are presented in the next section.

Qualitative Analysis

As described earlier, a trained specialist not involved in the faculty development process conducted interviews the four selected participants. These sessions, based on Flanagan's (1954) Critical Incident Technique (CIT), were designed by to probe faculty perceptions of key moments in the change process. This triangulation of methods (Miles and Huberman, 1994) enabled a clarification and extension of the understanding of faculty change processes developed from the CBAM data.

The CIT interview protocol itself was but slightly adapted from one developed, piloted, and employed by Lambrecht (1999) for a study of critical incidents in the teaching and learning of business technology (see Appendix E). It consisted of two parts highly parallel in structure. The first part focused on critical incidents that participants recalled from their experience as a learner in the summer workshop and beyond, as they increased their understanding about and skills related to facilitating learning more effectively through the use of technology. The primary question in this section of the protocol was:

I want you to think of an occasion this summer when you were in the faculty workshop or in a consultative situation working on your innovation and the activities had a noticeable impact on your learning and understanding. This might be an occasion when you finally caught on to a concept or skill that you were having a hard time understanding. Please describe to me the key elements of this time with enough detail so that they can be clearly understood by others. I will be asking some questions to assist you in telling your story.

The remaining questions called for interviewees to elaborate upon the experience, considering the background which led them to it and the ways that they thought about the implications of it for student learning.

The second part of the protocol featured a very similar opening question, but couched in terms of critical incidents from the fall, when they were teaching:

I want you to think of an occasion when your innovation had a noticeable impact on your students. This might be an occasion when students finally caught on to some difficult concept or skill. Please describe to me the key elements of this teaching experience with enough detail so that they can be clearly understood by others. I will be asking some questions to assist you in telling your story.

The researcher and his dissertation supervisor employed the constant comparative technique to develop codes that related both tangentially and directly to behaviors and attitudes associated with the SoC and LoU. The researcher applied these codes to passages from the transcribed interviews using the HyperRESEARCH software for qualitative analysis. The researcher then grouped the codes into themes to better characterize the overarching ideas within each interview and across the four interviews. Table 38 shows the themes which emerged and how many codes were grouped in each.

Table 38. Themes Emerging from CIT Interviews

Theme	Number of Codes Grouped in Theme
1. Instructor Technology Learning	18
2. Instructor Understanding of Teaching & Technology	15
3. Impact on Students	11
4. Instructor Pedagogical Approaches	7
5. Student Technology Learning	7

These themes are more fully described as follows:

- *Instructor Technology Learning* interview passages described the instructor process of exploring, evaluating, selecting, and implementing technologies.
- *Instructor Understanding of Teaching & Technology* passages explored how the instructor gained a greater understanding of the linkages between various aspects of technologies and teaching.

- *Impact on Students* passages described the observations and data which the instructor collected regarding how the innovation had made an impact on his/her students.
- *Instructor Pedagogical Approaches* passages focused on instructional strategies and activity details which were not directly linked to technologies.
- *Student Technology Learning* passages detailed the process by which students learned to make use of the technology associated with the innovation.

Table 39 shows how many passages were coded with the themes for the four interviews. Passages which had multiple code instances within the same theme were only counted once.

Table 39. Analysis of CIT Interviews by Occurrence of Themes (Frequency)

Interviewee SoC Change Profile	Number of Unique Passages					Total for Interview
	Theme 1 Instructor Technology Learning	Theme 2 Instructor Understanding of Teaching & Technology	Theme 3 Impact on Students	Theme 4 Instructor Pedagogical Approaches	Theme 5 Student Technology Learning	
Positive Change	25	16	14	15	9	60
Idiosyncratic Change	10	17	13	10	4	48
Little Change	38	37	18	7	10	68
Negative Change	4	9	3	6	0	22

Table 40 presents the information from Table 39 but by percentage rather than frequency. This enables a more straightforward comparison of the relative importance of the themes across the interviews, regardless of differences between interviews in interview length or number of codes assigned.

While Table 40 reveals some differences between and among the interviewees, the content and emergent themes from the CIT interviews also shows that all four of these participants, regardless of SoC change profile, described critical incidents which were *positive* experiences with the FDI, both as learners during the summer workshop and

Table 40. Analysis of CIT Interviews by Occurrence of Themes (Percentage)

	Percentage of Unique Passages				
	Theme 1	Theme 2	Theme 3	Theme 4	Theme 5
Interviewee SoC Change Profile	Instructor Technology Learning	Instructor Understanding of Teaching & Technology	Impact on Students	Instructor Pedagogical Approaches	Student Technology Learning
Positive Change	42%	27%	23%	25%	15%
Idiosyncratic Change	21%	35%	27%	21%	8%
Little Change	56%	54%	26%	10%	15%
Negative Change	18%	41%	14%	27%	0%

Note. Percentages may not add to 100 due to passages coded with multiple themes.

beyond, and as instructors implementing their innovation with students. The rest of this section, then, explores similarities and differences among the four interviewees—a holistic analysis that takes into account the interview findings, the SoC and LoU change patterns, and the IC assessment. The intent is not to develop comprehensive case studies for these participants; rather, the findings clarify and inform the change patterns with which the participants are identified.

POSITIVE CHANGE PARTICIPANT

As described earlier, the IC assessment for the participant characterized as having a *Positive Change* SoC profile reflected a high fidelity to the ideals of the FDI. Her innovation was a course project that involved students in synthesizing information and publishing an article on a public website. In addition, students reflected on the process and presented back to the class about the results. In addition to assessing the assignment, the participant surveyed students to obtain feedback about the project.

This instructor came to the FDI with significant prior experience innovating with teaching and technology, which may help explain why the theme of *Instructor Understanding of Teaching & Technology* was less prominent in her interview than all

others. However, she came to the FDI feeling a need to become more up-to-date on technologies for teaching, which is reflected in her initial SoC profile indicating high self-focused concerns. As she said, “I went with eyes open. I wanted to find some kind of tech that would improve my teaching... So I was literally there shopping... I wanted to learn about all these new techs.”

As her inclusion in the *Positive Change* SoC change pattern indicates, these goals were met, and by the end of the FDI her self-focused concerns diminished. The FDI experience allowed her to identify a technology that required some investment of time on her part, which is reflected in the greater emphasis on the *Instructor Technology Learning* theme in her interview compared to some of the other participants. But as this quote shows, she was very open to exploring once she identified a technology that “met” her interests:

What they gave us during the workshop was really the background that I needed. It was someone saying, “Hey, look! There’s a website ... You go to it. You know, follow the directions. Register yourself. Fool around with it.” So basically the sort of guided, forced, baptism by fire of throwing us into it was very useful. So just showing us where to go and then standing around and ... answering little questions here and there that arose. That was enough. It was very useful.

The projects of the *Positive Change* participant and the *Little Change* participant both involved technologies that called for substantive investment in both learning and managing, and in turn supporting students with the technology itself. This is reflected in the greater significance of the *Instructor Technology Learning* and *Student Technology Learning* themes for those two participants. However, they are differentiated in part by the importance which the *Positive Change* participant placed on the *Instructor Pedagogical Approach*. This is reflected in the *Positive Change* SoC profile, in which impact-focused concerns became primary once the innovation had been implemented. As she said, “I just knew that the use of this tech was going well because I wanted them to invest and I would say that about 75% totally invested.”

The importance of Stage 6, Refocusing, as well as LoU IVB, Refinement, were evidenced in her comments as she considered how to improve the project the next time she taught the course. She felt that additional scaffolding would have helped all students to become comfortable enough with the technology over time so that their projects would have been even more successful. As she summed up:

In terms of a teaching moment it's one of the more rewarding ones that I've had, even though -- I mean all its flaws, with all the things that went wrong, in terms of not giving them the guidance necessarily that they needed. There was the real payoff at the end of them saying, "Wow, I really did something."

Thus, for this participant from the *Positive Change* SoC change pattern, the findings from the SoC, LoU, and IC assessments, as well as the CIT interview, all appear to align quite well with an overall characterization of the change process: highly focused on both technical and pedagogical aspects of the innovation after an initial process of acquiring information and exploring possibilities.

IDIOSYNCRATIC CHANGE PARTICIPANT

Like the *Positive Change* profile, the *Idiosyncratic Change* profile represents someone whose self-focused concerns in Stages 1 and 2 diminished in intensity and relative importance over the course of the FDI. However, the participant representing this SoC change pattern was part of the *Growth from LoU III* group. Thus, while this participant came in open to many possibilities (here again, an attitude common to his *Positive Change* colleague), the lower LoU at the outset was reflected in his stated experience of the FDI workshop:

I remember struggling with myself over what to do during the workshop that we attended. They showed us many different new ways to present information to involve students -- to help students figure out how to learn better. And none of them were doing what I thought would be useful. None of them were doing anything that I thought, "Gee, that's going to work for this class, for what I hoped to accomplish for what the outcomes are gonna be."

And the 'ah-ha' moment, came when I think I figured out that I was looking too hard at the technology things, the gizmos and the gadgets, rather than what I wanted to happen when all was said and done. And I think I may have started with the mistaken notion that these new innovations were the goal, rather than a means to a different goal.

Ultimately, the innovation of the participant representing the *Idiosyncratic Change* SoC change pattern was a set of optional online tutorials focused on basic skill-building to bolster the writing quality on standard written assignments from the course. Because these tutorials were implemented in Blackboard (the campus-wide learning management system), the technology learning requirements for both the instructor and his students were minimal, as reflected in the lower emphasis on *Instructor Technology Learning* and *Student*

Technology Learning. However, although this approach might indicate lesser concerns with the management of the technology, one of the features of the *Idiosyncratic Change* profile is relatively high Stage 3 (Management) concerns. In this case, the fact that the tutorials were optional generated some uncertainty about the manner in which students approached their use:

It was all online ... and all of it interactive. So I figured, now it's up to the students ... It's possible—very conceivable—likely—that a student can go through it and say, “Just to get [the instructor] happy and get him off my back, I'm going to go through this and I'll just click whatever I need to click and be done.”

In the interview, the instructor also mentioned some issues with bugs in the learning management system. Although he did not dwell on these concerns in the interview, they, along with the uncertainty about the manner in which students used the technology, may have contributed to the high Management concerns expressed on the final SoCQ. These findings appear at odds with his final LoU rating of IVB, Refinement; however, the CIT interview suggested a greater emphasis on the teaching approach and impact than the technology itself—which is consistent with an LoU of IVB.

The low IC assessment ratings for this participant's innovation are due primarily to the optional nature of the innovation (rather than integral to the course learning), and its focus on building basic skills rather than tasks such as higher-level thinking, communication, and collaboration. These facets of the innovation might suggest, contrarily to the overall CIT interview results, minimized emphasis or impact on student learning. This is, however, consistent with the lower Stage 4 score associated with the *Idiosyncratic Change* SoC profile.

The data associated with the participant representing the *Idiosyncratic Change* SoC change pattern, then, present some challenges. On one hand, the CIT interview considered as a whole, coupled with the final LoU rating, suggests a greater focus on student impacts than the technology itself. On the other hand, specific comments from the interview, along with the IC assessment, support the notion from the *Idiosyncratic Change* profile that the participant had not yet overcome concerns about the management of the innovation itself in order to effectively facilitate the types of student impacts envisioned by the FDI.

LITTLE CHANGE PARTICIPANT

As noted previously, the innovation of the *Little Change* participant was similar to that of the *Positive Change* participant, in that it required more intense involvement with the technology itself. The *Little Change* participant, like his *Positive Change* counterpart, also was rated at LoU IVB at the outset of the study. But the CIT interview suggests that he placed far less importance on his pedagogical approach in discussing the innovation. This isn't particularly surprising—given that his innovation was not so much a course learning project as a technological infrastructure underlying course communication and activity.

Similarly to the *Positive Change* participant, but in contrast to their *Idiosyncratic Change* colleague, the *Little Change* participant indicated a great openness toward and interest in a variety of technologies: "I would go to each [FDI workshop session] and I would think 'that's what I need' -- going to one after another." However, his focus was more on the technologies themselves than on their potential pedagogical uses: "Maybe I will introduce [the innovation] as something that [students] would look at in the class but not so central to the actual teaching of the class." His initial choice for the innovation actually turned out to have such significant technical management challenges that he decided (well after the four-day summer workshop concluded) upon a second technology that had been presented:

Part of the reason that I moved from away from [the first technology] to the [second] was because I felt like [the first] had so many working parts—so many bits moving and I was feeling a bit kind of stressed by it all. I should say that—that the [second] was itself kind of stressful—early on, you know, until I settled on [a particular implementation of the second technology].

It is not surprising, then, that this participant's *Little Change* SoC profile represents an emphasis on Stages 1-3 – gaining more information about the innovation, addressing personal concerns with it, and management of tasks associated with its implementation. These foci are reflected in the strong emphasis on the *Instructor Technology Learning* and *Instructor Understanding of Teaching and Technology* themes in the CIT interview as well.

The IC assessment for this participant, resulting in the characterization of *Medium Fidelity* of his innovation to the ideals of the change leaders, is impacted by the fact that this innovation was not a course project with defined and assessed student learning outcomes. However, because the course content was highly relevant to the students' learning about, experiencing, and critically reflecting upon new media literacies, communication methods,

and collaboration, the innovation was more in line with the ideals of the change leaders than that of the *Idiosyncratic Change* participant. As he expressed in his interview, “We would talk in class about the sort of things—all the adaptations that one could make of [the innovation], all the sorts of audiences this would work for—the kinds of purposes and contexts and I could see that was something that they were pretty interested in.”

The portrait of the *Little Change* participant that emerges, then, is one that is highly focused on the technology, but as an experienced technology user open to various possibilities. The participant was willing to invest significant effort into learning about new technologies with an eye, ultimately, to a benefit to students, if somewhat vague. One should not, then, conclude that the *Little Change* profile represents participants for whom involvement with the FDI was not worthwhile. In the words of this participant, “It’s hard to say because like I said, my path through this whole thing was sort of—you know, really wasn’t direct, it was sort of all over the place. I found the whole [FDI] experience just extraordinarily valuable—everything about it.”

NEGATIVE CHANGE PARTICIPANT

Though part of the *Negative Change* SoC change pattern, the final interviewee expressed positive reactions to her FDI experience as well, as previously noted. Her innovation was rated on the IC assessment as having *Medium Fidelity* to the ideals of the FDI. Similarly to the innovation of the *Positive Change* participant, this project had defined learning outcomes involving multiple aspects of information literacy; however, like the *Idiosyncratic Change* participant, the project was offered as an optional experience for students (in this case, as extra credit).

The technology learning process for this participant was similar to that of the *Idiosyncratic Change* participant as well; both were rated at LoU III at the outset. Her struggle with the learning process during the four-day workshop was very similar to the *Idiosyncratic Change* participant and in contrast to the enthusiastic receptiveness of the other two interviewees:

I guess it’s a learning experience. To be able to learn that I was being bombarded with more information than I could possibly process and to really sort through what was going to be really most useful and accessible for me.

Like her *Idiosyncratic Change* counterpart, this participant chose an innovation that involved a web-based system that lowered the technical proficiency required for implementation: “[It] just felt like something that I would be able to implement in my classroom. Yeah. Without stretching.” This is reflected throughout her interview, where the importance of *Instructor Technology Learning* and *Student Technology Learning* is quite low. Rather, the focus was on the use of the technology to facilitate an authentic learning experience for her students:

Something along the lines of giving them an experience that you don’t normally have in a classroom setting ... The possibility of, you know, giving them an outside experience that you don’t get generally in a classroom setting.

Other than the fact that the project was offered as an extra credit, non-integral part of the course, there are few clues in the CIT interview as to why this participant was part of the *Negative Change* SoC change pattern. This researcher’s discussions with the participant during the final poster session, when the IC assessment was completed, may provide some insight. As a lecturer teaching on multiple campuses, the participant was severely challenged to find the time to implement the innovation fully within the course as she had desired. The high Stage 0 concerns characteristic of the *Negative Change* group’s final SoC profile may reflect the fact that it was very difficult for this participant to maintain this innovation as a top priority given her busy schedule. Despite this, her LoU status as part of the *Growth from LoU III* group, her *Medium Fidelity* IC assessment, and her CIT interview’s focus on growth in the *Instructor Pedagogical Approach* and *Instructor Understanding of Teaching and Technology* are all indicative of positive outcomes from the FDI experience for this participant.

Research Question 5 Summary

This analysis was intended to determine to what extent the data provided by the CBAM assessments “fit” with one another and the contextual information provided in the retrospective interviews. The SoC and LoU profiles did not mesh together to form one comprehensive change profile; instead, the SoC profiles served as the focal point for additional holistic analysis since they represented an apparent broad range of participant change patterns. IC assessments also showed varying degrees of fidelity to the change leaders’ ideals; the SoC *Positive Change* participant was the only one rated as *High Fidelity*.

The CIT interview findings depicted five key themes emerging from each interview, but the themes were emphasized differently across the interviews. The *Positive Change* participant's combined emphasis on *Impact on Students*, *Instructor Pedagogical Approach*, and *Student Technology Learning* was greater than the other participants, which fit well with her SoC profile emphasizing impact-focused concerns, and with her IC assessment.

All four interviews indicated important learning experiences on the part of the participants, positive feelings about the impact of those experiences on students, and appreciation for the opportunity. The departure of those who were not in the *Positive Change* SoC change pattern from the ideal was perhaps not as great as one might have thought simply by looking at the SoC profiles. Perhaps the most important distinction among the innovations was the highly integrated nature of the *Positive Change* participant's innovation, which was technically and pedagogically rich, and highly aligned with the ideals of the change leaders. The others were not actually required, assessed course projects. The implications of this will be discussed further in Chapter 5.

CHAPTER 5

DISCUSSION

For well over a decade, advocates of improved instructional quality in higher education have pointed toward: (a) a need to move toward more learner-centered instructional approaches (Barr & Tagg, 1995), and (b) the important role of technology in this shift (Chickering & Ehrmann, 1996). But technology's value goes well beyond teaching strategies; rather, it is a central aspect of:

- accreditation processes and accountability for evidence of student learning outcomes,
- student demands for flexible scheduling,
- student readiness for the workplace, and
- an institution's competitive edge (as represented by enrollment demand, number of graduates, research productivity, and much more).

Despite the affordances presented by instructional technologies, the dominant style of university instruction remains the lecture-oriented mode in which so many faculty were themselves instructed (Bates & Poole, 2003; Halpern & Hakel, 2003). Intervention in the form of professional development is necessary if faculty are to successfully (and quickly) change their teaching approaches (Brown, Benson, & Uhde, 2004; Moore et al., 2005).

This study, then, detailed how change unfolds—specifically, how university instructors responded to a faculty development program designed to increase the use of technology to facilitate learning. The study was grounded by the Concerns-Based Adoption Model (Hall & Hord, 2006), a widely-used framework that allowed the researcher to assess faculty response to the innovation in three different ways:

- concerns about the innovation (assessed via the Stages of Concern Questionnaire),
- levels of use of the innovation (assessed via the Levels of Use interview), and
- quality of the implementation of the innovation (assessed via the Innovation Configurations methodology).

From the first two measurement strategies, the researcher generated change profiles for faculty participants. These profiles represented a range of change patterns and informed

selection of a sample group for Innovation Configurations assessment and intense retrospective interviewing based on the Critical Incident Technique (Flanagan, 1954; Lambrecht, 1999)—both important strategies for triangulating and clarifying the CBAM findings.

In addition to contributing to an understanding of the way faculty respond to professional development interventions focused on innovative uses of technologies for teaching, this study also extends the knowledge base on the usefulness of CBAM as a framework for facilitating and assessing faculty development initiatives. Thus, this chapter is organized around the three primary aspects of the CBAM framework: the innovation and IC, SoC, and LoU. Within each area, the discussion includes:

- a summary of the findings associated with the relevant research questions in this study,
- the story the component helps to tell about the study participants,
- practical implications of the findings for future faculty development efforts, and
- a reflective assessment of the strengths and limitations of the CBAM tools, and recommendations regarding their use in research and practice.

The chapter ends with a discussion of the findings related to Research Question 5, in which data from the three CBAM components and the CIT interviews were brought together to create rich descriptions of four participants and their innovations.

THE INNOVATION AND INNOVATION CONFIGURATIONS

Although IC seems to be the third wheel of CBAM, with Stages of Concern and Levels of Use far more prominent, this researcher would argue that it ought to play a greater role as the primary mechanism for defining educational innovations. Because a thorough understanding of the innovation is so important for success in both faculty development and CBAM research, IC and the innovation are considered first in this chapter.

According to George et al. (2006),

In concerns research, the generic name given to the object or situation that is the focus on the concerns is *innovation*. The innovation and its use provide a frame of reference from which concerns can be viewed and described. The innovation is not necessarily new. It may be a new strategy, program, or practice, or it may be something that has been in use for some time. (p. 7)

The definition of the innovation, then, is central to a CBAM study, as it provides the focus for assessing concerns, levels of use, and/or implementation configurations. For this study, the innovation was defined as: using advanced technologies (a) for instructional design/planning/delivery, and (b) as a tool supporting students' ability to research, organize, visualize, manage, evaluate, and communicate information. The researcher developed this definition based on the stated goals of the FDI, which were very broad and allowed for a variety of outcomes for the faculty fellows.

Though this definition appears quite general, it is not more so than many others this researcher encountered in reviewing extant CBAM studies of instructional technology. In fact, it actually provides more details about the nature of the innovative uses of instructional technology than are found in many studies. Additionally, some studies, rather than focusing on a clearly defined innovation, instead targeted the interventions designed (implicitly) around an innovation. For this researcher, a key recommendation emerging from this study is the use of an IC Map to provide a clear definition of the innovation for both research and practical purposes.

Participants

All FDI fellows were aware that the focus of the FDI was broad. As the FDI invitation memo stated (see Appendix G): "The Fellowship is designed to help faculty consider various ways to incorporate innovative use of information and communication technology (ICT) in teaching and learning, and how to better prepare our students to address and solve 21st century problems." It is a matter for speculation (or further research) whether an invitation this broad has an impact on the type of faculty who choose to apply for such an opportunity.

As noted in Chapter 4, two of the four FDI fellows who participated in retrospective interviews enjoyed the workshop's broad approach—the many technologies, applications, and strategies to which they were exposed. Those two were rated at LoU IVB prior to the workshop. But the other two, initially rated at LoU III, felt overwhelmed and highly challenged to determine a useful technology to incorporate into their teaching. This is discussed further in the Levels of Use section below; for now it is sufficient to point out that

faculty development participants will vary in their receptivity to a broadly-defined technology-oriented innovation.

Via the IC assessment, the researcher classified the innovations of four study participants into three different categories, based on how well the innovations matched the ideals of the change leaders as expressed in the IC Map (see Appendix D). These three categories likely would be sufficient to encompass all of the FDI fellows' innovations:

- High Fidelity – Nearly all of the components of the innovation were implemented according to the ideals of the change leaders (i.e. were rated at 'a').
- Medium Fidelity – Over half of the components of the innovation were implemented at the 'a' or 'b' level.
- Low Fidelity – At least half of the components of the innovation were implemented at the 'c' or 'd' level.

As the IC Map provides the clearest indication of how well an individual's implementation of the innovation aligns with the ideals of the FDI, the breadth of these results could be viewed as disappointing. However, even for the participant whose innovation was rated as *Low Fidelity*, other study measures indicated some positive results. This suggests that either the IC Map used in this study may not have been completely on target, or simply that IC alone, important as it is, is not sufficient as the sole indicator of faculty development success.

Faculty Development Initiative

If the definition of the innovation impacts the change process of individuals, then worth further consideration is the importance of attending to how participants understand the innovation associated with technology-oriented faculty development efforts. In their review of the literature, van den Berg and Ross found numerous studies showing “the perceptions of those involved in innovations to be of major importance for the success of the innovation process. Of particular importance is the *significance attached to the innovation* [italics added] by those involved in it” (p. 880).

Although this study did not explicitly attend to the significance ascribed to the innovation by FDI participants, the high incidence of Stage 0 concerns throughout the study indicates that many participants were not focused on it. FDI leaders are advised to consider approaches to improve attentiveness. A successful faculty development infrastructure for sustaining faculty focus on the innovation beyond the initial four-day workshop would be

easier to achieve with a narrower definition of the innovation. Such a definition would clarify how to provide targeted support programs such as ongoing reflection and reporting, information dissemination, mentorship, and faculty learning communities.

The IC Map used in this study was not part of the FDI and it was not distributed to participants. However, IC Maps operationalize the continuum of possible implementations of an innovation, thus providing faculty development participants with consistent information about the innovation (Hord et al., 2006). Providing the IC Map to participants as part of the orientation to the FDI is worth considering, in order to clarify perceptions and expectations for participants related to the innovation.

Furthermore, while the researcher developed his IC Map from a preliminary rubric created by someone involved with the FDI, Ellsworth (2000) recommended a more participatory process involving instructors, change facilitators, administrators, and evaluators in IC Map development. This approach would potentially increase buy-in and understanding among participants, and would help to provide common language when participants and change leaders discuss ideas and implementations. Finally, participants might also be encouraged or required to periodically self-evaluate their innovations using the IC Map.

CBAM

To reiterate, this researcher finds it unfortunate that the Innovation Configurations tool is apparently employed so rarely in CBAM research, especially in relation to SoC and LoU, for it is through the IC that the innovation under study is most thoroughly considered. More research is needed to determine the impact of IC and non-IC approaches to providing a specific definition of the innovation in CBAM studies.

One reason why a broad innovation definition may appeal to CBAM researchers could be the sense that preassessing SoC and LoU on highly specified innovations would lead only to results typically associated with non-users, thus failing to adequately represent relevant preexisting concerns and uses. This study, however, shows that preassessment CBAM data collected based on a broad innovation definition may also not be particularly illuminating. Dr. Kay Uchiyama, the leader of the Colorado State University LoU interview team, explained the problem with a vague innovation definition in a reflective email at the conclusion of the final round of LoU interviews:

As I rated the interviews and also spoke with the interviewers, it seemed to me that the definition that was used to describe the innovation was extremely broad. There didn't seem to be a definitive number as to what constituted advanced use of technologies. For example, one person could be rated as LoU IVB-Refinement but had only worked with one technology such as Blackboard. Another person could be rated at an overall LoU III-Mechanical, but had been working with several different technologies and if we looked at each one technology individually the person might have been rated differently. (personal communication, January 4, 2007)

In fact, not until well after the study was underway did this researcher note the recommendation of developing "at least a rudimentary [IC] Map" (Hall et al., 2006, p. 18) for use during the LoU interview. Given the way that the IC Map calls out the various components and dimensions of the innovation, and specifies ideal and less-than-ideal possible implementations for each dimension, it seems clear now why this would have been so valuable to the LoU interview team.

Although each of the CBAM measurement tools is oriented around the notion of the innovation, this researcher believes that more guidance is needed to users of CBAM methods regarding the defining of an innovation and communicating this definition to participants. It seems that the IC Map is the most appropriate mechanism for this, and this author believes stronger faculty development and research outcomes would result from consistent use of an IC Map from the very outset of a change process.

STAGES OF CONCERN

As noted in Chapter 2, the SoC is the most widely used CBAM construct. Its relatively easy measurement via the SoCQ (especially when done via the Internet, as in this study) and the availability of tools to speed the analysis of results certainly contribute to this. However, the straightforward process of administration and initial analysis can mistakenly lull researchers into seeing the SoC in an overly simplistic light. In truth, accurately understanding, interpreting, and reporting SoC results can be challenging.

Too often, researchers employing the SoC read too much into one SoC profile. Studies which conduct multiple SoCQ assessments are often of a simple pre- and post-faculty development intervention variety, without sufficient time to determine the extent to which participants actually put the innovation to use.

To address Research Question 1, this researcher sought to identify change patterns based on change over time in the SoC. The SoCQ was administered prior to the initial FDI workshop activities in May, at the end of August (at the point where faculty had developed their innovations), and again at the close of the fall semester (December)—after the innovation had been implemented.

From this data, four SoC change patterns emerged. Determining these groups was complex, given the necessity of considering change over time on seven SoCs across three SoCQ measurements for each participant. Ultimately, the change profiles relied most heavily on the pre- and post- SoC scores. The August SoCQ provided additional information on an individual basis but it was not necessarily consistent within each change pattern. This serves as a reminder that faculty are engaged in many competing activities immediately prior to the fall semester, and points to the difficulty of finding an optimal time for higher education faculty development in general, and particularly for concerns-focused data collection.

To briefly reprise, the four SoC change patterns that emerged were:

- *Positive Change* – Closely resembling the CBAM ideal, these three participants experienced decreasing self- and task-focused concerns and increasingly important impact concerns over the course of the FDI.
- *Idiosyncratic Change* – While by December these four participants had decreased self-focused concerns in Stages 1 and 2, their Stages 0, 3, and 6 had the highest relative intensities, indicating potential frustration with the management of the innovation and a possible lack of focus on the innovation.
- *Little Change* – These four participants experienced little change in the relative intensity of their concerns over the course of the FDI. Stages 1-3 remained prominent throughout.
- *Negative Change* – These four participants started with differing SoC profiles, but by December, all had profiles which resembled the non-user profile, featuring much higher Stage 0 concerns than all others. Their ending profiles also indicated possible doubt about or resistance to the innovation.

With regard to Research Question 3, the exploration of demographic data showed no apparent connection between participant SoC change pattern membership and demography. This finding is in agreement with CBAM developer assertions that SoC is independent of demographics (George et al., 2006).

Participants

It is important to note that the SoC change patterns are not retrospectively predictive. That is, viewing participants' May SoC profiles does not necessarily enable one to determine conclusively the change pattern with which that participant ultimately would be associated. The patterns are defined by change over time. Additionally, as the investigation of Research Question 5 reveals, distinctions which the SoC patterns seem to draw between participants may not be as dramatic as the four patterns might indicate.

Nevertheless, the patterns raise many interesting questions about the circumstances and experiences of the participants which are beyond the scope of this study. While from a faculty development perspective it is disappointing that only 20% of the study participants fit the *Positive Change* pattern, it is worth noting that other indicators paint a more positive picture of their experience. Further discussion of these patterns appears in the final, integrative section of this chapter.

Future research that attempts to categorize faculty development participant SoC change patterns might benefit from the use of Rogers' structure for classifying innovation adoption. The Rogers categories may provide some insight which CBAM does not as to the different rates of progress which participants in faculty development exhibit (Ellsworth, 2000).

Faculty Development Initiative

This was not an action research study where the findings were actively incorporated into the FDI. It is interesting to consider how the FDI leaders might have taken study results into account if they had, in fact, been made available throughout the FDI. The initial group profile would likely not have affected the overall workshop; after all, participants indicated significant self-focused concerns (Stages 1-3)—substantiating a need for leaders to attend to the innovation and its management. The August group profile would likely have been viewed favorably, as those self-focused concerns had diminished. As the innovation had not yet been implemented, the fact that impact-related concerns remained relatively flat from May to August may not have been surprising. But the fact that Stage 0 concerns were unchanged, and in fact became the peak stage in August, could have drawn the attention of faculty developers. This might have led them to seek out approaches to increase participants'

attention to the innovation. Best practices in faculty development such as creating communities of practice, cultivating a reflective approach, and maintaining a cohesive model might all help to address the issue of faculty focus. The fact that the SoC changed little from August to December, except for a jump in Stage 6, indicates that, overall, faculty may have increasingly had competing priorities and challenges during the fall semester which resulted in a further loss of focus on the innovation.

One of the challenges for technology-oriented faculty developers is to maintain a balance between emphasis on technological skills and pedagogical approaches. CBAM theory suggests that faculty development needs and interests vary by the peak SoC of an individual. For example, emphasizing student needs early in the process could be counterproductive for a participant who is seeking primarily to understand the operation of a particular technology (Hall & Loucks, 1978). This again may point to the importance of providing FDI participants with a clear and thorough definition of the innovation through an IC Map, so that participant expectations are calibrated appropriately with faculty developer activities.

CBAM

For this researcher, a key element of this study experience was the complexity and richness of the individual participants' SoC profiles. When examining change over time for an individual participant, as well as when comparing SoC across individuals, viewing the profile graphs is vital. While the researcher followed all of the CBAM-recommended procedures for representing SoC data, he believes that the SoC profiles provide both the at-a-glance data of the *peak stage* and *peak and second high stage* analyses, along with the important consideration of the *relative intensities* of the SoC data. Simply examining peak stage data, or comparing one percentile to another, can cause a researcher to lose sight of the importance of considering the percentile scores for stages in relation to the percentile scores of the other stages. The subtleties of this—for instance, the differences between two profiles that have the same shape but are located significantly apart on the relative intensity scale—could be better explained in the SoC manual.

This researcher categorized SoC change patterns by considering change over time in both peak stage scores and in the relative intensities of the stages, all the while seeking to

interpret the SoC data according to CBAM guidelines. Examining other CBAM studies that considered individual pre- and post-SoC profiles to determine whether these change patterns are supported in similar or different contexts would be worthwhile. If typical SoC change patterns emerged from a meta-analysis of SoC studies, this would be a significant contribution to the CBAM literature.

Apart from these broad issues with regard to interpretation of SoC data, this study was one of the first to use the new version (075) of the SoCQ, which was intended to address issues with the reliability of Stage 0 (as reported to the developers over the years). The problems with Stage 0 reliabilities in this study (see Table 12, p. 93), given its small number of participants, should not be considered highly significant. However, as few studies using the new SoCQ have been published, this issue is worth briefly considering further here.

Table 13 depicted Stage 0 problems specifically with questions 3 and 12. Question 3 (*I am more concerned about another innovation*) seems particularly troublesome for university instructors, who typically are engaged with many competing innovations—both as instructors and researchers. Question 12 (*I am not concerned about this innovation at this time*) may share an additional issue with Question 3—the use of the word *concern*. Following the final administration of the SoCQ, one participant emailed the researcher this reflection:

I just thought I would mention that I have been a little confused by the "concern"-based model for evaluating my experience of the innovations. Does concern mean 'worried about' (which is clearly sometimes the implication in the question) or does concern mean 'care about'?

It would seem that individuals' responses would vary based on how worried or passionate/caring an individual they were? Not being a particularly worried or worriable [sic] individual and being sometimes accused of being too passionate/caring about the things I do (esp. with teaching), I wonder how that skews my answers? Since I'm a generally positive person, I've gone with a meaning of 'concern' meaning 'care about' unless 'worry' was the clear undertone of the question. Maybe I'm just thinking about it too much :). (personal communication, December 8, 2006)

Although other questions in the SoCQ feature the word *concern*, these two questions are the most general in their use of it. Other questions using the term reference a specific issue, problem, or situation (e.g. *I am concerned about revising the use of the innovation*). Is it possible that for these two, more general questions, participants' interpretation of *concern* varied enough to render these questions problematic? This seems worthy of additional study

as CBAM researchers continue to strive for reliability of Stage 0 on the SoCQ. Though CBAM validation studies have included university faculty, it seems that in light of the many demands upon and expectations for faculty at a research university, it is worth continuing to examine the validity of the CBAM measures for use in higher education contexts.

LEVELS OF USE

If LoU assessment follows the guidelines of CBAM researchers—using individuals certified in the interviewing and rating process—then it is resource intensive. For this study, the Colorado State LoU interview team conducted the LoU interviews in May (prior to the initial FDI workshop activities) and again in December (at the end of the fall semester)—after the innovation had been implemented. This researcher, to address Research Question 2, sought to identify change patterns based on change over time in the LoU. From the data, three LoU change patterns emerged:

- *Static LoU III* – Two participants remained at LoU III (Mechanical Use) throughout the study.
- *Growth from LoU III* – Four participants grew from LoU III to LoU IVA (Routine) or IVB (Refinement).
- *Static LoU IVA+* – Eight participants were initially rated at LoU IVA, IVB, or V (Integration); their ratings remained the same at the end of the study.

Thus, all participants were already considered innovation users at the outset of the study, and all participants either maintained or increased their LoU. The fact that only two of the study participants had an LoU of less than IVA by December can be interpreted as an indicator of the success of the FDI. On the other hand, the fact that only four of the study participants increased their LoU could be interpreted as a disappointment for the FDI. Either way, what is clear is that the LoU alone is insufficient as an indicator of faculty change; however, when examined along with other measures, it does provide illuminating information.

Participants

The LoU change profiles suggest that all participants were already users of the innovation, and further that most were already at least at the level of routine use (LoU IVA). However, as mentioned previously, the broad definition of the innovation makes it difficult to interpret this finding. As noted earlier, in the investigation of Research Question 4, the

researcher found that all participants who were initially rated at LoU III were lecturers, while all but one tenure-track participant were initially rated at LoU IVA or higher. This finding associating lecturers with a lower LoU for technology-oriented innovations is worth additional investigation in larger scale studies of faculty at similar institutions.

Based on the retrospective interviews, it appears that participants who entered the FDI at LoU III were less likely to choose to implement innovations that involved complex technology. This finding might have implications for faculty development participant selection, activity design, and outcome expectations. While the number of participants for this study was small, and thus caution must be exercised in generalizing findings, if these two LoU findings hold true, it would imply that a “smorgasbord approach” to technology-oriented faculty development may be more challenging for typical lecturers to contend with.

Faculty Development Initiative

Given the challenges associated with obtaining LoU data, the finding that four demographic survey questions appeared to be closely associated with the LoU is interesting. The four statements, each rated on a five-point Likert scale from Strongly Agree to Strongly Disagree, were:

- I am proficient with technologies that help manage my teaching work (e.g., Word, Excel, and the Internet).
- I am proficient with the use of technologies for presenting information and modeling or demonstrating in the classroom (e.g., PowerPoint, web browsers, and discipline-specific software).
- I am proficient with technologies used to communicate with and provide information to students outside of class (e.g., email, Blackboard, web conferencing tools).
- I am proficient with technologies typical in my discipline for problem-solving and research work.

Faculty developers might well wish to be able to tailor activities and outcomes to participants based on LoU without investing in LoU interviewing. However, as noted in Chapter 2, CBAM’s developers advocate that self-ratings cannot reliably be used to assess LoU. Thus, more research is needed to determine whether the four questions are sufficient as a predictor for the LoU of participants in other faculty development efforts focused on improved teaching with technology, especially if the innovation is defined more narrowly than it was in this study.

CBAM

For this researcher, the LoU data proved the least rich of all the information gathered in this study. Considering the time spent in obtaining it (by the researcher in coordinating the interviews, by the interview team, and by the participants themselves), this result is indeed unfortunate. In following the CBAM directive to use certified interviewers, the researcher himself became much less invested in this data—almost detached from it. LoU interviews themselves are potentially a rich data source, and interview ratings sheets, which assess the interviews on seven categories, also provide additional information. However, due to time limitations in conducting this study, only the final LoU ratings were incorporated into the analysis of the change process of the participants. Although the CBAM LoU manual does not emphasize the use of the ratings sheets for LoU research, this author believes that it may be worthwhile to use the category ratings to further compare users at a given measurement of the LoU, or to identify the details of change over time within a particular user.

The LoU data also may have been less valuable because of the broad definition of the innovation and the distance of the interview team from the FDI. As discussed earlier, had the interview team been provided with the IC Map, they may have been able to be much more specific with their LoU interview process and ratings, and the data may have shown more change over time with regard to specific aspects of the innovation as envisioned by the FDI leaders.

Primarily because of the limitations and challenges associated with obtaining LoU data, this researcher would not recommend LoU assessment as a component of typical faculty development efforts, unless the intention was to use more than simply the LoU ratings. In situations where assessment of the results of participants' innovation efforts is desirable, IC provides richer data. Additionally, this study has also suggested that it may be possible to obtain data comparable to LoU with regard to instructional technology uses by a much simpler means of self-ratings; this clearly requires further testing.

USE OF SoC, LoU, IC, AND CIT INTERVIEWS

The intent of Research Question 5 was to bring all of the data from the study together, to create a deeper understanding of the participants' various change processes. The first finding in this regard was that the LoU and SoC change patterns did not combine to create an

overall pattern of change. The two change patterns appear independent of one another. This suggests that both are important and distinct characteristics of instructor change. As explained in Chapter 4, the researcher chose to focus further analysis around the SoC change patterns, since they described a greater range of possible responses to the innovation.

Chapter 4 detailed the selection of four participants representing each of the SoC change patterns for additional IC Map assessment and CIT interviewing. Despite the seemingly dramatic differences among these patterns, each participant displayed evidence of growth in response to the FDI based on the extra research activities in which they engaged. When considering all four sources of data about participant change—SoC change patterns, LoU change patterns, IC assessment data, and CIT interview data—important details emerged which might be missed if focusing on any one measure alone.

The SoC *Positive Change* pattern, since it represents close to the idealized pattern of instructor change in the SoC framework, can be viewed as the starting point for analysis of the other SoC change patterns. Unlike any of the other SoC patterns, this one suggests an increasing focus on the impact of the innovation on students. The *Positive Change* pattern participant's IC assessment corroborated this finding, as her innovation was rated as *High Fidelity* to the ideals of the FDI. The innovation was the only one generated among the four final participants to engage students with a real-world technology within a project that was integral to the course content and assessed according to clear learning outcomes. Attention to the departures of the other three patterns from the *Positive Change* pattern may provide insight into faculty development approaches to consider for future FDIs.

Given additional time and access to participants, it would have been ideal to conduct IC assessment and CIT interviewing of all participants. In particular, neither of the two participants who were in the *Static LoU III* group were part of these final assessments. One of those was classified as SoC *Positive Change* while the other was in the SoC *Little Change* group; these distinctions would have been especially interesting to explore.

While the various change patterns emerging from this study provide insight at the macro level regarding possible responses of university instructors to faculty development interventions, what it reinforces even more is that change is a highly individual process—a key CBAM tenet.

While this study generated a rich set of data for each participant, the assessment measures did have some apparent limitations; issues related to SoC and LoU were described above. In addition, the CIT interviews did not elucidate the apparent challenges many instructors experienced as suggested by the SoC patterns. The warning about “post hoc rationalization” (Urquhart et al., 2003, p. 67) in retrospective interviews mentioned in Chapter 3 may have been prescient; it is possible that the CIT interviews functioned as a catalyst for the participants to rethink their perceptions. However, the fact that these discussions revealed largely positive experiences of the FDI among all of the interviewees may also indicate limitations to the characterizations represented by the SoC change patterns. The information that might most have informed understanding of the SoC change patterns, but was not collected in this study, is the context surrounding each participant during the study—specifically, the degree to which he or she was able to focus on the innovation and what competing priorities he or she may have faced.

An additional source of data not tapped for this study is the faculty developers and instructional design consultants. Their accounts might be one way to provide greater contextualization of faculty data. For example, consultants working with faculty might keep a log of interactions which could later be used to triangulate accounts of change and other self-reported data from faculty. Involving the faculty developers in an activity such as reflecting on the progress of participants in relation to the IC Map might also help to sustain their focus on the key components of the innovation, enabling them to in turn more effectively guide faculty.

CONCLUSION

The full potential of e-learning and electronically mediated instruction will not be realized unless there is an acknowledgement, on the part of a large number of faculty, that there is need to substantially improve educational quality, especially for undergraduates. What is required is a commitment to organized quality processes that transcend curricular innovation, stress technology as an important tool for improvement, and do not assume things are going well, absent evidence to the contrary. (Zemsky and Massy, 2004, pp. 57-58)

As universities increasingly recognize the importance of instructional technologies, so too will the need emerge for effective models of facilitating and assessing faculty development. High quality faculty development, like high quality instruction, must attend to

learner-centered practices such as meeting individual needs, providing timely feedback, enabling active learning, providing intrinsic motivation, and attending to the development of enduring conceptual structures (Foreman, 2003). The CBAM framework offers faculty developers an information-rich way to explore participant receptivity to change, and thus continually improve the effectiveness of faculty development.

In many situations, the success of faculty development will be judged according to its perceived impact on student learning outcomes. The connection between CBAM and student outcomes, however is not clear. CBAM advocates have long stressed the importance of research into this connection (Hall & Hord, 1987). The results of this study hint at this, in that the participant who scored closest to the ideal on CBAM measures including SoC and IC appeared to attend most closely to student learning outcomes. But actually assessing student work and connecting those results back to faculty change is a complex endeavor beyond the scope of this study. It is worth further research as to whether an IC Map can adequately capture how well a particular implementation of an innovation facilitates successful student outcomes.

In the final analysis, then, this study reinforced several essential tenets of the CBAM regarding instructor change:

- Change is a highly complex and individual process. Though a number of interesting change patterns were noted on various CBAM measures employed in this study, no unifying change patterns could be determined.
- The change process can be measured and characterized, but any single measure is insufficient to paint a complete picture.
- And finally, change can be facilitated when informed by rich data characterizing the receptivity of faculty development participants.

Additionally, this study developed several key recommendations for future related efforts, among them:

- CBAM must be understood as a rich and complex methodology that, while up to the task of capturing the complexities of instructor change, requires significant expertise to effectively implement and interpret.
- More extensive use of an IC Map may enhance both faculty development practice and CBAM research on faculty engaged in instructional innovations.
- Faculty development in higher education must attend to sustaining participant focus on the innovation beyond intensive workshop events.

- Identification of change patterns which differ from the ideal can provide formative feedback for faculty developers.

As universities increasingly emphasize instructional innovations associated with the uses of technology, this researcher's hope is that this study informs and improves the attendant faculty development efforts, and the assessment of those efforts, through a better understanding of the nature of instructor change.

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APPENDIX A

THE STAGES OF CONCERN QUESTIONNAIRE

The screenshot shows a web-based survey interface. At the top, there is a dark header bar with the text "Stages of Concern Questionnaire, round 3" on the left and "Exit this survey >>" on the right. Below the header, the word "Introduction" is displayed in a bold, sans-serif font. The main content area is white and contains several paragraphs of text. The first paragraph is an overview of the questionnaire. The second paragraph explains the purpose of the survey. The third paragraph describes the source of the items. The fourth paragraph discusses the relevance of items and the marking scale. The fifth paragraph provides examples of how items might be marked. The sixth paragraph defines the innovation being surveyed. The seventh paragraph asks respondents to respond based on their present concerns. The eighth paragraph states that there is no single definition of the innovation and asks for the respondent's own perception.

Stages of Concern Questionnaire, round 3 [Exit this survey >>](#)

Introduction

Overview of the *Stages of Concern (SoC) Questionnaire*

The purpose of this questionnaire is to determine the concerns people might have when they are using (or thinking about using) something new instructionally (for example, a software application, a group project, or a mediation strategy).

The items were developed from typical responses of school teachers and college instructors who ranged from no knowledge at all about (or experience with) their particular "innovation" to extensive knowledge about it (and many years of experience using it).

It is therefore possible that several items on this questionnaire may appear to be of little or no relevance to you at this time. For the completely irrelevant items, please mark a "0" on the scale.

Other items will represent those concerns you do have, in varying degrees of intensity, and should be marked higher on the scale.

For example:

"This statement is very true of me at this time" might be marked as a 7.

"This statement is somewhat true of me now" might be marked as a 4.

"This statement is not at all true of me at this time" might be marked as a 1.

"This statement seems irrelevant to me" would be marked as a 0.

For purposes of this survey, the innovation is: *use of advanced technologies (a) for instructional design/planning/delivery and (b) as a tool supporting students' ability to research, organize, visualize, manage, evaluate, and communicate information.*

Please respond to the items in terms of your present concerns, or how you feel about your involvement or potential involvement with this innovation.

We do not hold to any one definition of this innovation, so please think of it in terms of *your own perception* of what it involves.

Figure 17. Screen shot of web-based Stages of Concern Questionnaire – part one of introductory page.

Since this questionnaire is standardized (and thus used in many different situations), the description "using advanced technologies ..." never appears. However, phrases such as *the innovation, this approach, and the new system* all refer to *using advanced technologies (a) for instructional design/planning/delivery and (b) as a tool supporting students' ability to research, organize, visualize, manage, evaluate, and communicate information.*

Remember to respond to each item in terms of your present concerns -- not concerns you might feel in the future.

Thank you for taking the time to complete this task.

Please provide the last 5 digits of your SDSU Red ID (example: 97391). This will be used solely for the purpose of matching data you provide here with other data collected for this study.

Next >>

Figure 18. Screen shot of web-based Stages of Concern Questionnaire – part two of introductory page.

Stages of Concern Questionnaire, round 3

[Exit this survey >>](#)

Main Questionnaire

The 35-item Stages of Concern (Soc) Questionnaire

Remember that for this questionnaire, phrases such as "the innovation," "this approach," and "the new system" all refer to using advanced technologies (a) for instructional design/planning/delivery and (b) as a tool supporting students' ability to research, organize, visualize, manage, evaluate, and communicate information.

Select one number for each item from this scale:

0 = Irrelevant

1-2 = Not true of me now

3-5 = Somewhat true of me now

6-7 = Very true of me now

	0	1	2	3	4	5	6	7
I am concerned about students' attitudes toward the innovation.	☐	☐	☐	☐	☐	☐	☐	☐
I now know of some other approaches that might work better.	☐	☐	☐	☐	☐	☐	☐	☐
I am more concerned about another innovation.	☐	☐	☐	☐	☐	☐	☐	☐
I am concerned about not having enough time to organize myself each day.	☐	☐	☐	☐	☐	☐	☐	☐
I would like to help other faculty in their use of the innovation.	☐	☐	☐	☐	☐	☐	☐	☐

Figure 19. Screen shot of web-based Stages of Concern Questionnaire – part one of SoCQ page.

I have a very limited knowledge of the innovation.	☐	☐	☐	☐	☐	☐	☐	☐
I would like to know the effect of reorganization on my professional status.	☐	☐	☐	☐	☐	☐	☐	☐
I am concerned about conflict between my interests and my responsibilities.	☐	☐	☐	☐	☐	☐	☐	☐
I am concerned about revising my use of the innovation.	☐	☐	☐	☐	☐	☐	☐	☐
I would like to develop working relationships with both our faculty and outside faculty using this innovation.	☐	☐	☐	☐	☐	☐	☐	☐
I am concerned about how the innovation affects students.	☐	☐	☐	☐	☐	☐	☐	☐
I am not concerned about the innovation at this time.	☐	☐	☐	☐	☐	☐	☐	☐

Figure 20. Screen shot of web-based Stages of Concern Questionnaire – part two of SoCQ page.

Remember that for this questionnaire, phrases such as "the innovation," "this approach," and "the new system" all refer to using advanced technologies (a) for instructional design/planning/delivery and (b) as a tool supporting students' ability to research, organize, visualize, manage, evaluate, and communicate information.

Select one number for each item from this scale:

0= Irrelevant

1-2 = Not true of me now

3-5 = Somewhat true of me now

6-7 = Very true of me now

	0	1	2	3	4	5	6	7
I would like to know who will make the decisions in the new system.	☐	☐	☐	☐	☐	☐	☐	☐
I would like to discuss the possibility of using the innovation.	☐	☐	☐	☐	☐	☐	☐	☐
I would like to know what resources are available if we decide to adopt the innovation.	☐	☐	☐	☐	☐	☐	☐	☐
I am concerned about my inability to manage all that the innovation requires.	☐	☐	☐	☐	☐	☐	☐	☐
I would like to know how my teaching or administration is supposed to change.	☐	☐	☐	☐	☐	☐	☐	☐

Figure 21. Screen shot of web-based Stages of Concern Questionnaire – part three of SoCQ page.

I would like to familiarize other departments or persons with the progress of this new approach.	☐	☐	☐	☐	☐	☐	☐	☐
I am concerned about evaluating my impact on students.	☐	☐	☐	☐	☐	☐	☐	☐
I would like to revise the innovation's approach.	☐	☐	☐	☐	☐	☐	☐	☐
I am completely occupied with things other than the innovation.	☐	☐	☐	☐	☐	☐	☐	☐
I would like to modify our use of the innovation based on the experiences of our students.	☐	☐	☐	☐	☐	☐	☐	☐
I spend little time thinking about the innovation.	☐	☐	☐	☐	☐	☐	☐	☐
I would like to excite my students about their part in this approach.	☐	☐	☐	☐	☐	☐	☐	☐

Figure 22. Screen shot of web-based Stages of Concern Questionnaire – part four of SoCQ page.

Remember that for this questionnaire, phrases such as "the innovation," "this approach," and "the new system" all refer to using advanced technologies (a) for instructional design/planning/delivery and (b) as a tool supporting students' ability to research, organize, visualize, manage, evaluate, and communicate information.

Select one number for each item from this scale:

0= Irrelevant

1-2 = Not true of me now

3-5 = Somewhat true of me now

6-7 = Very true of me now

	0	1	2	3	4	5	6	7
I am concerned about time spent working with nonacademic problems related to this innovation.	☐	☐	☐	☐	☐	☐	☐	☐
I would like to know what the use of the innovation will require in the immediate future.	☐	☐	☐	☐	☐	☐	☐	☐
I would like to coordinate my effort with others to maximize the innovation's effects.	☐	☐	☐	☐	☐	☐	☐	☐
I would like to have more information on time and energy commitments required by this innovation.	☐	☐	☐	☐	☐	☐	☐	☐
I would like to know what other faculty are doing in this area.	☐	☐	☐	☐	☐	☐	☐	☐

Figure 23. Screen shot of web-based Stages of Concern Questionnaire – part five of SoCQ page.

Currently, other priorities prevent me from focusing my attention on the innovation.	☐	☐	☐	☐	☐	☐	☐	☐
I would like to determine how to supplement, enhance, or replace the innovation.	☐	☐	☐	☐	☐	☐	☐	☐
I would like to use feedback from students to change the program.	☐	☐	☐	☐	☐	☐	☐	☐
I would like to know how my role will change when I am using the innovation.	☐	☐	☐	☐	☐	☐	☐	☐
Coordination of tasks and people is taking too much of my time.	☐	☐	☐	☐	☐	☐	☐	☐
I would like to know how this innovation is better than what we have now.	☐	☐	☐	☐	☐	☐	☐	☐

This is the END of the survey. Thank you very much for your participation in this study!

[<< Prev](#) [Done >>](#)

Figure 24. Screen shot of web-based Stages of Concern Questionnaire – part six of SoCQ page.

Note: This is the latest version of the Stages of Concern Questionnaire, SoCQ 075, found in George et al. (2006, pp. 79-81).

APPENDIX B

**STAGES OF CONCERN QUESTIONNAIRE, WITH
QUESTIONS GROUPED BY STAGE**

Table 41. Statements on the Stages of Concern Questionnaire Arranged According to Stage

Item	Statement
Stage 0	
3	I am more concerned about another innovation.
12	I am not concerned about this innovation at this time.
21	I am preoccupied with things other than this innovation.
23	I spend little time thinking about this innovation.
30	Currently, other priorities prevent me from focusing my attention on this innovation.
Stage 1	
6	I have a very limited knowledge about the innovation.
14	I would like to discuss the possibility of using the innovation.
15	I would like to know what resources are available if we decide to adopt this innovation.
26	I would like to know what the use of the innovation will require in the immediate future.
35	I would like to know how this innovation is better than what we have now.
Stage 2	
7	I would like to know the effect of the innovation on my professional status.
13	I would like to know who will make the decisions in the new system.
17	I would like to know how my teaching or administration is supposed to change.
28	I would like to have more information on time and energy commitments required by this innovation.
33	I would like to know how my role will change when I am using the innovation.
Stage 3	
4	I am concerned about not having enough time to organize myself each day.
8	I am concerned about conflict between my interests and my responsibilities.
16	I am concerned about my inability to manage all the innovation requires.
25	I am concerned about time spent working with nonacademic problems related to this innovation.
34	Coordination of tasks and people is taking too much of my time.

Stage 4

- 1 I am concerned about students' attitudes toward this innovation.
- 11 I am concerned about how the innovation affects students.
- 19 I am concerned about evaluating my impact on students.
- 24 I would like to excite my students about their part in this approach.
- 32 I would like to use feedback from students to change the program.

Stage 5

- 5 I would like to help other faculty in their use of the innovation.
- 10 I would like to develop working relationships with both our faculty and outside faculty using this innovation.
- 18 I would like to familiarize other departments or people with the progress of this new approach.
- 27 I would like to coordinate my effort with others to maximize the innovation's effects.
- 29 I would like to know what other faculty are doing in this area.

Stage 6

- 2 I now know of some other approaches that might work better.
- 9 I am concerned about revising my use of the innovation.
- 20 I would like to revise the innovation's instructional approach.
- 22 I would like to modify our use of the innovation based on the experiences of our students.
- 31 I would like to determine how to supplement, enhance, or replace the innovation.

Note. From *Measuring implementation in schools: The Stages of Concern Questionnaire* (pp. 27-28), by A. A. George, G.E. Hall, and S. M. Stiegelbauer, 2006, Austin, TX: Southwest Educational Development Laboratory. Copyright 2006 by Southwest Educational Development Laboratory.

APPENDIX C

LEVELS OF USE INTERVIEW PROTOCOL AND

RATING SHEET

THE LEVELS OF USE OF THE INNOVATION

INTERVIEW PROTOCOL

The innovation for this study is defined as: using advanced technologies (a) for instructional design/planning/delivery and (b) as a tool supporting students' ability to research, organize, visualize, manage, evaluate, and communicate information.

1. Are you using the innovation?
 - If yes, then proceed to 2
 - If no, then proceed to 10
2. What do you see as the strengths and weaknesses of the innovation in your situation? Have you made any attempt to do anything about the weaknesses?
3. Are you currently looking for any information about the innovation? What kind? For what purpose?
4. Do you ever talk with others about the innovation? What do you tell them?
5. What do you see as being the effects of the innovation? In what way have you determined this? Are you doing any evaluating, either formally or informally, of your use of the innovation? Have you received any feedback from the students? What have you done with the information you get?
6. Have you made any changes recently in how you use the innovation? What? Why? How recently? Are you considering making any changes?
7. As you look ahead to later this year, what plans do you have in relation to your use of the innovation?
8. Are you working with others (outside of anyone you may have worked with from the beginning) in your use of the innovation? Have you made any changes in your use of the innovation based on this coordination?
9. Are you considering or planning to make major modifications or to replace the innovation at this time?
10. If Q1 = No
11. Have you made a decision to use the innovation in the future? If so, when?
12. Can you describe the innovation for me as you see it?
13. Are you currently looking for any information about the innovation? What kinds? For what purposes?
14. What do you see as the strengths and weaknesses of the innovation for your situation?

15. At this point in time, what kinds of questions are you asking about the innovation? Give examples if possible.
16. Do you ever talk with others and share information about the innovation? What do you share?
17. What are you planning with respect to the innovation? Can you tell me about any preparation or plans you have been making for the use of the innovation?
18. Can you summarize for me where you see yourself right now in relation to the use of the innovation?

From *Measuring Levels of Use of the innovation: A manual for trainers, interviewers, and raters* (pp. 24-26), by S. F. Loucks, B. W. Newlove, and G. E. Hall, 1976, Austin, TX: Southwest Educational Development Laboratory. Copyright 1976 by Southwest Educational Development Laboratory.

LEVELS OF USE OF THE INNOVATION INTERVIEW RATING SHEET

Tape # _____

Site: _____

Interviewer: _____

Date: _____

I.D. #: _____

Rater: _____

LEVEL	Knowledge	Acquiring Information	Sharing	Assessing	Planning	Status Reporting	Performing	Overall LoU
Non-Use	0	0	0	0	0	0	0	0
Decision Point A Orientation	I	I	I	I	I	I	I	I
Decision Point B Preparation	II	II	II	II	II	II	II	II
Decision Point C Mechanical Use	III	III	III	III	III	III	III	III
Decision Point D-1 Routine	IVA	IVA	IVA	IVA	IVA	IVA	IVA	IVA
Decision Point D-2 Refinement	IVB	IVB	IVB	IVB	IVB	IVB	IVB	IVB
Decision Point E Integration	V	V	V	V	V	V	V	V
Decision Point F Renewal	VI	VI	VI	VI	VI	VI	VI	VI
User is not doing	ND	ND	ND	ND	ND	ND	ND	
No information in interview	NI	NI	NI	NI	NI	NI	NI	

Past User _____

Estimated Past LoU _____

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APPENDIX D

INNOVATION CONFIGURATIONS MAP

INNOVATION CONFIGURATION MAP FOR FACULTY FELLOW PROJECTS
(FORMATTED FOR NOTE-TAKING DURING INFORMAL INTERVIEWS)

A. LEARNING SCIENCES			
1. Project Design			
a	b	c	d
<p>The project is complete and well-scaffolded. It offers adaptations for more motivated learners and/or for students with special needs or learning preferences. Use of ICT is integral to the project.</p>	<p>The project is complete. The instructor has included some scaffolding. The project could not be accomplished without ICT.</p>	<p>The project may be complete, but lacks depth. The learning time invested in the project may be inappropriately high or low given its educational value.</p>	<p>The project is incomplete or poorly conceived. The project's scope is too large or too small. The instructor has not considered student learning needs.</p>
<p>How did your students do with the project? Did some students respond differently than others? What did the technology add to the project?</p>			
2. Curricular Connections			
a	b	c	d
<p>The project's ICT use effectively and creatively supports a solution for a learning problem or opportunity linked with the course curriculum.</p>	<p>The project's ICT use supports a solution for a learning problem or opportunity linked with the course curriculum.</p>	<p>The project's ICT use has a tenuous connection to a learning problem or opportunity, which may not be clearly linked to the course curriculum.</p>	<p>The project's ICT use is unrelated to a learning problem or opportunity linked with the course curriculum.</p>
<p>How did you determine what you wanted to do, and what technology you would use?</p>			

3. Student Learning Outcomes			
a	b	c	d
Learning outcomes are measurable and clear. They are rigorous and inclusive of the learning associated with the project.	Learning outcomes are measurable and clear. They are somewhat rigorous and inclusive of the learning associated with the project.	Learning outcomes are present but may be only somewhat measurable, clear, rigorous, and inclusive of the learning associated with the project.	There are no stated learning outcomes associated with the project.
What were the learning outcomes associated with the project?			
4. Assessment			
a	b	c	d
Multiple assessments (e.g., formative, summative, reflection, feedback) are employed that directly align with learning outcomes. The assessment strategies are fair and clearly articulated. Instructor uses assessment data to evaluate project and inform next steps.	An appropriate assessment strategy is employed. Assessment is linked to the learning outcomes and adequately measures student learning. Instructor uses assessment data to evaluate project.	Assessment is planned for but the assessment is inadequate or incomplete, is only formative or only summative, and may not reflect or measure the learning outcomes. Instructor may not indicate how assessment data will be used.	There are no clear plans for formative or summative assessment or the forms of assessment do not match learning outcomes. Assessment data, if any, is not used by instructor for any purpose other than student evaluation.
How did you assess the learning outcomes? How did you evaluate the project?			

B. DIGITAL KNOW-HOW (INSTRUCTOR AND STUDENT)

5. Information, Technological, and Visual Literacies (see indicators on p. 3)

a	b	c	d
Instructor and student proficiency in multiple aspects of information, technological, and visual literacies is integral to attainment of student learning outcomes.	Instructor and/or students engage in multiple aspects of information, technological, and visual literacies.	Instructor and/or students optionally or minimally engage in aspects of information, technological, and visual literacies.	Neither instructor nor students engages in aspects of information, technological, and visual literacies.
<p>What were the key skills and knowledge you needed with regard to visual and information technologies in order for this project to succeed? What were the key skills & knowledge your students needed ...?</p>			

6. Effective Use of Real-World ICT Tools

a	b	c	d
Instructor and student use of real-world ICT tools to communicate, collaborate, solve problems, and accomplish tasks is integral to the attainment of student learning outcomes.	Instructor and/or students use real-world ICT tools to communicate, collaborate, solve problems, and/or accomplish tasks during the project.	Instructor and/or students optionally or minimally use real-world ICT tools during the project.	Neither instructor nor students uses real-world ICT tools.
<p>What were the tools that you/your students used on the project, and in what ways were they used?</p>			

C. KEY (STUDENT) COMPETENCIES

7. Inventive Thinking (adaptability/managing complexity, self-direction, curiosity, creativity, risk-taking, and higher-order thinking)

a	b	c	d
Student proficiency in multiple aspects of adaptability/managing complexity, self-direction, curiosity, creativity, risk-taking, and higher-order thinking is integral to the attainment of student learning outcomes.	Students engage in multiple aspects of adaptability/managing complexity, self-direction, curiosity, creativity, risk-taking, and higher-order thinking.	Students optionally or minimally engage in aspects of adaptability/managing complexity, self-direction, curiosity, creativity, risk-taking, and higher-order thinking.	Students do not engage in adaptability/managing complexity, self-direction, curiosity, creativity, risk-taking, and higher-order thinking.

What kinds of thinking and problem-solving skills were required of the students for the project?

8. Effective Communication (collaboration, interpersonal and interactive communication, and personal and social responsibility)

a	b	c	d
Student proficiency in multiple aspects of collaboration, interpersonal and interactive communication, and personal and social responsibility is integral to the attainment of student learning outcomes.	Students engage in multiple aspects of collaboration, interpersonal and interactive communication, and personal and social responsibility.	Students optionally or minimally engage in aspects of collaboration, interpersonal and interactive communication, and personal and social responsibility.	Students do not engage in collaboration, interpersonal and interactive communication, and personal and social responsibility.

What kinds of communication skills and responsibilities were required of students for the project?

Digital know-how and key competencies criteria based on North Central Regional Educational Laboratory's 21ST CENTURY SKILLS: LITERACY IN THE DIGITAL AGE. From that report:

People fluent with Technological Literacy:

- Demonstrate a sound conceptual understanding of the nature of technology systems and view themselves as proficient users of these systems.
- Understand and model positive, ethical use of technology in both social and personal contexts.
- Use a variety of technology tools in effective ways to increase creative productivity.
- Use communication tools to reach out to the world beyond the classroom and communicate ideas in powerful ways.
- Use technology effectively to access, evaluate, process and synthesize information from a variety of sources.
- Use technology to identify and solve complex problems in real-world contexts.

People fluent with Visual Literacy:

- Understand basic elements of visual design, technique, and media.
- Are aware of emotional, psychological, physiological, and cognitive influences in perceptions of visuals.
- Comprehend representational, explanatory, abstract, and symbolic images.
- Are informed viewers, critics, and consumers of visual information.
- Are knowledgeable designers, composers, and producers of visual information.
- Are effective visual communicators.
- Are expressive, innovative visual thinkers and successful problem solvers.

People fluent with Information Literacy:

- Determine what is known and what is needed for problem solving.
- Identify different sources of information, including text, people, video, audio, and databases.
- Prioritize sources based on credibility and relevance.
- Identify and retrieve relevant information from sources; use technology to enhance searching.
- Revise information-gathering strategies that prove to be ineffective.
- Understand how information retrieved does or does not address original problem.
- Evaluate information in terms of credibility and social, economic, political, legal, and ethical issues that may impact it; use technology to facilitate evaluation.
- Use retrieved information to accomplish a specific purpose.
- Present information clearly and persuasively using a range of technology tools and media.
- Evaluate the processes and products of these activities, including resulting social consequences.

APPENDIX E

CRITICAL INCIDENT TECHNIQUE INTERVIEW

PROTOCOL

This interview will consist of two primary components. First, I will ask you about an important learning experience (or experiences) for you during the summer workshop or follow-up situations, when you were working on understanding or developing an innovation related to using advanced technologies (a) for instructional design/planning/delivery and (b) as a tool supporting students' ability to research, organize, visualize, manage, evaluate, and communicate information. Second, I will ask you about an important experience (or experiences) you had during the fall semester, when you were trying to implement an innovation related to using advanced technologies: (a) for instructional design/planning/delivery and (b) as a tool supporting students' ability to research, organize, visualize, manage, evaluate, and communicate information.

Introductory Question: I want you to think of an occasion this summer when you were in the faculty workshop or in a consultative situation working on your innovation and the activities had a noticeable impact on your learning and understanding. This might be an occasion when you finally caught on to a concept or skill that you were having a hard time understanding. Please describe to me the key elements of this time with enough detail so that they can be clearly understood by others. I will be asking some questions to assist you in telling your story.

1. Can you give a brief overview of the experience? (Setting, circumstances, people involved hardware, software, content, methods, materials, timing, outcome)
2. Had you tried to learn the concept or skill before? IF YES, how was this time different?
3. What background do you think you needed to understand this concept or skill?
 - 3a. How do you think you got this background?
4. What makes this concept or skill particularly challenging?
5. How did you think you would apply this concept or skill to enhance student learning?
6. How could you tell when you were doing it right or could understand the problem?
7. Did you think the way that you understood this during this experience would be beneficial for when you actually wanted to use this with your students?
8. If the [FDI] program wanted to provide a similar learning experience for other faculty, what would they need to know?

(What are the key elements that made this learning experience effective?)

Do you have another important learning experience you would like to share?

(if so, then repeat questions above. Continue to ask about other important learning experiences until no more)

Thank you. Now I would like to ask about an important experience you may have had this fall while implementing an innovation related to using advanced technologies (a) for instructional design/planning/delivery and/or (b) as a tool supporting students' ability to research, organize, visualize, manage, evaluate, and communicate information.

Introductory question: I want you to think of an occasion when your innovation had a noticeable impact on your students. This might be an occasion when students finally caught on to some difficult concept or skill. Please describe to me the key elements of this teaching experience with enough detail so that they can be clearly understood by others. I will be asking some questions to assist you in telling your story.

1. Can you give a brief overview of the experience? (Setting, circumstances, people involved, hardware, software, content, methods, materials, timing)
2. Had you tried to teach the concept/skill before? IF YES, how was this lesson different?
3. What background do you think students need to understand this concept/skill?
3a. Where do you think students learn this (background needed to understand concept/skill)?
4. What makes this concept/skill difficult for students?
5. How do you balance the need to teach technology operations and subject-area content?
6. How do you think students would apply this concept/skill in other courses and/or in a work setting?
7. How do you decide when students have mastered this concept/skill?
8. If other faculty wanted to provide a similar learning experience for students, what would they need to know?

(What are the key elements that made this teaching experience effective?)

Do you have another important teaching experience you would like to share?

(if so, then repeat questions above. Continue to ask about other important teaching experiences until no more)

Thank you very much for your time.

Adapted from protocols found in Lambrecht (1999).

APPENDIX F

INITIAL WEB-BASED SURVEY DEMOGRAPHIC

QUESTIONS

Stages of Concern Questionnaire [Exit this survey >>](#)

Supplemental Questions

Please answer a few brief questions about yourself.

How many years of *university-level* teaching experience do you have?

Into which age range do you fall?

☐ 30 or under
☐ 31-35
☐ 36-40
☐ 41-45
☐ 46-50
☐ 51-55
☐ 55-60
☐ over 60

Please indicate the extent to which you agree or disagree with each statement below. (If your answer varies depending on which course you are teaching, then respond based on the course you'll be working on as part of your PICT fellowship.)

	Strongly Agree	Agree	Uncertain	Disagree	Strongly Disagree
I am proficient with technologies that help manage my teaching work (e.g., Word, Excel, and the Internet).	☐	☐	☐	☐	☐
It's important for me to use technologies that help manage my teaching work (e.g., Word, Excel, and the Internet).	☐	☐	☐	☐	☐
I am proficient with the use of technologies for presenting information and modeling or demonstrating in the classroom (e.g., PowerPoint, web browsers, and discipline-specific software).	☐	☐	☐	☐	☐
It's important for me to use technologies for presenting information and modeling or demonstrating in the classroom (e.g., PowerPoint, web browsers, and discipline-specific software).	☐	☐	☐	☐	☐

Figure 25. Screen shot of web-based Stages of Concern Questionnaire – part one of demographic question additions to the May SoCQ administration.

I am proficient with technologies used to communicate with and provide information to students outside of class (e.g., email, Blackboard, web conferencing tools).	☐	☐	☐	☐	☐
It's important for me to use technologies to communicate with and provide information to students outside of class (e.g., email, Blackboard, web conferencing tools).	☐	☐	☐	☐	☐
I am proficient with technologies typical in my discipline for problem-solving and research work.	☐	☐	☐	☐	☐
It's important that my students use technologies typical in my discipline for problem-solving and research work.	☐	☐	☐	☐	☐
I spend a portion of class time giving students background factual knowledge and directly teaching concepts.	☐	☐	☐	☐	☐
I spend a portion of class time using such instructional approaches as whole- or small-group discussions, projects, and presentations.	☐	☐	☐	☐	☐
My role is to be a facilitator, providing opportunities and resources for students to discover or construct concepts for themselves.	☐	☐	☐	☐	☐
My role is to go over course material in a structured way, explaining, demonstrating, and assigning specific practice.	☐	☐	☐	☐	☐
This is the END of the survey. Thank you for your time!					
<< Prev Done >>					

Figure 26. Screen shot of web-based Stages of Concern Questionnaire – part two of demographic question additions to the May SoCQ administration.

APPENDIX G

FACULTY DEVELOPMENT INITIATIVE MATERIAL: INVITATION TO PARTICIPATE, APPLICATION, GUIDELINES FOR REPORTING

**MEMO FROM UNDERGRADUATE DEAN TO ALL
FACULTY, SENT MARCH 2, 2006**

TO: All Faculty
FROM: Geoffrey Chase, Dean, Division of Undergraduate Studies
RE: People, Information and Communication Technology Summer Workshop

Dear Colleague,

People, Information and Communication Technologies (pICT) invites you to apply for the 2006 pICT Faculty Fellowship Program and Summer Institute. The Fellowship is designed to help faculty consider various ways to incorporate innovative use of information and communication technology (ICT) in teaching and learning, and how to better prepare our students to address and solve 21st century problems. Funding from the Qualcomm Institute for Innovation and Educational Success will allow us to provide stipends to approximately 20 participants. This year we are interested in working with faculty and lecturers who teach lower-division GE Foundation courses, particularly those with class sizes of 60 or more students.

The Fellowship begins with a four-day workshop, May 22-25, which includes short presentations from experts in the field, and provides opportunities for faculty participants to learn about exciting new instructional technologies designed to engage students and enhance learning. The program will also provide opportunities for participants to work together with resource experts, and to actively engage in a learning community of faculty scholars and staff who are excited about developing rich and meaningful learning experiences for students. An ongoing program of workshops, customized consulting and other activities will continue throughout the summer and fall to help participants revise their course to enhance, introduce, or incorporate the use of or knowledge about information and communication technology and to design a way to assess its impact on student learning.

Applications for the Fellowship Program are due April 3, 2006.

At the end of the summer, pICT Fellows will share their course changes with others. Participants who make revisions to their courses will receive a stipend of \$1,000. Those who implement and assess the impact of their revisions in a fall course will receive a second stipend of \$1,000 in January.

For more information and to apply please go to:

<http://www.formdesk.com/sdsu/fellows06>

For questions please contact:

Suzanne Aurilio, Assistant Director, pICT

pict@rohan.sdsu.edu

ext: 4-2953

APPLICATION FOR 2006 FDI FELLOWSHIP (ORIGINALLY AN ONLINE APPLICATION)

People, Information and Communication Technologies (pICT) invites you to apply for the 2006 pICT Faculty Fellowship Program and Summer Institute. The Fellowship is designed to help faculty consider various ways to incorporate innovative use of information and communication technology (ICT) in teaching and learning, and how to better prepare our students to address and solve 21st century problems. Funding from the Qualcomm Institute for Innovation and Educational Success will allow us to provide stipends to approximately 20 participants. This year we are interested in working with faculty and lecturers who teach lower-division GE Foundation courses, particularly those with class sizes of 60 or more students.

Program Overview

The Fellowship begins with a four-day workshop, May 22-25, which includes short presentations from experts in the field, and provides opportunities for faculty participants to learn about exciting new instructional technologies designed to engage students and enhance learning. The program will also provide opportunities for participants to work together with resource experts, and to actively engage in a learning community of faculty scholars and staff who are excited about developing rich and meaningful learning experiences for students. An ongoing program of workshops, customized consulting and other activities will continue throughout the summer and fall to help participants revise their course to enhance, introduce, or incorporate the use of, or knowledge about information and communication technology, and to design a way to assess its impact on student learning.

At the end of the summer, pICT Fellows will share their course changes with colleagues. Participants who make revisions to their courses will receive a stipend of \$1,000. Those participants who implement and assess the impact of their revisions in a fall course will receive a second stipend of \$1,000 in January.

Applications due April 3, 2006

Program Details

The Fellowship is designed to:

- * Create a cadre of faculty who have developed an understanding of various learning technologies, how they can be used to facilitate a student learning activity or assignment, and who will serve as role models and future mentors to other faculty.
- * Provide recognition and reward faculty efforts to infuse information and communication technology literacy in their courses.
- * Promote more coherent, challenging and relevant learning experiences for our students by providing opportunities for faculty to discuss their teaching and learning goals.
- * Provide an environment that fosters interdisciplinary discussions and faculty learning communities.

Changes that faculty might make include but are not limited to:

- * Introducing learning technology to enhance an assignment, to improve a student-learning outcome, to develop a virtual learning environment or to create a resource efficiency.
- * Using information and communication technology issues as subject matter in their courses (e.g., how the internet has changed the concept of a global community; how the medium changes the message, how innovation might differentially impact various cultures or countries; how digital information creates new challenges and legal issues related to intellectual property, etc).
- * Creating class, group, or individual projects that incorporate the use of information or communication technology to, for example: address a community problem, improve some type of communication, respond to an educational or teaching need, etc.
- * Working with Library Faculty to create a learning module that responds to a specific class assignment in a way that will improve at least one element of information literacy.

- * Working on a team project with other faculty to use technology to develop, enhance, improve the coherence of a common learning goal or goals across disciplines.
- * Creating a technology enhanced student learning outcome assessment tool.

Expectations and Benefits for Selected Faculty:

- * Participant faculty who are selected as pICT Fellows will attend the workshop and develop an innovative change in their course over the summer.
- * On August 22, Fellows will present their course change to colleagues and submit a short write-up, at which time they will receive the first \$1,000 stipend.
- * Participants who implement and assess a course change in the Fall and present and submit a short write-up at the beginning of January 2007 will receive a second \$1000 stipend.
- * Other support resources will be provided as needed, including consulting or GA educational technology support, and learning outcome assessment of the course innovation.
- * Participants will increase their familiarity with new learning ideas using enGauge's 21st skills framework.
- * Participants will receive recognition for their project.
- * The workshop will provide opportunities to work with faculty from other disciplines.

Application procedure: We have found that these workshops yield the best results when they are small enough so that participants have ample opportunity to work in small groups and to get to know each other. Therefore, we will limit enrollment to 20.

Applications due April 3

Fellowship announcements will be made by April 17

pICT Faculty Fellowship 2006 Application

Dear Colleague,

Thank you for your interest in our program. The Fellowship is designed to create a cadre of faculty who are thinking ahead and anew about student learning at SDSU. We're looking for faculty who are excited about educational technologies and how they can be coherently integrated into courses and curricular. Expertise using technologies is not required. However, in order to make the most of the experience, you should be proficient in basic uses of the MS Office Suite and have an interest in expanding your toolbox.

Selected Faculty attend the summer workshop, develop an innovative change in their course over the summer and on August 22, present their change to colleagues and submit a short write-up, at which time they receive a \$1,000 stipend. Those participants who implement and assess the course change in the Fall, and present and submit a short write-up at the beginning of January 2007, will receive a second \$1000 stipend. Support resources will be provided as needed including consulting or GA support from educational technologists.

Thank you and we look forward to receiving your application!

Cathie Atkins, Director

Suzanne Aurilio, Assistant Director

First name

Last name

Position

Department

Email

Preferred Telephone Number

What course do you plan to focus on?

Title

Course Number

Department

Briefly describe why you are interested in participating in the pICT Faculty Fellowship:

- 1) What you hope to gain professionally from the experience, and
- 2) What improvements and/or innovations you would like to address.

Briefly describe your current use of technologies for teaching and learning.

If you plan to work in a team on a cluster of related courses, please give us a brief overview of how those courses are related and the changes you're considering. Please give us the name of your partner(s) and how you're envisioning the collaborative process.

Please attach a current syllabus for the course you plan to focus on.

Please (re)name your file with your last name, e.g. aurilio.doc

Further information contact:

Suzanne Aurilio

Assistant Director, pICT

pict@rohan.sdsu.edu

594-2953

GUIDELINES FOR FDI PROJECT ASSESSMENT AND REPORTING, SENT OCTOBER 11, 2006

plCT Project 2006

Assessing your experiment

Now that you have developed your innovation, and you are in the process of implementing it, a critical component of that implementation is assessment—determining if it accomplishes what you had intended. As experienced instructors, you know that feedback from your students is key to designing effective student learning experiences.

We have listed a number of leading questions below which we hope will guide the assessment of your new curricular piece. All of your projects are small teaching and learning experiments, and like all experiments it's important to know how well they worked, what we can learn and tweak, or reconsider to make improvements or build upon in future semesters. These questions will help focus your attention on your desired outcomes and the process by which you've accomplished them and should also form the basis of your poster presentation and write up.

The presentations will take place on January 11, 2007, 12-2pm in LL108, Love Library.

Leading Questions:

- Give a very brief background or description of your innovation so we can orient ourselves.
- Describe your assessment approach.
- What factors (environmental, logistical, *etc.*) contributed to you choosing that approach?
- What conclusions about your intervention have you drawn from the feedback you've collected?
- How does the feedback you've received differ from your observations and/or expectations of your innovation's *impact/success*?
- *Describe/List/Identify* the changes you *will/would* make as a result of this process.
- If you had anticipated problems implementing your intervention, how might they be reflected in the results of your assessment?

APPENDIX H

KEY COMMUNICATIONS WITH PARTICIPANTS

SDSU RESEARCH PARTICIPATION INVITATION
EMAIL OF MAY 12, 2006 TO ALL FDI FELLOWS

Dear 2006-07 *p*ICT fellow:

I am writing to let you know about a research study I am conducting that may be of interest to you. I am a doctoral student in the San Diego State University – University of San Diego joint doctoral program in education, and the associate director of Instructional Technology Services here at SDSU. I am the principal investigator; Dr. Marcie Bober of the Department of Educational Technology is my dissertation chair.

This study is being conducted with the cooperation of SDSU's People, Information, and Communication Technologies (*p*ICT) program. All 2006 *p*ICT fellows are eligible to participate.

The focus of the study is the faculty change process in response to an innovation introduced through a faculty development program. If you choose to participate, you will be asked to complete two phone interviews (15-45 minutes each) and three web-based surveys (each featuring 35 items) between now and December. In addition, you may also be part of a subset of participants asked to consent to a review of the reports you present in the course of your *p*ICT fellowship and complete a final retrospective interview lasting no more than an hour. Please see the attached consent form for more details about the study, including incentives for participation.

Please be aware that your involvement in this or any research study is completely voluntary. There are no consequences to you whatsoever if you choose not to participate, and your *p*ICT fellowship will not be affected in any way by that choice.

In order to determine your interest in participating, I will be calling you directly on Monday. You may choose not to speak with me. If you do speak with me, I will address any questions you have about the study. If you are willing to participate, please print and sign the attached consent form.

Of course, you may feel free to contact me directly using the information on the attached consent form. Thank you for your consideration.

Sincerely,
Jim Julius

ONLINE SURVEY FOR STUDY OF PICT FELLOWS
EMAIL OF MAY 16, 2006 TO ALL PARTICIPANTS

Hello,

Thanks again for agreeing to participate in my dissertation study of 2006 pICT fellows.

I know this is a busy week, but it is very important that we complete the pre-assessment data collection before the workshop begins on Monday.

Here is the link to the Stages of Concern Questionnaire. Please click it to take the survey.

<http://www.surveymonkey.com/s.asp?u=37602141991>

This is a questionnaire of 35 scaled items. For this first administration of the questionnaire, there are about 10 additional scaled items for demographic purposes. I estimate that the survey should take no more than 15-20 minutes. You may take it at any time before Monday. For those who do not complete it before the weekend, I will send a reminder on Friday afternoon.

Many of you have already indicated your preferred time for your phone interview - thanks.

As a reminder, once you have completed the questionnaire and interview, you will receive a \$10 gift card for Aztec Shops during next week's workshop.

Again, thanks for your participation in this research. Please do not hesitate to contact me if you have any questions.

- Jim Julius

jjulius@mail.sdsu.edu

619-594-5852

STUDY PARTICIPATION**EMAIL OF MAY 19, 2006 TO ALL PARTICIPANTS**

Hello,

I wanted to thank you again for your willingness to participate in my dissertation study. Of the 23 *p*ICT fellows, 16 of you agreed to participate. Considering the tight timeline during this finals week for kicking this off, I think that's remarkable.

Most of you have completed your phone interview, and many of you have taken the online survey.

Please let me know if you need to (re)schedule a phone interview.

If you have not yet taken the online survey, here is the link:

<http://www.surveymonkey.com/s.asp?u=37602141991>

It should take no more than 15-20 minutes, and ideally would be completed before the workshop begins on Monday.

Again, my deepest appreciation, and I look forward to seeing you at the workshop next week. FYI: Though as the ITS associate director I may be involved in some larger group activities next week, in order to maintain some distance as a researcher, I will not be involved in individual or small group consultations.

- Jim

ONLINE SURVEY FOR STUDY OF PICT FELLOWS
EMAIL OF AUG. 23, 2006 TO ALL PARTICIPANTS

Hello,

I hope your summer has gone well, and you are looking forward to the fall semester.

As a reminder, I am working on a dissertation study of the 2006 pICT fellows, and you have agreed to participate in my study. Thanks again for doing so, and for participating in the initial round of data collection in May. After yesterday's pICT open house, it is now time for the mid-point data collection, which repeats the online survey which you initially completed in May. (There is no phone interview at this time.)

Please take 10-15 minutes to complete this before class starts next week.

Here is the link to the survey (the Stages of Concern Questionnaire).

<http://www.surveymonkey.com/s.asp?u=478692504041>

Please click the link to take the survey, which is a questionnaire of 35 scaled items.

Again, thanks so much for your participation in this research. Please do not hesitate to contact me if you have any questions.

- Jim Julius

jjulius@mail.sdsu.edu

619-594-5852

SCHEDULING INTERVIEW (DISSERTATION)
EMAIL OF NOV. 16, 2006 TO ALL PARTICIPANTS

Hello all,

I hope your semester has been going well and is heading toward a satisfactory end. As a reminder, you are a participant in my Concens-Based Adoption Model (CBAM) dissertation study of this year's pICT fellows.

We are approaching the end of the data collection phase. In early December, I will send you a link to take the CBAM Stages of Concern Questionnaire one final time.

At this time, I would like to **schedule your second phone interview** (the first was last May) with the Colorado State University interview team conducting the CBAM Levels of Use interviews. They have a team ready to conduct interviews **any time in the weeks of Nov. 27-Dec. 1 and Dec. 4-Dec. 8**. Hopefully this timing will allow you to have mostly or completely implemented your pICT project this semester, yet not be overwhelmed with the end-of-semester rush.

Please let me know your preferred date and time for the interview, which should last around 30 minutes.

As with the first round of phone interviews, you will be provided with a prepaid phone card to allow you to make the phone call at no expense to you. Also, upon the completion of both the questionnaire and the phone interview, you will receive an Aztec Shops gift card as a token of appreciation for your time.

Please contact me via email or phone (619-594-5852) if you have any questions or concerns.

Thank you very much,
Jim Julius

***FINAL ONLINE SURVEY FOR STUDY OF PICT
FELLOWS***

EMAIL OF DEC. 8, 2006 TO ALL PARTICIPANTS

Hello,

Most of you have completed your final phone interview with Colorado State - thanks so much for your continued participation in my dissertation study of the 2006 pICT fellows.

The last part of this phase of data collection is an online survey, repeating the survey you took prior to the pICT summer institute and again at the end of the summer.

Please take 10-15 minutes at your convenience to complete this before the holidays.

Here is the link to the survey (the Stages of Concern Questionnaire).

<http://www.surveymonkey.com/s.asp?u=205213012306>

Please click the link to take the survey, which is a questionnaire of 35 scaled items.

Again, thank you for your participation. Upon the completion of both the questionnaire and the phone interview, you will receive an Aztec Shops gift card as a token of appreciation for your time.

Please do not hesitate to contact me if you have any questions.

- Jim Julius

jjulius@mail.sdsu.edu

619-594-5852

FINAL STAGE OF PICT STUDY PARTICIPATION
EMAIL OF JAN. 9, 2007 SENT INDIVIDUALLY TO
SELECTED PARTICIPANTS

Hello Dr. _____,

After analysis of the data compiled from my study of the 2006-07 pICT fellows, I am ready for the final stage of data collection.

In this stage I am hoping to work with a sampling of the fellows for two final activities:

1. An assessment component which I will conduct on Thursday during the open house through informal discussion and examination of the posters.
2. A final retrospective interview which will be conducted at your convenience by a third party not employed at SDSU. This interview will last 30-60 minutes and take place within the next few weeks.

I am hoping that you would be willing to participate in these final two activities. As a token of appreciation you would receive one more Aztec Shops gift card.

I greatly appreciate your participation thus far in my study. Please let me know if you are willing to continue with these final activities.

Thank you very much for your consideration.

Jim Julius
619-594-5852

**LETTER OF APPRECIATION SENT TO EACH
PARTICIPANT FOLLOWING FINAL SOCQ AND
LOU DATA COLLECTION**

Jim Julius
3112 41st St.
San Diego, CA 92105

[Date of letter]

Dr. _____
[Campus Location]

Dear Dr. _____:

Thank you so very much for your participation in my dissertation study of the 2006-07 pICT fellows. Your contributions in the form of two phone interviews and three surveys will be an important part of my data set as I examine the change process in the fellows. This work will hopefully inform future faculty development efforts at San Diego State and beyond. Ultimately, I hope that the findings and recommendations will help faculty development to be more effective – as evidenced by improved student learning outcomes.

The enclosed gift card is a small token of my appreciation for your very generous giving of your time and energy to this project. I appreciate your dedication not only to your own growth as an instructor making wise use of technology, but also as a contributor to the scholarly investigation of this process.

I hope you enjoy your well-deserved holiday break.

Sincerely,

Jim Julius

**LETTER OF APPRECIATION SENT TO FOUR
PARTICIPANTS WHO COMPLETED THE FINAL
INTERVIEW**

Jim Julius
3112 41st St.
San Diego, CA 92105

[Date of letter]

Dr. _____
[Campus Location]

Dear Dr. _____:

Thank you once again for your participation in my dissertation study of the 2006-07 pICT fellows. Your willingness to engage in an in-depth retrospective interview on your experience as a pICT fellow provided depth and detail to the analysis of the data collected previously through surveys and shorter interviews.

As I mentioned earlier, I am hoping that the effects of this work will be to enhance future faculty development efforts at San Diego State and beyond, ultimately resulting in improved student learning.

The enclosed gift card is a small token of my appreciation for your above-and-beyond giving of your time and insight to this project. Again, I appreciate your dedication not only to your own growth as an instructor making wise use of technology, but also as a contributor to the scholarly investigation of this process.

Sincerely,

Jim Julius

APPENDIX I

FACULTY DEVELOPMENT INITIATIVE 4-DAY

WORKSHOP SCHEDULE

Monday, May 22

8:30 am	Coffee, continental breakfast
9:00 am	Welcome, Introductions, Overview
9:20 am	Tools for Writing, Reflection and Collaboration (Bernie Dodge & Bob Hoffman)
10:00 am	Breakout 1 Explore class blogs & wikis and collaborative writing examples. Tool Sheets: Blogging for Personal Reflection; Group Blogging as a Collaborative Activity; Wikis as Collaborative Learning Environments; Writely and Other Collaborative Writing Tools.
10:45 am	Break
11:00 am	Set up a personal blog and a group blog for a course on Blogger. Think about applications of blogging by dragging and dropping the possibilities in this exercise. Post your ideas on the instructional uses of wikis and blogs using Writely .
12:00 pm	Lunch (Box lunch provided)
12:45 pm	Information gathering and sharing. Tags and social software. (Bernie Dodge)
1:15 pm	Breakout 2 Set up an account on Bloglines; explore RSS feeds. Add the Bloglines bookmarklet to make it easy to add new feeds; Set up an account on del.icio.us; search Flickr. Tool Sheets: Tracking and Sharing Sharing and Finding Images with Flickr
2:00 pm	Break
2:10 pm	Video & Audio Conferencing (Bernie Dodge, Jim Julius)
2:30 pm	Breakout 3 Skype & iChat. (Bernie Dodge & Bob Hoffman) Toolsheet: Classroom Conferencing Horizon Wimba (Jim Julius & Jon Rizzo) Toolsheet: Voice conferencing in Blackboard
3:00 pm	Whole group brainstorming (Bernie Dodge, Bob Hoffman)
3:30 pm	Adjourn for refreshments

Tuesday, May 23

8:30 am	Coffee, continental breakfast
9:00 am	WebQuest overview (Bernie Dodge) Previews of breakout sessions (all)
10:10 am	Breakout 4A Using and Creating WebQuests (James Frazee and Bernie Dodge) Learning with Video (Randy Yerrick and Bob Hoffman) Technology and Diverse Learners (Alberto Rodriguez) Lively Interaction with Blackboard (Jim Julius)
11:05 am	Break
11:15 am	Breakout 4B Using and Creating WebQuests (James Frazee and Bernie Dodge) Learning with Video (Randy Yerrick and Bob Hoffman) Technology and Diverse Learners (Alberto Rodriguez) Lively Interaction with Blackboard (Jim Julius)
12:00 pm	Lunch (Box lunch provided)
12:45 pm	Previews of breakout sessions (all)
1:15 pm	Breakout 5A Digital storytelling. Video without cameras (Terri Linman) Finding podcasts for your course (Bernie Dodge) Intro to creating a podcast (Karl Richter) Quick and Easy Web Pages for Students and Faculty (Bob Hoffman)
2:10 pm	Breakout 5B Digital storytelling. Video without cameras (Terri Linman) Finding podcasts for your course (Bernie Dodge) Intro to creating a podcast (Karl Richter) Quick and Easy Web Pages for Students and Faculty (Bob Hoffman)
3:05 pm	Feedback Please complete the online evaluation for this workshop
3:15 pm	Whole group discussion (Bernie Dodge & Bob Hoffman)
3:30 pm	Adjourn

Wednesday, May 24

8:30 am	Coffee, continental breakfast
9:00 am	Real Time Professor <i>Or</i> Is the Live Linear Lecture a Dying Art Form? (Brock Allen)
9:45 am	Video and Audio on demand (Suzanne Aurilio) Blackboard and Horizon Wimba (Jim Julius)
10:45 am	Break
11:00 am	Blended Learning: Getting the Mix Right (Brock Allen)
12:00 pm	Lunch – group discussion (Cathie Atkins)
12:45 pm	Refining your ideas – Guided work session with instructional designers Break-out sessions as needed
3:30 pm	Adjourn

Thursday, May 25

8:30 am	Coffee, continental breakfast
9:00 am	Open “office hours”
10:00 am	Concurrent Workshops Blackboard and Horizon Wimba WebQuests
12:00 pm	Lunch
1:00 pm	Open “office hours”
3:00 pm	Wine and cheese reception

ABSTRACT OF THE DISSERTATION

A Concerns-Based Adoption Model Study of University Instructors
Engaged in Faculty Development for Enhancing Learning with
Technology

by

James W. Julius

Doctor of Education

San Diego State University and the University of San Diego, 2007

For over a decade, theorists have suggested that higher education institutions are in the midst of a shift from an emphasis on student access to instruction to student success in learning. Digital technologies are one “lever” increasingly touted as a means to improve teaching and learning in higher education. Because serious efforts at technology integration not only require competence with the technologies, but also often result in changes to instructional methods, colleges and universities are urged to consider faculty development needs.

This study detailed how instructor change unfolded in response to a faculty development program intended to enhance the use of instructional technologies at a large public university in the southwestern United States. The program was designed to enable faculty to adopt the innovation of using advanced technologies: (a) for instructional design/planning/delivery and (b) as a tool supporting students’ ability to research, organize, visualize, manage, evaluate, and communicate information.

The study was grounded by the Concerns-Based Adoption Model (CBAM), first proposed by Hall, Wallace, and Dossett in 1973. CBAM is a widely-used framework that allowed the researcher to assess faculty response to the innovation in three different ways:

- concerns about the innovation (assessed via the Stages of Concern Questionnaire),
- levels of use of the innovation (assessed via the Levels of Use interview), and
- quality of the implementation of the innovation (assessed via the Innovation Configurations methodology).

From the first two measurement strategies, the researcher generated overall CBAM profiles for faculty participants. These profiles represented a range of faculty change patterns and informed selection of a sample group for Innovation Configurations assessment and intense retrospective interviewing based on the Critical Incident Technique, developed by Flanagan in 1954, for triangulating and clarifying the CBAM findings.

Findings from this study will be useful for launching and sustaining future faculty development efforts, and thus point to strategies that can improve the undergraduate experience. CBAM studies are most often conducted at the K-12 level; this study also provides recommendations for the use of the methodology in higher education.