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Educators Who Use Technology: Characteristics and Experiences Through Individual and Group Perspectives

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ABSTRACT

Despite expenditures of funds to integrate ICT in primary, secondary, and tertiary classrooms, not much has changed in most classrooms overall. This paper reports on two research studies that sought to understand this complex issue from the individual teacher perspective and then from a large scale project perspective. First, a research project examined the ways in which technology-savvy educators learned what they know, challenges they identified in using ICT instructionally and professionally, and constraints felt in their implementation efforts. Second, research investigated an intense two year project that created technology-intensive classrooms, a learning community of educators, and a concentrated set of training and support programs focused on pedagogy first and technology second to understand how participants incorporate the technology and professional development into their classrooms and its impact on student learning.

KEYWORDS: *ICT integration, Educator professional development, ICT pedagogy*

INTRODUCTION

It is clear that throughout the world, ICT has been seen as a way to improve educational opportunity, expand authentic students' learning, and allow access to primary documents and multiple perspectives through human and non-human resources. Funds have been expended to support these goals, and yet, in general, the educational community has not seen enormous changes in primary, secondary, and tertiary classrooms (Cuban, 2001; Hernandez-Ramos, 2005, Williams & Kingham, 2003). Communities ask what the visible payoff has been for all these expenditures and thus far, the research community has only tentative answers; still, research has demonstrated that technology training for teachers does have an impact under some circumstances (Atkins & Vasu, 2000; Casey & Rakes, 2002; Ertmer, 2005).

This paper seeks to address the challenges posed by this question from two perspectives. First, one research project examined the ways in which technology-using educators (termed tech-savvy educators) learned what they know, challenges they identified in using the technology instructionally, and the constraints they identified for their implementation efforts. Second, a series of research studies investigated an intense two year project that created technology-intensive classrooms, a

learning community of educators, and a concentrated set of training and support programs that focused on pedagogy first and ICT second. This research sought to understand how participants incorporate the technology and professional development into their classrooms as well as student learning outcomes. This paper begins by examining the research literature that informs these two complementary investigations.

LESSONS FROM LITERATURE

The literature demonstrates that much has been done to improve access to ICT and professional development to support educators' skills and knowledge to use those tools effectively. Educational institutions have invested time, money, and energy to improve learning and in particular, for students who traditionally are less academically successful. ICT has often been seen as one addition to traditional learning environments that actually may change the learning outcomes; this hope has been consistently promoted although even with extensive expenditures evidence of change is not abundant (Hernandez-Ramos, 2005; Norris, Sullivan, Poirot, & Solloway, 2003). At the same time, efforts have been made to prepare educators at the inservice and preservice levels to use ICT in effective and appropriate ways, although many remain uncomfortable using it (Bauer & Kenton, 2005).

In the past twenty years, a gradual transformation has occurred in education; now, teachers are being required and expected to use educational technology in one form or another in their classrooms (Collier, Weinburgh, & Rivera, 2004). With continual increases in new technology, many schools are in the process of adopting new methods to improve communication, teaching, and learning. Underlying these new methods are the hopes that teachers will learn the skills to successfully use ICT as an effective part of their instruction (Guerrero, 2005). Due to the increased pressures placed upon teachers to use ICT by schools, federal governments, and professional organizations, expectations to use technology to prepare teachers at the preservice and inservice levels have continued to rise (ISTE, 2000). Burns & Polman (2006) did find that teachers who understood the research behind the integration of ICT and expectations from parents and school administration seemed to be more comfortable in their integration of technology into their classrooms. Given the efforts to encourage appropriate use of ICT, examining two studies in which educators do seem to have made the transitions sought would be useful.

THEORETICAL FRAMEWORK

These studies were examined through the lens of Fullan (2001) which guided an understanding about the challenges to changing educational practice. His notion of a recursive and difficult process included three stages: initiation or adoption, implementation, and continuation or institutionalization. As he stated, it is a formidable irony that schools' main tasks are teaching and learning, yet schools are terrible at learning from each other. Additionally, he suggested that teachers as learners require time to gain knowledge and then weave that knowledge into what

they know and do in their instructional lives. This seemed particularly appropriate when examining the use of educational technology. Fullan depicted professional development as including those activities which are intended to improve skills, attitudes, understandings, or performance in present or future roles. He demonstrated a positive correlation between attendance at faculty development activities targeting technology integration and an increase in usage levels of technology in teaching practices, yet this most likely would not be the case unless those in attendance had sufficient motivation to be there. Balancing the efforts with the time needed appears a difficult task as well as a useful lens through which to examine these efforts.

RESEARCH STUDY 1

The participants for a recent study (Schrum, Shelley, & Miller, in press) were current members of a western US state educators' technology coalition whose members were primarily public school teachers and were advocates for ICT use in their schools. All members of the organization were invited to participate. An online survey was constructed to gather participants' perspectives and experiences in learning about, using, and implementing technology for their professional and instructional activities. Those who chose to answer the survey were also invited to participate in a focus group. Ultimately, 77 individuals completed the online survey, three individuals participated in the focus group, seven interviews were conducted through e-mail and one interview was conducted in person. Of the respondents, 51 were teachers and their responses were used to examine teachers' experiences. Of the fifty-one, 57% were female and 43% male. The vast majority (80%) was over the age of 40 and had been teaching for more than 10 years. Just over half (55%) of the participants taught at the elementary level, while 43% taught at the secondary level.

Methods. Qualitative methods used in this investigation included the semi-structured interviews, a focus group, and open-ended questions as part of the online survey. Through the use of open-coding, data were examined seeking emergent themes (Compte & Preissle, 1993) by each researcher and compared as part of the analysis (Merriam, 1998). While the findings from these qualitative approaches may not be generalizable to other tech-savvy populations, they are invaluable in gaining insight into the attitudes, beliefs, and experiences of the tech-savvy population this study sought to investigate. Simple descriptive statistics were used on the answers to the survey questions that provided such data (Gall, Gall, & Borg, 2003).

Results. Every participant had access to technology at home and at school; they reported word processing, PowerPoint presentations, and Internet research were the three most common uses for instruction with students. These teachers spend a great deal of personal money purchasing technology equipment and software for classrooms and students. Two-thirds of the participants noted that this amount was in excess of $100 dollars annually, while many reported spending into the thou-

sands each year. Similarly, nearly all teachers noted that they spend personal time preparing and planning to use technology in their classroom; three-fourths estimated working a minimum of one extra hour every day just to integrate ICT into their teaching.

Approximately one-half of the participants have received technology training through professional development classes and district inservice courses. Three-fourths increased their technology skills through conferences and workshops. Remarkably, 94% reported that they are self-taught when asked about their use of technology in the classroom. Furthermore, they sought ways to acquire and learn about ICT without the help of funds, or additional compensation from their school. These educators appear to share a level of confidence that enabled them to take risks in their teaching and were more willing to try new things; they also believed they could troubleshoot their way out of a possible computer difficulty. It may be that this confidence and willingness to take risks have allowed them to become self-taught tech-savvy educators and overcome a fear of failure in using ICT in front of tech-savvy students.

One characteristic of the teachers in this study was humility. While they were extremely confident, they were also quite willing to put aside their egos in front of their students in the service of promoting student learning. This willingness to place learning ahead of personal pride or ego is a characteristic which may separate tech-savvy teachers from those who do not integrate technology into their teaching. Another characteristic was their strong desire for continued or "life-long learning." While these teachers tended to be over the age of 40 and had extensive classroom experience, nearly all of them (94%) claimed that they have learned to use technology "on their own." This clearly demonstrated their willingness and continued desire for new knowledge and personal development. Rather than becoming stagnant, these teachers have a thirst for new and creative ways to help students learn.

Inspiring students to engage, perform, and become life-long learners is a central issue in education and thus a significant concern for educators. In this study, the majority of the respondents mentioned using technology because of its perceived ability to motivate students in learning. The participants responded that they use technology because it is fun and challenging for their students as well as for themselves. These teachers realized that using technology has risks that may cost some class time, but the rewards outweigh those risks. Additionally, teachers in this study attributed student success to technology because they believe that every student gets involved and more particularly, because technology can appeal to diverse learning styles. Participants thought that all students, regardless of their learning style, were able to experience success and learn while using a computer or other forms of technology. They also reported that technology ties learning to the real world. Teachers thought students were able to connect with technology since they were learning future job skills and becoming proficient in programs and technologies that they anticipate using in future careers.

These teachers overwhelmingly identified funding and time as ongoing challenges to their goals to implement technology, as the current literature suggests (Bauer & Kenton, 2005; Cuban, 2001). Yet these themes are still compelling and worth understanding.

RESEARCH STUDY 2

This study (termed MINTY) sought to understand the experiences of educators who participated in a two year technology project developed from a strong literature base and constructivist approach (Glassett & Schrum, 2008). It created technology-intensive classrooms, a learning community, and an intense set of training programs focused on pedagogy first and technology second for two years, and then provided teachers with ongoing support. Each of the participating classrooms was equipped with a projector, teacher workstation, printers, digital cameras, and enough Internet-connected student computers to facilitate a high level of student access (2-1). The schools were identified as high poverty in one western US state. This mixed methods research sought to understand how participants incorporated the technology and professional development into their classrooms. It particularly sought to understand the impact on students' learning outcomes in comparison to students who did not participate in the program.

This mixed methods study used a qualitative approach, through focus groups and open-ended question interviews, to understand educators' pedagogical beliefs and uses of technology. Qualitative data came from four focus groups, each lasting approximately one hour, plus email interview responses to similar open-ended questions sent to those individuals who were unable to attend the focus groups (Merriam, 1998). In order to measure any program effects on student outcomes, scores from a mandated Criterion Referenced Test (CRT) from randomly selected classrooms (grades 4, 5, and 6) were compared using demographic matching and effect size calculations, to search for any possible program effects. Primary quantitative data were from a comparison of CRT tests (given during the spring, 2007) between the 12 MINTY classes and randomly matched 12 non-MINTY classes for a total 24 primary classrooms.

Results. The findings revealed significant evolution of teachers' perceptions of their roles and responsibilities for integrating ICT, influence of technology on student success, and type of professional development activities conducted. Teachers in every stage of their professional lives (from first year to 20th year) self-selected to become part of this project. MINTY teachers were asked to create portfolios that represented reflection and implementation of the professional development activities. These data sources, in combination with the test scores, provided a picture of the impact of the MINTY project.

Qualitative Data. Qualitative analysis revealed three primary themes that appear to be essential to understanding the use and integration of technology in classrooms and the influence of technology on student success. Those primary themes include: (1) barriers to ICT integration; (2) importance of technology train-

ing; and (3) support within the learning environment. The teachers reported two similar and related motivations to participate in MINTY. Most described their desire to learn about and teach with technology in their classrooms. Frequently, this was a result of working with or knowing teachers who had participated in a previous MINTY cohort. A subset of teachers, primarily those in rural areas of the state, was most interested in gaining access to expensive technology. They described their districts as lacking in resources and saw this as an opportunity to have enough technology to make a difference in their teaching.

The teachers also reported the most important knowledge they took away from the program was specific teaching strategies they learned. More than information about the ICT, their new understanding of designing, supporting, and implementing cooperative learning and problem based learning made the most significant impact in their classroom. The modeling of communication and interaction in their professional development training was implemented in their own classes.

Teachers were asked how their teaching had changed and what impact they notice in their classroom environments. Most mentioned how much more confident they were in using cooperative learning and inquiry based lessons. They also felt that there was a change in students' attitude. Students were more engaged, less disruptive, and excited to participate in instruction. Teachers also reported that students participated in higher order thinking and problem solving, individually and collaboratively.

The teachers were invited to describe how their teaching had changed and what impact they notice in their classroom environments and their students. Teachers related stories of students working more diligently, correcting their work, collaborating in positive and elegant ways, and in being extremely proud of their efforts and result. They mentioned how much more confident they were in using cooperative learning and inquiry based lessons, even from the end of their first year of the program. They also felt that they continued to notice changes in attitude of their students this year from previous years.

Quantitative Data. A variety of confounding factors make conclusive analysis of data gathered on the success of the MINTY program challenging. These factors include differences in implementation of the MINTY project between schools and teachers, lack of congruence in relevant descriptors between sampled populations' CRT scores and demographic characteristics, and high levels of noise within data sets. These factors have the largest effect on analyses that focus on small subsets of the population. In light of the large amounts of data collected and effort invested in evaluating the MINTY program, these factors do account for the enormous variation in scores of MINTY and non-MINTY students at nearly all individual grade levels and/or within individual subjects. Therefore, results are reported as percentile rankings and an overall effect size was calculated at 0.6 (medium) for all grades using Cohen's *d* (Cohen, 1988).

In examining the data for Language Arts, Mathematics, and Science it became clear that the MINTY project had affected student learning. The data are reported

as percentile rankings on state mandated CRT tests. As seen in Table 1, overall the MINTY students performed somewhat better than the non-MINTY students. Again, given that this was not an experimental design, it is worth viewing these results with caution.

Table 1: *Results of Students' CRT Test Scores*

	Grade 4		Grade 5		Grade 6	
	Minty	Non-Minty	Minty	Non-Minty	Minty	Non-Minty
Language Arts	86.37	83.39	83.17	81.85	84.28	83.88
Math	81.54	79.52	69.72	68.25	67.75	69.12
Science	81.09	80.13	79.64	78.52	72.53	79.32

Overall, when assessment measures are averaged across sampled MINTY & non- MINTY students, MINTY students' performance is revealed to be clearly better than non- MINTY. We are confident that the effects of MINTY program on a large population are positive & encouraging, but not necessarily statistically significant. A study such as this was unable to control for teachers' years of teaching/experience, and skill, and yet these things may have had a profound impact on students' ultimate scores on standardized tests. Implementation does not appear to be uniform across districts, schools or among individual educators. This is a severe limitation in assigning effects of a program such as this. It is important to note that factors not related to students' scores (self confidence, interest in school, attendance, etc.) were not measured.

CONCLUSION

When considering the data across these two studies, it can be concluded that teachers themselves are key to meaningful change, whether we look at them as individuals or through a more aggregated lens in a large project. When supported, encouraged, and provided with time, tools, and training, amazing results may emerge.

REFERENCES

Atkins, N. E., & Vasu, E. S. (2000). Measuring knowledge of technology usage and stages of concern about computing: A study of middle school teachers. *Journal of Technology and Teacher Education, 8*(4), 279-302.

Bauer, J., & Kenton, J. (2005). Toward technology integration in the schools: Why it isn't happening? *Journal of Technology and Teacher Education*, *13*(4), 519-546.

Burns, K., & Polman, J. (2006). The impact of ubiquitous computing in the Internet age: How middle school teachers integrated wireless laptops in the initial stages of implementation. *Journal of Technology and Teacher Education, 14*(2), 363-385.

Casey, H. B., & Rakes, G. C. (2002). An analysis of the influences of technology training on teacher stages of concern regarding the use of instructional technology in schools. *Journal of Computing in Teacher Education, 18*(4), 124-132.

Cohen, J. (1988). *Statistical power analysis for the behavioral sciences* (2nd ed.). Hillsdale, NJ: Lawrence Earlbaum.

Collier, S, Weinburgh, M., & Rivera, M. (2004). Infusing technology skills into a teacher education program: Change in students' knowledge about and use of technology. *Journal of Technology and Teacher Education, 12*(3), 447-468.

Compte, M. D. & Preissle, J. (1993). Analysis and interpretation of qualitative data. In M. D. Compte & J. Preissle (Eds.), *Ethnography and qualitative design in educational research* (pp. 234-278). San Diego, CA: Academic Press Inc.

Cuban, L. (2001). *Oversold and underused: Reforming schools through technology 1980-2000*. Cambridge, MA: Harvard University Press.

Ertmer, P. A. (2005). Teacher pedagogical beliefs: The final frontier in our quest for technology integration? *Educational Technology Research and Development, 53*(4), 25-39.

Fullan, M. (2001). *The new meaning of educational change* (3rd ed.). New York: Teachers College Press.

Gall, M., Gall, J., & Borg, W. (2003). *Educational research: An introduction* (7th ed.). New York, NY: Longman.

Glassett, K. f., & Schrum, L. (2008). Technology-rich classroom environments and student achievement: A two year implementation. Paper presented at the Annual Meeting of AERA, New York, NY.

Guerrero, S. M. (2005). Teacher knowledge and a new domain of expertise: Pedagogical technology knowledge. *Journal of Educational Computing Research, 33*(3), 249-267.

Hernandez-Ramos, P. (2005). If not here, where? Understanding teachers' use of technology in Silicon Valley schools. *Journal of Research on Technology in Education, 38(1),* 35-46.

Merriam, S. B. (1998). *Qualitative research and case study applications in education* (2nd ed.). San Francisco: Jossey-Bass Publishers.

Norris, C., Sullivan, T., Poirot, J., & Solloway, E. (2003). No access, no use, no impact: Snapshot surveys of educational technology in K-12. *Journal of Research on Technology in Education, 36*(1), 15-28.

Schrum, L., Shelley, G. & Miller, R. (in press). Understanding tech-savvy teachers: Identifying their characteristics, motivation, and challenges. *International Journal of Technology on Teaching and Learning.*

Williams, H. S., & Kingham, M. (2003). Infusion of technology into the curriculum. *Journal of Instructional Psychology, 30*(3), 178-184.