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Novice Researchers Find their Power: Using Technology to Support the Development of Doctoral Students

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This study examines innovative technology uses of proficient doctoral students in action research and uses the findings for doctoral program planning and revision. The authors conducted an environmental scan of students' uses of technology to support their work throughout the dissertation process. They identified one to three students in each phase of the action research cycle, called "power users," who innovatively used technology. Rogers' (2003) theory of diffusion suggests that, as a result of the understandings from this study, the faculty-researchers are gatekeepers, responsible for systematically addressing the diffusion of technology. Recommendations include the adoption of a shared technology vision and leveraging the power users' skills through the doctoral program.

Keywords: action research, doctoral education, technology integration, professional development, power users

INTRODUCTION

This study examines innovative technology uses of proficient doctoral students in action research and uses the findings for doctoral program planning and revision. We use the results of this study to recommend specific programmatic changes. In 2006, the doctoral program (Ed.D.) in Leadership and Innovation was initiated in the Mary Lou Fulton Teachers College at Arizona State University. The program attracts practitioners who currently work full time in the field of education. Soon after the doctoral program admitted its first set of students, the Carnegie Project on the Education Doctorate (<http://cpedinitiative.org/>) invited the faculty to participate in a multi-university collaborative. This think-tank involves twenty-five United States university affiliates who collaborate to help their Ed.D. programs become more relevant to school practitioners and professional staff (Perry & Imig, 2008; Shulman, Golde, Bueschel, & Garabedian, 2006).

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The associated universities work together to provide fertile grounds for their students to solve school-based problems. The Carnegie Project collaborative helped prompt our program developers and instructors to keep the program goal in mind: that students become effective and powerful change agents in their local context. This goal requires students to develop skills in innovation, leadership, research methods, and organizational change while they work directly within their own local institutions.

The Ed.D. program in Leadership and Innovation is a three-year program that focuses on action research. The students often describe it as fast-paced, intense, and overwhelming. All students are enrolled in courses full-time, including summers, and must also be employed in an educational setting. The program admits approximately twenty-five students each year and includes many supportive structures intended to facilitate students' persistence to graduation.

Anecdotally, we observed that a small number of students in our program, who we call "power users," appeared to use technology in meaningful ways. At the same time we observed that most students used basic technologies, but they did not apply them in ways that would allow them to be as effective as the power users. To better understand the technology knowledge, skills, and dispositions of the power users, and make recommendations for program improvement, we asked the following research question:

What can we learn from the doctoral students who exemplified powerful uses of technology in each phase of the action research process?

LITERATURE REVIEW

ACTION RESEARCH AS A PEDAGOGICAL FOUNDATION

Increasingly, action research is used in school settings as a way to instigate local change (Sagor, 2005; Stringer, 2007). Action research can instigate change in larger systems as well, by incorporating a variety of collaborative means whereby participants co-construct innovations and work together for the common good (Gordon, 2008). It is a sophisticated research method that is rigorous and systematic, and can create permanent change (Cochran-Smith & Lytle, 2009; Sagor, 2005).

The Ed.D. program uses action research as the foundation that connects all course curriculum. Action research is a method of inducing change whereby the student, as a practitioner working in the field of education, identifies an area of concern (planning), implements some sort of innovation meant to address that concern (acting), conducts formative analysis (to refine the innovation as it rolls out) as well as summative analysis (to understand the overall effects) (observing), then participates in reflection and dissemination to determine next steps (reflecting) (Kuhne & Quigley, 1997). An iterative process, the final cycle of action research serves as the student's dissertation project. Because it is conceptual in nature, the Kuhne and Quigley (1997) model of action research has been adopted by instructors in our program. The four processes of this model, planning, acting, observing, and reflecting, were used in this study to frame data collection and analysis.

CHANGE IN HIGHER EDUCATION AND TECHNOLOGICAL SOLUTIONS

Educational issues are often complex and efforts to make changes are slow and require substantial effort over time (Hall & Hord, 2006). Kirschner (2012) remarked, "the pace of change (in higher education) is stuck somewhere between sluggish and glacial." Although this statement is a generality, higher education learning paradigms have proven very difficult to change (e.g., Fullan & Stiegelbauer, 1991; Sarason, 1996). Educational

systems must be transformed into learning organizations (Senge, 1990). For learning and innovation to take hold for an organization, the technique must be communicated through certain social channels over time among the members of the organization (Rogers, 2003).

Rogers' (2003) theory of the diffusion of innovations addresses the cultural elements that effect how, why, and the rate at which innovations are adopted. Rogers defines diffusion as having four components: an innovation (a new idea or technology), communication channels, time, and a social system. For instructors who are early adopters of technological innovations, new technology tools provide an innovative response to exploring new ways of teaching; however, educational changes of this sort are not easily diffused throughout complex systems. The adoption of an innovation is a process involving five stages progressing from initial exposure to confirmation that the innovation is valuable and useful (Rogers, 2003).

Doctoral students most often use technology for social networking, collaboration, and technology-mediated communication (Prensky, 2001). In addition to adopting an identity of a technology-using student, Phelps, Fisher, and Ellis (2006) note three major developments that also effect doctoral undertakings, in the area of academic research: "the Internet provides global connectivity; the personal computer provides processing power; and an increasing range of user friendly applications, often involving point and click web based interfaces, provide the information management and organizational tools, which can lead to real efficiencies in research processes" (p. 145).

Will these students adopt technology as a tool in their educational experiences? Rasmussen, Davidson-Shivers, and Savenye (2011) pose the above question and conclude that they will if they receive proper teaching and guidance. How do we help these experienced professionals shift their identity to that of a researcher who uses technology to their advantage?

TECHNOLOGICAL VALUE TO ACTION RESEARCH

Our review of literature reveals that technology use specific to doctoral education could also serve as a vehicle for helping students become fuller participants in the academic context, when faculty support them, as novice researchers, to learn the "tools of the trade" (Stelma, 2011). Technology is a platform for building doctoral student communities (DiPietro, Drexler, Kennedy, Buraphadeja, Liu & Dawson, 2010; Ryan, Magro & Sharp, 2011). Efforts to integrate technology into action research processes are supported by educational technology standards (<http://www.iste.org/standards/nets-for-students/nets-student-standards-2007.aspx>). Both the study and use of technology are vital to the educational professionals we served, as "the medium itself may be transforming what it means to be learning and to be motivated in these environments" (Berliner, 2006, p. 285).

For these reasons, we felt that learning about the knowledge, skills, and dispositions of "innovator" and "early adopter" students (Rogers, 2003) in our program would help us understand how technology integration might be addressed on a broader scale. To do this we framed an action-research type innovation of our own, to further the use of technology that would help our students be more efficient, more effective, and consequently less susceptible to any adverse effects from the stresses of this rigorous program. In other words, we hoped to learn from innovative, technology-using students so that we could define an innovation that would promote technology as a tool for action research processes. This research could help define changes to the program's curriculum and pedagogy by incorporating technological resources. Thus we embarked upon an action research study of our own by learning about the technology tools the innovative students found useful.

*COMMON DOCTORAL TASKS, ACTION RESEARCH
AND TECHNOLOGY PROCESSES*

In the Ed.D. program in Leadership and Innovation, we help our students develop two primary roles: that of a practitioner instigating change in their own workplace, and that of a researcher studying the process and effect of their own efforts. In this way they increasingly gain the skills necessary to influence workplace dilemmas.

Action research tasks (Kuhne & Quigley, 1997) are analogous to common doctoral tasks associated with conducting research, including dissertation research (Golde, 2011), with the exception that action research requires the practitioner-researcher instigate an innovation. With this in mind, we align the action research tasks outlined by Kuhne & Quigley (1997) to Golde's definition of common doctoral tasks (2011). We situate this comparison with the culminating doctoral experience, the dissertation, as outlined by Calabrese & Smith (2010) (see Table 1).

Table 1. Comparison of action research tasks and common doctoral tasks

Action Research Tasks (Kuhne & Quigley, 1997)	Common Doctoral Tasks (Golde, 2011)
Planning	Identify and define problems Generate questions and hypotheses Review and summarize the literature
Acting	(May or may not include implementing an innovation)
Observing	Apply appropriate methods Collect data properly
Reflecting	Analyze and judge evidence Discuss findings Produce publishable results
Dissertation Tasks (Calabrese & Smith, 2010)	
Engage in a sustained piece of research or argument Think and write critically and coherently	

Willis and Kim (2006) suggest the following uses of technology as a support to each phase of the research process: locating literature, online sources of information, tools for collaboration, organizing data, software for analyzing quantitative and qualitative data, writing proposals, and creating multimedia presentations. In the table below (see Table 2), we apply Willis & Kim's (2006) outline of research uses of technology to the tasks described earlier.

Examples of tools for locating literature include the use of databases such as ERIC, online sources of information include Google Scholar, collaboration tools include Google Docs and wikis, data organizing tools include Inspiration and spreadsheets, quantitative analysis tools includes SPSS, qualitative analysis tools include NVivo and HyperResearch, writing tools include Word, and multimedia presentations include Prezi and PowerPoint.

Table 2. Comparison of action research, common doctoral tasks, and technology tools for research.

Action Research Tasks (Kuhne & Quigley, 1997)	Common Doctoral Tasks (Golde, 2011)	Technology Uses in Research Processes (Willis & Kim, 2006)
Planning	Identify and define problems Generate questions and hypotheses Review and summarize the literature	Locating literature Online sources of information
Acting	Implement an intervention or innovation	Tools for collaboration
Observing	Apply appropriate methods Collect data properly	Organizing data
Reflecting	Analyze and judge evidence Discuss findings Produce publishable results	Software for analyzing quantitative and qualitative data
Dissertation Tasks (Calabrese & Smith, 2010)		Tools for writing proposals, and creating multimedia presentations
Engage in a sustained piece of research or argument Think and write critically and coherently		

Willis and Kim's (2006) technology research framework supports the research of Phelps, Fisher, and Ellis (2006) who argue that doctoral programs must renew their focus on technological research skills. They surveyed doctoral students in multiple disciplines to determine their confidence levels in technology use throughout the research process as well as their perceptions of the importance of such technology use. They found that the students were moderately confident in their use of technology in research processes, and while they can "get by with what they know" (p. 151), they also "recognize the need for greater knowledge and support to improve the effectiveness and efficiency of their research" (p. 151).

In this study we looked closely at doctoral students who developed their innovation and leadership skills through their participation in multiple cycles of action researchers. We felt that those who were identified as power users of technology might provide some insight about how we could further empower other students. Our research question is: What can we learn from the doctoral students who exemplified powerful uses of technology in each phase of the action research process?

METHOD

PARTICIPANTS

Eighty former and current students were surveyed to determine how they used technology during each phase of the action research process. During Step I of the study we sought to understand how students used technology to support their doctoral work and

to identify the students thought to be power users. For this we defined “power users” as those who demonstrated the following criteria:

1. Vital: Students felt their success as an action researcher was dependent upon their use of technology.
2. Frequency: Students often turned to technology to accomplish tasks in one or more phases of the action research process.
3. Innovative: Students were creative in finding new technology tools or repurposing common tools as a solution to areas of concern with action research process.
4. Added Value: Students used technology as a way to improve effectiveness and/or efficiency of action research processes.

We plotted the selection process in a Venn diagram with each criterion comprising an overlapping circle. Those selected were in the center of the diagram showing they met the criteria for being a power user in one or more phases of action research (see Figure 1).

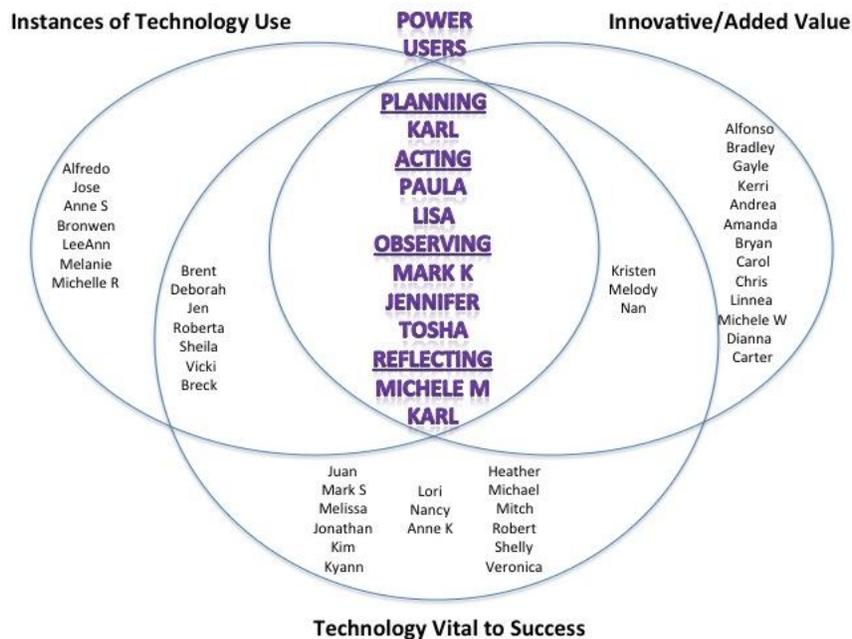


Figure 1. Power users selection process. This figure illustrates the selection of the student “power users” in relation to other students in the program and delineates the action research phase in which the student was considered to be a “power user.”

INSTRUMENTS

We accomplished the selection process through an online questionnaire administered to all past and current students (See Appendix for full questionnaire). Of 80 students, 73 (91%) completed the questionnaire. The questionnaire included items on a three-point Likert scale as well as open-ended questions. Questions on a Likert scale were aligned to the Kuhne and Quigley (1997) tasks of action researchers and included: To what extent did your success in the PLANNING phase of your action research project depend on the technology that you used? (1=would not have been possible without it; 2= would have been somewhat possible; 3= was not dependent on technology.) The questions were repeated for each action research phase. All responses were tallied. In addition, those

who indicated that technology was vital (criteria #1 of a power user) to their success in one or more phase were noted.

The survey also contained the following open-ended questions, which were repeated for each phase of action research:

- During the _____ phase of your action research project, what was the most innovative manner in which you used technology tools? Give details about the circumstance and how the technology was used.
- If you used technology tools to work with others, give details about the circumstance and how the technology was used.
- Were there any impediments to using technology during the _____ phase of action research? If so, explain.

PROCEDURES AND DATA ANALYSIS

We conducted the study in two steps. In the first step we used a mixed methods approach to select a purposeful sample (Creswell, 2009) in order to define the participants in the study. The mixed methods approach allowed us to use descriptive statistics to analyze items on a Likert scale and to use qualitative methods to analyze responses to open-ended survey questions. The study was approved by our university's Institutional Review Board, and is exempt under 45 CFR part 46.

We then employed a descriptive case study approach (Yin, 2009) to address the research question. The case study method was selected because it is an inquiry approach that explores a program, or one or more individuals, bound by time and activity (Stake, 1995). This approach was ideal for uncovering the key knowledge, skills, and dispositions of the seven power users in one program who were making real-life decisions in the context of the tasks required for their dissertations. The case strategy allowed us to describe multiple approaches of the seven power users. Also we anticipated that the case might inform our own teaching and provide insight to programmatic changes we could implement to address the needs of all students.

To address frequency (criteria #2 of a power user), we tallied the number of uses reported per participant, and counted how many phases of the action research process they used technology. Students were ranked according to number of uses and number of phases.

To address innovative users (criteria #3 of a power user), we came to consensus on the coding of the open-ended responses. An example of thought units coded for "innovation" included using blogs to collect data and share experiences.

To address criteria #4 (added value), we came to consensus on coding of the open-ended responses a second time. An example of thought units coded for "added value" included using electronic software such as HyperResearch to code qualitative data, and then to manipulate the data and codes in ways that would allow the researcher to review from multiple angles and for different purposes.

Authors came to consensus on coding, then determined the students who exhibited both innovative and added value uses of technology. Using several student samples, we compared our coding of the types of technology use to establish coding procedures for the remainder of the data set. Differences in coding were discussed and the authors came to consensus. Then we divided the remaining student responses and coded them individually.

Based on the data analysis, one to three students per action research phase were then selected who had the highest incidence of technology use (a range of 16-28 instances), believed technology was vital to their success, and exhibited either innovative or added value uses of technology. To address the research question, we sought to understand how

these power users leveraged technology to help them be more efficient and effective in specific phases of their research work. The responses of the power users to the open-ended questions in the initial survey were revisited. Then, we emailed a second set of questions to each power user to obtain a more complete picture of their selection and application of technology in each phase of action research. In this questionnaire we asked them to elaborate about the context in which each technology tool was used. Specifically, we asked, “How was this technology use helpful? What value did technology add to your action research? What could you have not done without the technology?” All seven students responded to the follow-up email questionnaire.

The coding process was similar to the process employed earlier to identify the users describing instances of innovative or added value uses. We coded the open-ended questions in the initial questionnaire and the in-depth follow-up protocol using *a priori* coding (Miles & Huberman, 1994) based on the common phases of action research (planning, acting, observing, and reflecting) as outlined by Kuhne & Quigley (1997). All researchers read and re-read the open-ended questionnaire responses and the responses to follow-up questions. The researchers met to discuss the types and applications of technology and the quality of these applications in each stage of the dissertation process.

In addition to using the action research phases as *a priori* codes, we also coded thought units by each individual doctoral student. Each researcher reviewed the data for a particular phase and crafted a vignette about each student’s applications of technology in one of the four common stages of the dissertation process. Thus we organized the data by person and phase and wrote content-specific vignettes to report open cases of personal experiences. The specific vignettes were selected because doctoral students could find them authentic and helpful, they addressed common events in the doctoral process, and they provided enough contextual information while being ambiguous enough to support multiple applications (Veal, 2002). Overall, the vignettes selected “represent an ideal of what is real and creates an opportunity to discuss issues surrounding teaching and learning” (Veal, 2002, p. 1).

Vignettes varied from a paragraph to a page in length, but taken together they provided a word picture (Hall & Hord, 2001) of the breadth and depth of the uses of technology by power users in each phase of action research. In order to validate research findings, a member check was conducted whereby all seven power users were sent the draft of the full article and were asked to provide comment on accuracy of their vignettes (Plano Clark & Creswell, 2010). No changes were made to the article as a result of this process.

RESULTS

The set of vignettes below describe how one to three power users leveraged technology in each phase to efficiently and effectively complete their doctoral work. The vignettes are organized by the four phases of an action research cycle as defined by Kuhne and Quigley (1997): planning, taking action, observing, and reflecting.

PLANNING PHASE: KARL

Karl is a middle school science teacher. He used technology-based planning tools extensively, which enabled him to successfully implement and analyze the innovation for his dissertation. A description of his project can be found at http://asunews.asu.edu/20100329_karlochsner. Karl searched for literature in traditional publications such as books and academic journals. But, because the publication cycle of most academic journals in education can be longer than eighteen months, Karl used social

media to connect with researchers before they published in traditional formats. Karl stated:

My research was related to the latest in classroom technology integration, so my research at times needed information that had not necessarily made it into books or journals yet. Some of the information came from experts in the field using blogs, wikis, social video networking sites, and websites. Without using these resources, my research would have been already out of date.

Karl also leveraged technology in organizing his literature. He used a citation management tool called Zotero to keep a research trail. Zotero is one of many citation management systems (others include Mendeley, RefWorks, CiteULike and EndNote). He stated:

Zotero was an incredible organization tool that kept track of my websites and journals. Zotero also placed the bibliographic information from each article in correct format. Information was kept in the computing cloud where it could be accessed from work, home, or at school, not to mention keeping it in a safe place.

Karl utilized technology to efficiently and effectively find and organize literature related to his research project.

TAKING ACTION PHASE: PAULA AND LISA

Paula, an elementary school principal, used a wiki to help teachers plan and conduct action research in their classrooms as part of a teacher induction program. Paula studied her teachers' knowledge of action research and their process of implementing innovations. She examined how teachers explained their intentions and reflected upon their own action research implementation. She stated:

In the first meeting where I introduced the idea of action research, I was able to use the wiki as a teaching tool. Teachers were first asked to respond to the following question: "What does innovation look like in the classroom?" Their answers were recorded as they instantaneously looked at responses from their peers.

Paula facilitated collaboration among the participants in her study by using the wiki. She stated, "The synchronous format allowed the teachers to look at one another's responses in order to produce a deep statement about classroom innovation. Many of the teachers referred to peer responses in their revisions." As we reflect on Paula's vignette, we see that technology is not only embedded in her action research project but also adds value to allow her to make progress toward project goals.

Lisa, a university librarian and one of the teachers Paula was working with, described the process of creating online learning modules and conducting action research on their use by students. These modules helped undergraduate students learn about empirical research articles and primary documents and how to locate them. Modules can be found at <http://www.asu.edu/lib/tutorials/empirical/>. Lisa employed various technologies in several of the steps of the implementation process. With her colleagues she created two tutorials. She used Inspiration, a graphic organizer program, to organize and plan (storyboard) the tutorial content. She used online project planning software BaseCamp and Sharepoint, to collaborate and manage communication. Librarians in many disciplines were able to utilize the tutorials for teaching and learning, demonstrating that these tutorials were effective and value-added.

OBSERVING PHASE: MARK, JENNIFER, AND TOSHA

Mark, a community college information technology director, used a Google Group with the goal of increasing collaborative capabilities of a group of college-level technology directors from various institutions who periodically met face-to-face. He initiated, participated in, and captured the between-meeting correspondence that furthered this group's initiatives. He explains:

All of the interactions were documented and recorded for me to observe. Google Group has some useful logging capabilities that I was able to use to get some qualitative data about usage.

Jennifer, a distance learning program director also experienced this phenomenon and realized the power of her technology choice right away:

I was able to record each of the Elluminate (online video conferencing tool) sessions then control the speed of the playback to see what discussions were happening on the chat board and listen to/record the audio conversations also happening.

Tosha, a university academic advisor, had two responsibilities at once, that of the participant and that of the observer, but had a difficult time when she needed to engage through two diverse roles simultaneously. She wanted to capture the essence of meetings for research purposes, but she also wanted to participate fully as a member of the meeting. Doing both at once would not do justice to either responsibility. By using a real-time capturing device, she was able to participate during the meeting as the facilitator, then observe the meeting via listening to the recording:

I used Garageband podcast software to record our writing group sessions. I was able to use my laptop and set it up just as I would have used a tape recorder, but Garageband allowed different editing capabilities for me.

Most students used audio recorders to capture interview data either on a digital audio recorder or their smartphone. These recordings were transcribed and then coded using qualitative research methods. By having digital recordings, some students were able to conveniently email them to professionals who were hired to transcribe. If files were too large to go through email, online tools such as yousendit.com were used.

REFLECTING PHASE: MICHELE AND KARL

Michele, a high school librarian, used a blog to record researcher notes and to communicate with her advisors throughout the research process. She explained, "During the intervention, I created my researcher notes in a blog. This way my committee could stay apprised of my progress. The blog forced me to transcribe my handwritten notes after each of the weekly data collection sessions."

Karl utilized technology as a meta-reflective element. His process included a verbal reflection on video in order to capture additional nuances that could not be picked up by traditional field notes. He stated, "I would reiterate any problems or successes so I could record any emotions that might not have been picked up on when the students felt that the camera was on them." Finally, Karl comments on the effectiveness of utilizing digital video for reflection, including capturing "in the moment" data and ease of use for the researcher.

I chose video rather than writing since I tried writing before, but the students spoke so fast, I didn't want to interrupt them to repeat. I

videotaped their focus group too so I could transcribe it and also use it for a video reflection reminder.

Effectively, the video technology allowed Karl to immerse himself in the context as a practitioner, capturing the exact situation for reflection after the fact.

DISCUSSION

TECHNOLOGY USE IN DOCTORAL PROGRAMS

What we learned about doctoral students who are power users support the work of Willis and Kim (2006), in that students value technology, and more specifically innovative uses of technology, to support them in each phase of the research process. Although the examples provided are based on the work of just one to three early adopters of technology in each phase who naturally turned to technology to help them be most efficient and effective, these power users provided us with examples of the types of technology that illustrate our vision of doctoral student knowledge, skills, and dispositions associated with technology use in research processes. We also note that the specific software titles or applications discussed were not as important as the fact that these students used a variety of technologies appropriately to act creatively to perform research-related tasks. We would like to explore strategies to empower all of our students to be accomplished power users.

THE DIFFUSION OF AN INNOVATION

We realize that administration as well as teaching faculty must buy into the idea of maximizing technology use for the benefit of our students. Rogers’ (2003) theory helped us identify the details of this position. Table 3 aligns Rogers’ innovation-decision process with the associated process of this study.

Table 3. The Power Users investigation viewed through Rogers’ Innovation-Decision process.

Rogers’ Innovation-Decision Process	Power Users Project
Knowledge Stage: Gaining initial knowledge of an innovation. Individuals tend to expose themselves to ideas that are in accordance with their interests, needs, and existing values.	Student awareness of technology use that was not mandated, but was allowed and possibly encouraged. The power users used technology without prompting.
Persuasion Stage: Forming an attitude toward the innovation. Attitudes are related to feelings, and are relatively enduring, based on an individual’s held beliefs, and always have some amount of uncertainty.	Power users hold attitudes that technology is generally useful, and would help them be more effective and efficient researchers, even though it could be time consuming to learn.
Decision Stage: Making a decision to adopt or reject. This is usually accomplished through a partial trial or probationary trial of the innovation.	Findings of the current study suggest that power users’ use of technology was advantageous. Gatekeepers (instructor-researchers) believe that other students might be served by technology as well.
Implementation Stage: Decision-making unit puts an innovation to use. There is a degree of uncertainty about the	Gatekeepers (instructor-researchers) have made plans to share research results with the program Advisory Council, to

outcomes, and problems should be expected. Re-invention is more likely to occur when the adopter is an organization vs. an individual.

address the creation of a vision for technology integration in the program.

The Confirmation Stage: The innovator seeks reinforcement for the decision to innovate. The decision to innovate could be reversed if conflicting information is evident.

Gatekeepers (instructor-researchers) propose further investigation to the Ed.D. research team, to assure continued improvement of the innovation.

After learning about the techniques of the power users, a second research question emerged: What doctoral program improvements might enable the students who are not power users to adopt the tools and practices of the power users? Stringer (2007) notes that action research works on the assumption that stakeholders should be engaged in all aspects of the investigation, including defining the problem, participation in data collection and analysis, and the implementation of action to address the problem. Thus, we realized the next phase of our study would best be co-constructed by the multiple stakeholders who support the doctoral program.

So, during the early months of the 2012-2013 academic year, we held a discussion with our faculty colleagues during our monthly Advisory Council meetings regarding the uses of technology in the program. A brief summary of the power users study was outlined and then the following questions were posed to the program faculty and leadership:

1. How are faculty and students currently using technology in the program?
2. How confident are you in your own use of technology?
3. What is our vision for technology in the program?

A team of thirteen who teach in the program as well as the program coordinator and division administration participated in the discussion. The faculty-researchers provided examples of technology use by students as well as technology modeled by instructors. Examples included an “app” for social stories to work with students with autism, the use of Twitter to facilitate a discussion around a problem of practice, and using images to create digital ethnographies. Additionally, faculty reported varying levels of confidence in their technology use, with seven feeling confident, four feeling moderately confident and two feeling less confident.

As a result of the discussion, the faculty generated the following shared vision for technology in the Ed.D. in Leadership and Innovation:

1. Faculty model meaningful use of technology.
2. Students use technology to efficiently and effectively complete coursework and dissertation.
3. Students apply technology learned in the program to local contexts.
4. Students use technology applications beyond the implementation of the innovation to transform the workplace context.

The next steps unfolded naturally from the discussion. For example, one way to generate discussion in the next program faculty meeting would be to model use of a “backchannel,” an online discussion conducted simultaneously while a presenter is speaking.

In order to implement this vision with fidelity, we propose the following recommendations for the program. First, we recommend taking advantage of the program’s co-teaching model and encourage pairing faculty who are technology-savvy with those who are less confident. Second, provide “just in time” learning of technology

tools for both students and faculty. Finally, allow innovation to spread naturally throughout the program by leveraging the strengths of the power users.

The theoretical work of Rogers (2003) supports our stance that, given certain circumstances, all students can be supported to adopt innovations. Rogers terms this process the “diffusion of innovations.” This theory can be useful to us as we look forward in time to the next step of adopting technology in our doctoral program. Similarly, a case study of the training of researchers by Phelps, Fisher, and Ellis (2006) supports the need to explicitly teach doctoral students about the basic technology tools we feel will assist them in becoming efficient and effective scholar-practitioners, and encourage students’ exploration of innovative technologies.

From our perspective, applying the diffusion of innovation (Rogers, 2003) theory will help us decide how, why, and under what conditions technology can become a part of our doctoral studies culture. The program’s curriculum relies on multiple cycles of action research, with some cycles stretching across several semesters. The next steps for this action research study are to track the implementation of the faculty’s vision for technology integration across all levels of the program.

CONCLUSION

On the one hand, we are clear about the fact that some aspects of research need to be taught through coursework that is cohesive and tied to program goals. On the other hand, learning to be a researcher is best addressed through a personalized and participatory approach, as indicated by one participant in the Phelps, Fisher, and Ellis study, “research approaches can’t be prescriptive...There is no easy way or best way. People just have to figure it out for themselves” (2006, p. 164). By allowing students to take a great deal of the responsibility in the learning process, we found that the power users maximized our ideals of individuation, challenged themselves to find technological solutions, and leveraged technology to complete coursework tasks, all within the constraints of the coursework requirements.

As the Innovation Gatekeepers, we are the ones “controlling whether or not an innovation is diffused to an audience of potential adopters” (Rogers, 2003, p. 156). With this in mind, it is our responsibility to determine how best to proceed in a way that will assure maximum diffusion of the power users’ practices. In support of this notion, we have shared our research findings with other instructors who teach in this program with the hopes that they will allow technology infusion to take place in their courses. Additionally, we encourage students to continue to develop their technology prowess, even if they encounter instructors who are limited in or possibly prohibit technology use. As demonstrated by the results of this study, these students have the power.

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APPENDIX

Online Questionnaire

1. During the PLANNING phase of your action research project, what was the most innovative manner in which you used technology tools? Give details about the circumstance and how the technology was used.
2. During the PLANNING phase of your project, who did you work with and what was their affiliation with your study?
3. If you used technology tools to work with others, give details about the circumstance and how the technology was used.
4. Were there any impediments to using technology during the PLANNING phase of action research? If so, explain.
5. To what extent did your success in the PLANNING phase of your action research project depend on the technology that you used (choose one)?
 - a. Success would not have been possible without technology
 - b. Success would have been somewhat possible without technology
 - c. Success was not dependent on technology
6. During the ACTING phase of your action research project, what was the most innovative manner in which you used technology tools? Give details about the circumstance and how the technology was used.
7. During the ACTING phase of your project, who did you work with and what was their affiliation with your study?
8. If you used technology tools to work with others, give details about the circumstance and how the technology was used.
9. Were there any impediments to using technology during the ACTING phase of action research? If so, explain.
10. To what extent did your success in the ACTING phase of your action research project depend on the technology that you used (choose one)?
 - a. Success would not have been possible without technology
 - b. Success would have been somewhat possible without technology
 - c. Success was not dependent on technology
11. During the OBSERVING phase of your action research project, what was the most innovative manner in which you used technology tools? Give details about the circumstance and how the technology was used.
12. During the OBSERVING phase of your project, who did you work with and what was their affiliation with your study?
13. If you used technology tools to work with others, give details about the circumstance and how the technology was used.
14. Were there any impediments to using technology during the OBSERVING phase of action research? If so, explain.
15. To what extent did your success in the OBSERVING phase of your action research project depend on the technology that you used (choose one)?
 - a. Success would not have been possible without technology

- b. Success would have been somewhat possible without technology
 - c. Success was not dependent on technology
16. During the REFLECTING phase of your action research project, what was the most innovative manner in which you used technology tools? Give details about the circumstance and how the technology was used.
 17. During the REFLECTING phase of your project, who did you work with and what was their affiliation with your study?
 18. If you used technology tools to work with others, give details about the circumstance and how the technology was used.
 19. Were there any impediments to using technology during the REFLECTING phase of action research? If so, explain.
 20. To what extent did your success in the REFLECTING phase of your action research project depend on the technology that you used (choose one)?
 - a. Success would not have been possible without technology
 - b. Success would have been somewhat possible without technology
 - c. Success was not dependent on technology