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Implementation of Innovation: Evolving Models for Soci-Technical

Diffusion of Innovation and Changing Practice

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Abstract

Implementation of an online tool designed to support accreditation requirements often focuses on training issues. However, the tool and the accreditation requirements are means to the end of creating a unit that continually improves their practice within a culture of assessment and data driven decision making. This case study explores the evolution of models to support implementation developed over a two year implementation process in the education unit of a mid-sized private, East coast university. It also explores the evolution of both use and practice by individuals and the unit as a whole. A key “tipping point” occurred when researchers began to examine attributes of early adopters and used that information to encourage use. Using Roger’s studies of the diffusion of innovations and Easson’s socio-technical view of organizational interactions with complex systems, the researchers explore the evolution of models to support implementation, lessons learned, and theoretical implications.

Implementation of Innovation: Evolving Models for Socio-Technical Diffusion of Innovation and Changing Practice

Introduction and Background

Driven by mandates from the National Council for Accreditation of Teacher Education-NCATE (the body responsible for accreditation for over 600 colleges of education), faculties in departments of education are being encouraged to fundamentally change their assessment practices. In particular, a move from course-centric evaluation (How many of our students got what grades in which classes?) to a more program-centric evaluation (Are students who go through our program more aware of and able to meet educational needs of diverse populations?) has been emphasized. To be able to address these larger, more amorphous questions requires a different type of data. New models for evaluation must be developed. New methods and tools for data collection must be designed. New approaches to evaluation and use of data and analyses have to be attempted, examined, and improved.

Analysis based on pre-service teacher candidate work and grades is relatively easy and straight forward. Analysis based on teacher attitudes and dispositions, gathered across several class and field experiences by different faculty members and at different times, is far more challenging. In order to support this new approach to data collection and analysis, an education department in a mid-sized, private university opted to turn to an online data collection and storage system that combined multiple functions including assessment, collections of candidate documents, and survey-type instruments.

A common pipe dream of faculties is that mere adoption of such systems will take care of the problem in and of itself, allowing the faculty to get on with their overcrowded schedules.

However, rarely is that the case. The first difficulty in implementation is encouraging and supporting the use of the system, as without use, there is no data collection and nothing further can be done. If this first challenge is surmounted, an unpleasant realization dawns upon the group that the system is not the “magic bullet” envisioned, merely a tool. Shovels do not dig ditches by themselves. So, while data is gathered, understanding what data is needed, gathering that data in a systematic way, analyzing and reporting data in a useful way, and then using that data to affect programmatic decisions is an implementation problem that is conceptually more difficult and usually more time and resource demanding than simple adoption and implementation of a computer system. If one adds into the mix the social dynamics of who uses what, who understands what, who wants to move forward (or not) and why, and how all this change affects the social structure and the implementation, a much more complex picture emerges.

In addition to the challenge of implementation, the real goal of these systems is use of data for decision making purposes. The underlying goal of accrediting bodies in mandating a move from course-centric to program-centric data gathering is to encourage the ongoing use of data to drive programmatic decisions and creation of a culture of on-going evaluation and analysis. Instead of an after-the-fact proof, the goal of NCATE (National Council for Accreditation of Teacher Education) is to move units to continually improve their practice through regular and systematic measurement and evaluation of results, making changes to practice and programs based on data gathered, and evaluating the affect of their actions. NCATE's standard 2 states:

The unit is implementing its assessment system and providing regular and comprehensive data on program quality, unit operations, and candidate performance at each stage of a program, including the first years of

practice...Data are regularly and systematically collected, compiled, summarized, analyzed, and reported publicly for the purpose of improving candidate performance, program quality, and unit operations. (NCATE, 2007)

In this world of, in Barone's (2003) terms, the changing landscape of the new academy, the needs and requirements to which a school must respond are in a near constant state of flux. To effectively meet these changing needs, while consistently supporting a quality educational program, without continued guidance from data gathered across multiple courses in an on-going, systematic way, is too much to expect of a faculty that is also staying abreast of their own changing areas of specialization, teaching multiple courses, conducting research, and pretending to have a life outside of work. Cross-program data collection coupled with data driven decision making is quickly becoming not just a good idea, but the only means of continuing to meet the needs and requirements of candidates, faculties, institutions, and accrediting agencies. New needs spawn new tools.

This research examines a two-headed implementation beast (socio-technical system and data driven decision making processes) through a case study of a unit educating pre-service teacher candidates and in-service educators in a mid-sized, private university. The unit encompasses 3 schools and 6 departments. Specifically, we focus on understanding the effects and relative success of evolving models of implementation that were used over a two and a half year period. Our goal in this research is to improve practice using theory, as a tool, to inform and impact this practice. Additionally, we will briefly explore how this research may impact theory.

Methodology

This article is the report of case study research (Yin, 2002) in a naturalistic setting (Denzin and Lincoln, 2000). The research was conducted to gain a richer understanding of the

implementation of a complex, online tool, viewed as a socio-technical system. The researchers used Rogers' (2003) diffusion of innovation theoretical perspective, as well as Eason's (1988) socio-technical design for organizational change to inform the development of models.

The researchers explicitly assumed the dual role of designers and researchers throughout the process. This allowed greater latitude in seeking information. Data was collected through notes on group meetings, one-on-one meetings, in-person interviews, observations, and analysis of emails over two and a half years of data gathering. The two researchers met regularly throughout the time to discuss perspectives, observations, check understandings, and, on separate occasions, to work on the evolution of the models for implementation.

Principles Guiding Implementation

The authors of this research are participant/researchers, intimately involved in planning, developing, and executing the models of implementation. As participant/researchers, we clearly impacted the study. During the study, the researchers held regular meetings and discussed our efforts to maintain a clear distinction between the different "hats" of researcher and participant. We have opted not to pursue an action research methodology, in order to focus attention on the impact of different models on implementation, adoption, and use of the technical system, as well as, the social interactions and evolution of practice. Rather than studying the process of developing models, we seek to look at how the models affected adoption and how adoption affected systems.

As the models were developed, implemented, and changed over time in response to changing needs, we always kept to the following foundational assumptions, informed by Eason(1988), Gabriel (1998) and Rogers (2003):

- We were implementing a socio-technical system, where the technical and people systems

are of equal import.

- How the technical system is used would change over time, often as a result of use.
- The quantity and quality of use would vary over time as opposed to a binary adopt/don't adopt decision.
- There were qualitative differences to be considered when measuring the use of the system – ranging from telling teacher candidates to fill in an online form, to using a rubric for grading a course, to consideration of how the system might be used to evaluate changes in attitudes and dispositions over several courses and several years.

Different Measures of Use

In this study, it became clear that “use” could not be a binary measure. All full-time faculty had a training session before the tool was used in any classes, so they could be said to have used the tool. Our measure of “use” has evolved to be a continuum. This is represented by increasingly complex levels of use and understanding.

Use:

- Use of the tool to have students turn in assignments
- Use of the tool for the instructor to assess assignments
- Use of the tool to assess an assignment that covers multiple sessions of a single class
- Use of the tool to assess work that spans more than one class
- Use of the tool to assess non-specific work (understanding of diversity, attitudes and dispositions) over time.

Understanding:

- Mechanics of using the tool – putting up an assignment, grading
- Training and supporting their students in use of the tool

- When faced with an assessment in a class, consideration of how the tool might be used
- Consideration of “use” to collect cross-program assessments
- Use of data collected to inform a programmatic decision
- Independent requests for new data during programmatic discussions. (For example, when discussing candidate writing ability, a suggestion to gather data to inform current performance)

It is an interesting consideration that while we study and report on the activities of individual faculty members, in the end, the unit of measurement is actually the unit. NCATE is not so much interested in the work of individual faculty members, but rather of the unit as a whole. This current work does not deeply explore this aspect of analysis, using the more accessible observation and reporting of the work of individuals.

What Happened

Description of the department

The unit studied is a disparate organization at a mid-sized, private, East Coast university. The unit includes two core departments. The first, Education and Human Services, offers both undergraduate and graduate degrees. A separate department, Educational Leadership, only offers graduate degrees. In addition, students may matriculate in programs in Secondary English, Secondary Mathematics, Music Education, and School Psychology. These programs are under the direction of departments in different schools, but teacher candidates take all required education courses in the education department. In all, there are 3 colleges and schools, 6 departments, and 14 programs that are a part of the unit. The core programs in the Department of Education and Human Services offer both graduate and undergraduate certification tracks in elementary education and early childhood education and undergraduate only certification in

elementary/special education; as well as graduate courses in deaf education, educational technology, and school counseling. Additionally, the Educational Leadership Department offers an Ed.D in Educational Leadership. Approximately 300 undergraduate students and 130 graduate students enroll in courses each semester. These course are taught by 25 tenured or tenure-track faculty and 18 adjunct faculty. The University itself has steadily rising enrollment, which is reflected in the unit. The departmental faculty is perhaps older than average, with at least 25% of the core faculty considering retirement within the next 3-5 years. The unit passed it's last NCATE accreditation visit in 2002 and is scheduled to have a visit in Fall, 2009.

What it was like

Both the NCATE Accreditation visit and the State accreditation teams visited in Fall 2004, resulting in clear, positive accreditation decisions. Most data collection at the time of those visits was course specific (grades and course work), was kept by individual instructors, and was largely not digital (except spreadsheet grade books). Most of the faculty had recently begun to use Blackboard as a course management tool, usually to keep syllabi. However, less than 4 faculty members kept digital versions of any kind of evaluations.

Prior to the implementation of the online tool being researched in this study, two faculty had developed a survey to measure changes in attitudes and dispositions, among the pre-service teacher candidates. The purpose of the questionnaire was to measure, longitudinally, changes in attitudes and dispositions toward teaching and, thereby, be able to determine individual program accommodations. This tool consisted of two case studies followed by a series of both qualitative questions and quantitative rating scales (Likert scales). This questionnaire was to be administered three times across the pre-service teachers' training. They were to be given the questionnaire as new freshmen, as sophomores about to enter the professional program, and as

seniors, just prior to student teaching. Over a two year span the questionnaire had been pilot tested, modified, and was being implemented. The questionnaires were being administered in paper form. At the time of the online tool implementation detailed in this research, the questionnaire was finalized but the data had not being analyzed.

Applications for the professional program (which typically took place in the first semester of the sophomore year) were paper based. A database that had previously been used to track candidate applications had run into technical hurdles and had become too unstable to use. Evaluation of candidates during student teaching was paper based and filled out by permanent and adjunct faculty. Only the coordinator of student teachers (a staff position), the coordinator of teacher education (tenure track faculty), and the department chair saw all of the evaluations. There was no systematic discussion of candidate performance, although, as with any small program, those candidates who needed remediation were brought to the attention of program directors. Paper-based student teaching portfolios, another important assessment, were evaluated by program directors who, individually, kept the evidence of these performance assessments. Again, beyond informal discussions, this data was not used for programatic analysis or decisions.

There was nothing in place that supported collecting or sharing of data or analyses in a systematic way. There were few conversations taking place that evaluated, or considered how to evaluate, the efficacy of education programs or how the unit was progressing toward meeting the accrediting agencies' standards.

A progression of Models

Model One: If we buy it, our problems will be solved model

During the visits by NCATE and the State accreditation team, because of positive feedback of the existent (but flawed) online database and indications of the future importance

NCATE reviewers would place on data collection and analysis, the leadership of the department (chair and program coordinators) became convinced that a more robust tool for data collection was needed. During a conference for the American Association for College of Teacher Education (AACTE) in Fall, 2004, several members went to sessions detailing existing products. They also talked with vendors who were exhibiting. After comparing impressions, the department invited two vendors to come to campus to provide a more detailed session for the entire faculty. Toward the end of 2004, the entire department voted to select one product for use. The vote was taken in an education department meeting, so did not have members of the departments associated with (but not in) the Department of Education and Human Services. However, members from some of those departments had attended the sales presentations and were asked for feedback during the process. No clear timeline for implementation was set, No clear implementation plan was developed. No group or individual was identified as coordinator of the program or implementation. The decision made was to use a particular product and to pay to have a one day training during the Spring, 2005 semester. It was generally assumed that the unit would begin to use the tool (although who, where, and how were not delineated) in the Fall of 2005.

In February, 2005, a mandatory, one day training was conducted on campus and most faculty attended, including those from other departments. No follow-up was scheduled. No implementation was planned. In March, 2005, a faculty member (one of the authors of this research) volunteered to take on the role of software coordinator.

Model Two - Friendly Carrot Model

Informed largely by the writings of Easson (1988), the coordinator developed a model that tied implementation strategy to socio-technical needs of target faculty. This model rejected a training approach that identified functions of the system, knowledge gap of faculty, and then

attempted to bridge that gap through training. Instead, the model addressed the question of “How do we do what we want to do, better?” “If the technical system design is treated separately from organization (sic) issues the result may be a splendid system that may not serve its users” (Easson, 1988, p.45). Most any tool may be used in different ways. An essential step in implementation is to understand the tool, the needs of the users, and the organization within those needs are met. This model focused on three major activities:

- Modeling potential uses - Using the tool in classes, creating documents and evaluation rubrics, demonstrating how the tool might be used.
- Enthusiastic demonstration - through individual demonstrations as well as short presentations in faculty meetings, the tool was kept in the consciousness of the faculty.
- Support - whenever a faculty member suggested a use for, or interest in, the online tool, the coordinator provided, at that moment, training, created objects, answered questions, and provided all support necessary.

This “friendly carrot” model was used from initial implementation (Spring, 2005) through Fall, 2005. During this time there was slow, steady growth of use by individual professors. However, overall departmental use was spotty and use across the unit (outside of the department), was non-existent. In Fall, 2005, the education faculty voted to require purchase of the tool by all Freshmen, Sophomore, and Junior pre-service teacher candidates. All incoming Freshmen were required, by the University, to take a 1 credit orientation class. The Freshmen in the Education and Human Services Department were given training (by the faculty software coordinator) in the tool. These training sessions also provided faculty with another exposure to the tool (often the first time they had seen it since initial training). Following Easson's (1988) suggestions, the support included familiarization sessions, printed support guides, online screen

movies, and telephone support, both at the school and from the company. No other faculty use, outside of these orientation sessions, during the Fall, 2005 semester was noted. In Spring, 2006, two instructors began using the tool for a required assignment in two different classes. However, the tool had not been purchased by all pre-service teacher candidates. No other faculty members were using the tool. There was no discussion between faculty members concerning current or possible future use of the tool was rare.

One faculty member stated in an email, "I sent an email saying what I was doing to all the faculty, because we don't know what, or if, other people are doing. I didn't know C--- was doing anything until she responded. I think it is useful because they we get to see how other people are using it. This is coming up because students are wondering why they need this program. I'm not sure if Juniors are going to use the program, because I don't think we are going to have it together to do the portfolios, electronically, by next year."

Shortly after this the largest program within the core department decided not to require Juniors to buy the online tool. A proposal to require the tool for graduate students was considered. Emails from the temporary department chair and implementation coordinator sounded increasingly desperate in their attempts to encourage use. By the end of the semester, it was clear that while there was some basic understanding of some of the functions of the tool as a data collection tool, however, there was not general agreement on what data should be collected and how it should be used once collected. There was not clear agreement on which students should use the tool. Use by pre-service teacher candidates was spotty. Use by departmental faculty was limited to 4 or 5 professors. Use outside the core department was best typified by the chair of another department, within the unit, who turned to the coordinator during a meeting and said, "I need to have you come over some time and explain that stupid program to us since we

are supposed to be using it." The coordinator agreed to be available, but no invitation was forthcoming. (In October, 2007 the request for a presentation finally came.) So, as the school year ended in Spring, 2006, 15 months after the initial training, 18 months after the initial decision, and 24 months before the NCATE unit report was due, usage by faculty both personally, and in classes, was limited, although it was used in one class that spanned two sections. Understanding of the mechanics of the tool was at a basic level throughout the core department, but did not extend to adjuncts or to the extended unit.

There were inherent weaknesses within this "friendly carrot" model. While the coordinator for the project was considering the socio-technical implications, he was largely operating alone and the unit (as a whole) did not seem to be particularly interested in the implementation. The general view, or at least hope, was that this was a tool that would fix the problems in assessment with little extra work required.

Additionally, there had been a tradition, within the unit, of the chair taking on most of the work of accreditation, only asking specific people for specific information. As an organization, there was not a strong tradition of unit-wide consideration of accreditation or assessment issues. There had been department work on the unit conceptual framework and some assessments, but those were usually ad hoc efforts. Having a single person, rather than a committee taking on the role of implementation coordination of the tool furthered this organizational foible. This failure to address organizational issues limited the effectiveness of implementation. Although knowledge of how to use the tool was growing, knowledge of why to use the tool was not. This reality was exacerbated by the person leading the effort. Hampered, on one hand, by lack of knowledge of the tool (initially) and on the other by a limited understanding of the needs of a teacher education program (the implementer being an instructional systems scholar),

implementation tended to favor “how to do it”, versus “what we should do.” The hope was that those who knew more about assessment and accreditation would take on that part of implementation. However, with a single person with obvious limitations leading the effort, implementation was bogged down.

Model Three - Push From Above - Support from Below

Beginning in the Fall 2006, the Dean of the unit took a much more active role in the implementation process, strongly encouraging faculty to use the tool in their classes. Before the semester began, the coordinator of implementation conducted a workshop on data driven decision making (D3M) that was attended by most tenure track faculty (attendance was required by the Department Chair). Part of the discussion centered on how to move toward cross-unit assessment. While nothing was resolved, the faculty began to consider different approaches. In addition, the Dean committed more funds – providing two course releases for the coordinator in order to support not only the tool, but also D3M considerations in the unit.

Several professors agreed to require the use of the online tool in submitting assignments in classes required for graduation. Students were told that if they did not have the tool, they would fail the assignment and, therefore, might fail the class. The tool became near universally accepted, in short order, within the core department. Shortly after, several more faculty members began to use the tool to grade at least one assignment per class per semester. Support questions began to be qualitatively different, involving how to use the tool for more advanced functions and some cursory comments about how to use the data were raised. In several courses, the professors set up template documents within the tool, sharing them with students, and requiring students to use the tool to write and submit their work. At this point several of the faculty began to conduct their own introductory training for students. A required assessment, the attitudes and

dispositions questionnaire (discussed earlier) was migrated to the online tool. More data was going into the online tool. However, there was still very little studying of the data collected, consideration of what the data meant, or understanding of what to do with what was collected. Implementation of the tool was proceeding. Understanding was lagging.

In addition, the implementation was still not uniform. While a few of the faculty outside the core department expressed resistance, such was not the case with the core faculty. That did not mean faculty from the core department used the tool. Many did not. The researchers turned to Everett Rogers' (2003) theoretical exploration of the diffusion of innovation, both to better understand who had adopted the innovation, and why, and to provide guidance in how to encourage diffusion. Rogers work underlies the more popular work, *The Tipping Point*, (Gladwell, 2000) and draws on studies in many fields that explore the process by which populations adopt new technologies. The most striking phenomena of this work is the common occurrence of an S curve when charting adoption over time, indicating that first a small number adopt, then at some point, a critical mass is reached, and adoption shoots up, finally leveling off once most have adopted the innovation. Studies often point to those early adopters as more educated, with broader communications networks than later adopters. While these characteristics did not seem to hold in a population composed of well (and similarly) educated people, this theoretical perspective did provide useful insight.

Rogers divides adopters into 5 categories (Rogers, 2003, p. 22): innovators, early adopters, early majority, late majority, and laggards. He views the innovation decision process as a 5 step procedure consisting of knowledge, persuasion, decision, implementation, and confirmation. These steps work within four main elements of diffusion: the innovation, communication channels, time, and social system. Rogers emphasizes that diffusion is a

communications process. He further points to the importance of the early adopters in the process. The time it takes to make a decision to adopt an innovation (the innovation-decision period) grows longer for each of the 5 adopter categories, taking a relatively short time for innovators and ever increasing time for each group through the laggards. Research has found that interpersonal channels of communications are more important to move potential adopters from the knowledge step to the decision step. Early adopters tend to occupy a more persuasive position in the social structure than innovators, and so are more able to support interpersonal communications (Rogers, 2003).

This perspective helped drive this research, forcing the researchers to consider the characteristics of the early adopters. While all of Rogers' typical characteristics did not hold in a department of education, the researchers attempted to determine if there were other characteristics that made early adopters in this circumstance unique?

Diffusion of innovation also provided practical guidance in developing this new model for adoption. While Rogers focuses on adoption decisions made of one's free will, it does not necessarily follow that willing adoption is a requirement. By using the social structure to force use both by faculty and pre-service teacher candidates, we moved closer to the critical mass, or tipping point within the unit. By targeting extra support to those who were early adopters, to enable them to have success with the tool, and so begin to spread the word themselves, we sought to move information and communication from the coordinator, who was obviously a hopeless innovator, and as such, had little potential for impact (“Oh, he can do it, but there is no way that I can.”) to the early adopters, who should have a greater influence practice.

Hagner's (2003-2004) model for higher education faculty development, based on Rogers work, provided additional guidance. Hagner posited 4 adopter categories: entrepreneurs, second

wave, careerists, and reluctant. He suggests that second wave faculty should be the key focus for support services. Additionally, he emphasized the importance of buy-in from leadership. “First and foremost is leadership. Without an assurance of leadership commitment to the process, progress will be isolated to sub-areas within the institution” (Hagner, 2003-2004. p. 3).

During the semester break (January, 2007), the coordinator held a workshop on cross-unit assessment. During that day-long workshop, the core faculty explored this concept and developed two rubrics that would address values from the unit's conceptual framework that cut across all courses (communications and diversity). It was agreed that all faculty would use these rubrics to evaluate each candidate in each course, resulting in multiple assessments for each candidate. This would allow inter-rater reliability measures, as well as an analysis of the efficacy of the rubrics. There was additional discussion of using the tool in more classes for required assignments. Finally, there was some discussion of using the tool to build online portfolios. The coordinator had built templates for each program and explained how pre-service teacher candidates could use them as working e-portfolios to store key assignments. While there was some interest, the faculty did not implement e-portfolios at this time. However, at a faculty meeting at the beginning of the 2007-2008 school year, the faculty decided to move forward with e-portfolios, requiring seniors to submit their final student teaching portfolios (an NCATE gate) through the online tool.

In the Spring, 2007 semester, more courses used the tool and more faculty became more advanced in their considerations of how and why to use the tool. Teacher education faculty meetings discussed possible uses without the impetus or even presence of the implementation coordinator. Individual faculty members discussed and developed new uses of the tool. Within the core department, use was widespread. However, in the other departments, use, and even

interest in the tool, was near non-existent. Not only was the tool not used, but the researchers were not aware of any discussions of data driven decision making, data collection, or reporting for accreditation, despite repeated inquiries.

The researchers conducted a series of interviews with all of the faculty members from the core department. They then focused on three early adopters (second wavers in Hagner's model), with a view to both understanding what distinguished them from their peers and to gauge changes in their practice of assessment. The early adopters were not the most junior or most senior in the department. They were not the youngest. They were not the most technology savvy. Adoption could not be ascribed to close friendship with the implementation coordinator. However, when asked why they used the tool, all answers mentioned duty. A special education faculty member said, "Well, as a faculty that's what we decided to do. We committed as a group. We all had a say." The coordinator of the secondary English program echoed similar feelings when she said, "Why? Because I have this mindset that says: I was told this is the expectation.. I play by the rules. That is a question of my life, cause I do it."

This spoke to Hagner's discussion of leadership. A sense of duty is activated by leadership action. Clear direction from the top was crucial for successful implementation. So, in developing the next model, the researchers decided to emphasize direction and a "call to duty" from Dean and Chair. In addition, while not noted, all three of these early adopters had particularly challenging program reports for accreditation, due in Fall, 2008. Others who had been more successful in program reports in the past did not seem to exhibit the same urgency. We decided to also use this pressure from the outside as part of the motivation for the next iteration of the model.

It was interesting to note that statements during these interviews indicated a marked

change in practice. Mention of assessment of student/candidate work and dispositions across different classes and different years were given by all interviewees.

It has allowed me to look at cross course assessment. I can develop the same assessment courses. I work with (another faculty member) to show her basics so we can create assignments that are parallel. We use a different case study, but the rubrics look at the same competency. (Debbie, Special Education Faculty)

Model Four – Sticks, Resources, and Wolves: Spreading out beyond the Core

In evaluating the progress in implementation in view of the impending NCATE visit, it became clear that progress outside of the core department needed to be accelerated. Based on the data gathered over two years of implementation and study, we developed the Fourth Model, a mixture of more support, directives from leadership, and heightening the sense of urgency with an emphasis on each person's duty to accomplish the tasks in time.

A new position of NCATE coordinator was established as a 12 month position. This position is to be in place through the NCATE 2009 visit. The position also included a teaching load reduction to two courses per semester. The new position focused on setting deadlines, communication between different parts of the unit, regular meetings with the Dean and program coordinators, and supporting the work of each group toward the end of collecting and using data, as well as preparing for program reports. Methods included regular email announcements, posters in display cabinets, short presentations at faculty meetings, on-going weekly seminars, in both online tool use and D3M, as well as, continued consultation and outreach to faculty. In addition, the coordinator specifically set a goal of reporting data as it was collected in order to demonstrate the reason for the data collection, as well as modeling different ways to analyze,

report, and use the data collected.

This model, with the new position, increased emphasis from unit and departmental leadership, and increased focus on the impending deadlines, coupled with the work that had been accomplished over the previous two years, resulted in a startling cascade of use in the first few months of the model's use. Nearly every week a faculty member presents a new tool, rubric, or lesson that they have developed in order to collect or evaluate candidate knowledge, skills, or dispositions. Less "how to" questions are asked. Usually this new work is presented to the coordinator as a final check, after being planned and developed. Faculty discuss and develop these instruments independently and collaboratively. This is a very significant step in diffusion. Rogers (2003) writes, "...the heart of the diffusion process is the modeling and imitation by potential adopters of their near-peers' experiences" (p. 304).

There has been a qualitative difference in use and application of the tool and considerations of how it may be used to better understand both individual instructor's practice and the practice of the unit as a whole. As more work is taken on, the coordinator has had more time to reach out to other parts of the unit. While those outside of the core have not moved to adopt the tool, there is greater evidence in consideration and use of D3M. This trend is certainly not ubiquitous at this time. There has still been little movement to bring adjunct faculty into use of the online tool, although a few adjuncts began using the tool during the 2007-2008 year. There has been a successful second pass at using the tool to assess attitudes and dispositions, not only freshman level. In addition, sophomores and seniors are beginning to be required to take the questionnaire, giving multiple points of analysis over time. The core faculty decided to bring all portfolios into the online tool and assess them online beginning in 2008. Planning to develop rubrics and procedures to assess these online portfolios is proceeding.

What have we learned?

As we move into the third year of implementation, much has been learned. The most important requirements we have found are support, resources, advocacy from the Dean, pressure, and time. Eason (1988) has several propositions he says are necessary to meet objectives. We see particular importance in proposition 8, “The effective exploitation of information technology requires a major form of organisational (sic) and individual learning.” and proposition 9, “The exploitation of the capabilities of information technology can only be achieved by a progressive, planned form of evolutionary growth.” (p 48). We can summarize these as, “There's a whole lot of learning going on. It takes a while. Plan for change.”

Support

It is remarkable that in the core department, there was very little resistance to adoption. There might have been delay, but no one actively worked against adoption. There really were no “reluctants” (in Hagner's terminology). In addition to the social workings of the department, we believe a large reason for this was strong support at every turn. No faculty member had to contact the company for support. All faculty and teacher candidates were given support tools. All candidates had the email address of the coordinator and all faculty had his phone number. He made a specific choice to be available at all hours on all days. There was never a time that a user was stuck for more than a few hours. In addition, there was constant modeling, guidance, and support for moving forward, trying new techniques. While screen capture disks with tutorials, paper based, and web based tutorials were all available, our experience was that demonstrations to model, then email support, then extensive availability (the coordinator was located in the middle hallway of the core department, always had his office door open, and would usually stop his work to guide a professor through a question) was the key. When a teacher wanted to have

something built, the coordinator built it. When they needed a step by step guide for candidates, he made it for them. With continued support and modeling, the faculty has now moved to largely take this work on themselves.

Resources

Funding a position, with the time to be able to devote to this work is critical. It is simply too much to expect a faculty member to do all that is required without significant release time. The researchers have been constantly surprised at the amount of time required for all phases of implementation. After going through this process for the last three years, the researches firmly believe that this type of data collection, assessment, etc., really needs a full-time position (if the unit can afford one). If not, then major teaching reductions are required to give a faculty member the time to devote to this process. Release time for all faculty to work on both learning and building is essential. Taking time in faculty meetings and workshops before and after semesters not only moves the process forward, but emphasizes the importance that leadership places on these activities.

Leadership Support

Leadership must drive implementation. A significant turning point occurred when the Dean expressed displeasure with the pace of implementation and took several actions to move the process forward. Requiring ongoing updates on work from all areas has provided impetus. Finding funding for positions, releases, and workshops also clearly demonstrates the value placed on this work. Continued expressions of the importance of the work as well as actions undertaken by those in leadership have proven to be invaluable. Rogers points to the importance of an innovation champion (Rogers, 383), however, a champion needs more than a blessing from above. In a world of too much work and too little time, the importance of leadership making this

work a priority is essential to success. As we saw from our research, the early adopters who drove adoption were largely motivated by a sense of duty. That call to duty certainly comes from within, but must be strengthened by actions of leadership.

Time

The researchers developed four models. However, the fourth model is not a magic bullet. The models could only evolve as the unit's knowledge and use of the tool evolved and as our understanding of the motivation of the individuals within the unit evolved. Learning takes time. In particular, learning about complex processes is an intricate interaction between trial, discussion, study, and reification that involves all participants working together. There is no clear, "correct" answer in data driven decision making. It is an approach, a practice of asking about the effectiveness of activities and seeking methods of answering those questions. It is our belief that the development of this practice is the goal of accreditation bodies. This ongoing process is necessary so that we, as educators, can continually improve our practice and educate teacher candidates who will be able to, in turn, meet the changing needs of the coming generations. This is a fundamental change in our own practice and in the practice of our candidates.

Making such a change will not take place quickly. We cannot hurry up and learn this so we can take some test and get back to the way things used to be. This is a task without end and we must rethink the amount of time we give to considerations of cross unit assessment and evaluation. Taking a wider view, we believe that this will almost certainly be the case for any complex, socio-technical implementation. Learning, communication, and diffusion takes time. It cannot be measured or planned in weeks or months. We must plan implementations over years, expecting that plans will change as our knowledge evolves.

Many Hands

The biggest weakness, the researchers believe, was the continued hope for a single knight on a horse. While attempting this implementation, the single coordinator carried on most of the planning and training for much of the first year and a half. It was only as more people began to use the tool and become interested in possibilities that diffusion accelerated. This single “hero” mind set still hampers the work as we attempt to grow diffusion outside the core department. This may be an issue particular to this organization, as it has grown from very separate groups, and there is an independence of action throughout the university. However, it may be a common trait in institutions like this one. Busy people, faced with tasks viewed as not inviting, interesting, or easy often seek to put this task on a single person and let them take care of it. We have seen this happen in larger organizations that have the funds to hire a person to handle accreditation. It is our feeling that this pushing off of the task to a person or office will certainly not result in a change of practice and probably will not meet the requirements of accreditation. If we had the implementation to do over, we would start with a broader planning group from the beginning and bring more players into the process early and often. This will be one of the next big steps as we move forward.

Implications for theory – extensions of diffusion theory

Diffusion theory gave important insight into the development of the models used as well as providing a clearer understanding of who was using the online tool and why. Asking the question, “Why did you begin to use the tool?” was invaluable. This research also informs the theory in a few crucial ways.

By studying diffusion of not only an online tool, but a practice, we are studying a continuum of adoption, not a binary use/don't use decision. In fact, in this setting, with the unit

making the adoption decision before the fact, use/don't use was a moot point. However, understanding at what point along the continua, of both the tool and the practice of gathering and considering data, one is located; as well as providing guidance in the development of approaches to encourage increased usage, has been shown to be a valuable application of this theoretical perspective.

Finally, viewing the tool as a socio-technical system introduces the concept of symbiotic evolution of both tool and group. Not merely studying a single person's decision to adopt or not, this research has shown that this theoretical perspective also helps to inform the activities of a group as it changes how a software tool is used, and in doing so, changes the group's practice.

Future Study

The research will continue. Of particular interest to the researchers are the following areas:

- How will practice involving D3M change as more data is reported?
- How will the lessons learned affect diffusion in the non-core departments?
- What will happen to practice after the sword of re-accreditation has passed?
- How will the socio-technical interaction between online tool and faculty evolve over time? What changes in each will occur?
- How will a large change in faculty (new hires because of faculty retirements) over the next two years affect practice?

The potential for continuing study promises to provide excellent insight into challenges of changing practice for several years.

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