

Fly on the Wall: Using Teleconferencing to Supervise Student Teacher Performance

Marcia Bolton

Center for Education

Widener University

Chester, Pennsylvania, United States of America

mvbolton@mail.widener.edu

Introduction

Teleconferencing is a communications technology that integrates video and voice to connect remote users with each other as though they are in the same room. Each user needs a broadband internet connection to participate. Users see and hear each other in real time, allowing natural conversations that are not possible with voice-only communications technology.

Partnerships between public schools and colleges and universities in the United States began to change in the 1980s. Teacher education institutions organised new relationships with public schools for the initial and continuing education of teachers. These schools, called professional development schools, or partner schools, focus on improving pre-service teacher education and creating strong partnerships with teacher preparation institutions (Zeichner, 2006). The partner schools became an ideal place for the culminating student teacher experience of 12–16 weeks in a classroom. Because of their long-term relationship with a partner school and its teachers, student teachers placed at identified partner schools are guaranteed time to develop effective teaching practices, including using new technologies such as teleconferencing. Partner schools can begin to take advantage of harnessing the new technologies offered through the institute of higher education. Many teacher education institutions have not taken advantage of technology partnerships and coordinated training in technology in the past (Wei & Johnes, 2005; Conole, 2004). Teleconferencing gives the teacher preparation school and the partner school an opportunity to use, understand, and explore an advanced technology system.

Studies by Diaz and Carnal (1999) and Strauss (1993) show that a visitor to a classroom can interrupt the routine of everyone involved. Students usually straighten their posture and watch carefully as the visitor takes a seat. The in-person visit affects the student teacher as well. A student teacher who is observed by a supervisor from their college or university will change their behaviour to make their evaluation proceed more positively (Lesley, Hamman, Olivarez, Button, & Griffith, 2009). Student teachers realise that if their students are well behaved, they will be able to impress the supervisor with content knowledge and instructional methodologies. Ardley (2009) believes such behaviour can create an artificial situation for the supervisor, student teacher, and the students in the classroom. The question posed for this study was whether the physical presence of an outside observer is the *best* means of assessing the performance of student teachers. The researcher agrees that if a supervisor can watch student teachers remotely via teleconferencing, with the aim of watching a real classroom teaching event rather than an ideal one, the behaviour of all involved may be more natural (Ardley, 2009; Shifflet & Brown, 2006).

Supervising student teachers by remote observation or teleconference is certainly an option. Richter, Backer, and Vogt's (2009) review of distance education research indicates that a study on the supervision of student teachers, and the interaction and communication between the college supervisor, student teacher, and partner teacher, would add to the current body of literature.

Context of the study

A study of the effectiveness of using teleconferencing technology as an evaluation tool for student teachers was developed. A survey instrument was distributed to 16 student teachers who were observed via teleconferencing. All respondents (16 student teachers and 2 partner teachers) agreed the technology was less intrusive, less distracting, and easier to 'tune out' than was an in-person supervisor (see Table 2, lines 1 & 2). Only one student teacher expressed a preference for in-person visits from a supervisor (line 7). As shown in line 8, if student teachers and their students are indeed less aware of the observation, student teachers will be more likely to exhibit instructional methodologies that indicate their true potential (Diaz & Carnal, 1999; Strauss, 1993).

Research was conducted at a college that was founded in 1872 as a branch of the State Normal School of West Virginia to provide quality teaching professionals to the state's public schools. Since its founding, the college has

progressed to its current position as a comprehensive liberal arts institution, offering a wide variety of degree opportunities. Because the college is located in the most rural part of West Virginia, student-teaching observation emerged as a unique challenge. In the fall and spring semesters, an average of 35 student teachers require at least 6 supervision visits each. Supervisors may spend whole working days driving on country roads, often in inclement weather, to visit the professional development partner schools that mentor the student teachers.

Public schools

School funding to buy distance-learning equipment came from both a National Aeronautics and Space Administration (NASA) grant and a local benefactor. At the time, schools in only one county were equipped to participate in teleconferencing interactions, which they could operate within their school and from a distance. Although the equipment was somewhat dated, it proved adequate to meet the needs of this study. Specifically, the equipment consisted of a camera video-conferencing system that included a viewing screen with embedded camera, a remote control, speakers, viewing screen, cart, and a 42” television screen. The system worked very well for classrooms of all sizes and was fully interoperable with standards-based video when used with a PC. The video-conferencing system was set up in the classroom the day before it was needed so students would not have heightened alertness to new equipment in the classroom. The system was also used regularly in these schools, so students and teachers accepted, and were used to, the equipment being in the room. All respondents (16 student teachers and 2 partner teachers) stated they learned about the technology and would use it again because of their participation in the teleconferencing study experience (see Table 2, line 4 & 5). Fourteen student teachers and one of the partner teachers went on to state they had an excellent experience with the teleconferencing supervision (Table 2 line 6).

College level

At the college, the supervisor had a smaller screen with embedded camera on their desk. Their teleconferencing equipment included a portable 18” screen, camera, speakers, and remote control. The supervisor used the mute option unless they needed to interact with the classroom; they could not, therefore, be seen or heard during observation. All students in the classroom had signed permission slips from their parents (Collins & Grisham-Brown, 2001). On-site supervision did not occur in classrooms if permission was not received from every student’s parents. School building administrators were informed, and consented to supervision via distance video conferencing.

At the conclusion of every remotely observed class, the student teacher and partner teacher sat in front of the viewing screen with embedded camera and had a two-way discussion with the supervisor about the lesson, thus forming a triad learning community (Anderson & Petch-Hogan, 2001; Edwards, Nicoll, Solomon & Usher, 2004). The wrap-up discussions enabled the pre-service teacher to learn about, apply, and prepare for technology to be included in their future classroom. Today's student teachers must learn how to teach via video teleconferencing or online to stay current in instructional delivery methods, because 21st century students require instruction and guidance in this new form of teaching and learning (Anderson & Petch-Hogan, 2001; Grable, Kiekel, & Hunt, 2008; Gao, Choy, Wong, & Wu, 2009). The 35 student teachers and the partner teachers who participated in this study were able to construct their own understandings of technology use by integrating new knowledge with what they already knew, in a constructivist environment of active learning and application (Gao et al.). Members of the triad of supervision learned about the technology from each other as they solved problems together.

It must be noted that it was never intended that teleconferencing would completely replace visits from supervisors—it is evident that face-to-face interaction, feedback, and support are essential for teacher development. However, if proven to be an effective tool in observation, teleconferencing could significantly cut the number of in-person visits to remote schools, reduce the cost of supervisors' travel, and increase the ability of student teachers to use technology for teaching and learning. As with many forms of teleconferencing, there is little or no cost for use after the initial purchase of equipment and wiring—a positive outcome (Barron, 2009).

Student teachers often need to be placed at a school close to their home but some distance from their college campus. Teleconferencing allows the college to grant these requests, with added benefits for the student teachers, placement schools, and the college. Using teleconferencing establishes a visible presence in these remote schools that would not otherwise be able to have a student teacher. A professional partnership with the college faculty and resources is also established. This study found that, once the teleconferencing technology was seen in use, teachers at the partner schools began to use teleconferencing within their buildings for increased student learning and exposure to technology, just as others had done in studies completed by Ardley (2009), and Richter et al. (2009). Further, using teleconferencing for supervision and discourse provided “pre-service teachers with a balance between pedagogical knowledge and technological knowledge” (So & Kim, 2009, p. 102).

From the beginning of this study, the latent function of observing classroom management became very clear. The ‘artificial eye’ allowed more natural student behaviour (Lesley et al., 2009). Students were not all sitting erect, quiet and attentive as they so often do when a professional stranger is in the back of the room, jotting down observations on a legal pad. Instead, they were shouting out answers, interrupting instruction with requests to leave the room, whispering, passing notes and, in some cases, dozing. The way a student teacher handles this behaviour indicates both classroom management style and future effectiveness as a teacher (Kong, Shroff, & Hung, 2009). After the session, the triad held an open discussion that addressed sanctions of positive and negative behavior, and allowed the student teacher to request and be given advice (Kong et al.).

Of course, the picture is not one of uncontrollable students and ineffective discipline. Most student teachers shone! For example, a learning disabled child who was prone to uncontrollable verbal outbursts was quickly involved in a music lesson when one student teacher gave her a tambourine, showed her how to make sounds, and continued with the lesson. Just as the classroom students assumed more natural behavior, so did the student teacher. Student teachers did not glance nervously at the supervisor, set up demonstrations of ‘expert’ teaching vignettes, or display nervous habits such as wringing their hands. Most student teachers (15 of the 16 survey respondents) seemed to forget the supervisor was observing via satellite, and exhibited their natural teaching behaviour (Table 2, line 10).

Research background

Distance learning technologies may provide many benefits for K–12 teacher education programmes, including convenience, flexibility, and effectiveness (Barron, 2009). Barron supports the fact that supervising student teachers via teleconferencing is convenient because it can be conducted from a single place, such as a college supervisor’s office, to many school sites that are some distance from the college. If the technology is advanced enough, satellite transmissions can be recorded for later review. As Kong et al. (2009) found, teacher education has to offer many opportunities to build up professional knowledge, skills, and reflective ability if it is to create competent student teachers.

Using distance learning satellite transmissions to supervise student teachers has proved to be effective and reliable (Anderson & Petch-Hogan, 2001; Ardley, 2009; Conole & Culver, 2009; Hannon, 2009). Teleconferencing is equal to face-to-face supervision when the technologies used are appropriate

for the instructional tasks and when there is student-to-supervisor interaction. Timely supervisor-to-student teacher feedback must be provided to ensure the student teacher can benefit from the supervision opportunity (Moore & Thompson, 1990; Verduin & Clark, 1991).

Teleconferencing also increases the visible presence of colleges in remote areas, and this can increase awareness of what professional learning communities can offer in terms of instruction and learning to teachers, students, and building administrators. Rural schools often have less contact with educational trends, fewer qualified teachers, and a greater need for technology-delivered benefits. Teleconferencing and its use in student teaching supervision offers great potential for addressing some of these issues (Annetta & Symansky, 2008). Student teachers, supervisors, students, and partner teachers who participated in teleconferencing supervision activities demonstrated how effectively they create a learning environment that leads to success in the classroom. Additionally, student teachers learn an alternative delivery method, which they may need when they become in-service professionals (Grable et al., 2008).

Supervision by teleconference offers the possibility of increased interaction with student teachers and with students in the class. In particular, introverted students, or more introverted student teachers, will often ‘open up’ when they are supervised from a distance (Annetta & Symansky, 2008). Because everyone involved forgets supervision is going on, innovation and creativity in teaching are seen, not as tasks to be accomplished, but as ways to conduct a class every day. The supervisor, student teacher, and partner teacher become a collaborative triad that judges instructional methods and skills on results, rather than intentions or artificial behaviour. “Schools cannot achieve the fundamental purpose of learning for all if educators work in isolation” is part of the definition of professional learning communities or triads (DuFor, Dufor, & Eaker, 2008, p. 18). Using distance learning for supervision and learning forges a connection between colleges and schools that may be separated by miles, but not in thinking.

The live wrap-around discussions after the lessons are an important element of teleconferencing supervision. These wrap-around discussions develop the depth of the professional learning community (or, in this case, the triad) that is built to develop and train future teachers (Annetta & Symansky, 2008; Kong et al., 2009; Gao et al., 2009). Teachers must always ask themselves, “Do they learn what I teach?” Throughout history, teachers have been overly concerned with the question, “What was taught?” instead of the more

relevant question, “What is learned?” (Dufor et al., 2008). To address some of this thinking, teleconferencing wrap-around discussions allow for *right now* learning and reflection with the student teacher, partner teacher, and university supervisor (Kong et al., 2009).

According to Pierson (2001) technology integration, or the ‘know-how’ to use technology for personal use, is another benefit of teleconferencing during student teacher training (see Table 1).

Table 1 Features of two modes of observing student teachers

Direct observation	Indirect observation
Supervisor is in classroom to observe student teacher	Supervisor observes via teleconferencing equipment and is invisible to students in classroom
Greater potential for Hawthorne Effect ¹ because students know they are being observed (artificial responses)	Less intrusive; class forgets equipment is in the room, therefore Hawthorne Effect is minimised (more natural responses)
Student teacher behaviour is more focused on supervisor than on instructing students	Student teacher forgets about supervision and instructs in more natural ways, demonstrating more authentic skill set
It is difficult to evaluate authentic classroom management	There is greater opportunity to evaluate natural classroom management

Numerous studies (e.g., Barab, Thomas, Dodge, Carteaux, & Tuzun, 2005; Barak & Dori, 2005; Barron et al., 1998; Bottino & Silva, 2007) have found that technology interventions have many positive effects on achievement when student teachers are taught to use technology in the context of their teacher education courses. Metacognitive thinking strategies were improved significantly in classrooms in which the teacher was skilled at using technology (So & Kim, 2009). Teleconferencing during supervision of student teaching gives the student teacher and partner teacher an opportunity to engage in learning about teleconferencing and, at the same time, to teach one another how to apply the technology (So & Kim, 2009). So and Kim (2009) found the beneficiaries of such learning by their teachers to be the students in the classroom. Riel and Becker (2000) found “the teacher’s use of technology for teaching and learning is closely related to the ability to translate their beliefs into teaching practices” (So & Kim 2009, p. 105).

1 The *Hawthorne Effect* is an increase in worker productivity produced by the psychological stimulus of being singled out and made to feel important

Teacher candidates who have a constructivist orientation cannot disregard sharing *through doing* as a mighty tool that increases their ability to teach powerful learning strategies to their students (So & Kim, 2009).

Methods and findings

A survey instrument was developed and administered to those student teachers and partner teachers who experienced supervision via both teleconferencing technology and in-person visits. The survey instrument was distributed to 16 student teachers and 6 partner teachers. All 16 student teachers and 2 of the 6 partner teachers responded.

The following questions formed the basis of the survey, which was designed to assess the effectiveness and perceptions of the teleconferencing:

- Would student teachers or partner teachers use teleconferencing equipment again?
- Was the teleconferencing intrusive or distracting to students or student teachers?
- Did partner teachers and student teachers learn about using a new technology?
- Did student teachers and partner teachers prefer teleconferencing to in-person supervision?

Concern that student teachers and their cooperating teachers would feel they received less attention from the college supervisor when technology was used quickly abated when all 16 student teachers and 2 partner teachers stated they received appropriate individual attention (see Table 2, line 3). Furthermore, both partner teachers commented that the technology offered an added benefit of impromptu conferencing when necessary.

Table 2 Key findings of survey

Key findings	Student teachers (ST) in agreement (n = 16)	Partner teachers (PT) in agreement (n = 2)	Comments
1. Teleconferencing distracts student teacher and intrudes on instructional focus	16	2	Less distracting and better for my student teacher to learn (PT)
2. The equipment was not a distraction	15	0	
3. Received sufficient supervisor support	14	2	I really liked that I could talk with supervisor at any point. I asked for additional observations and talks with my student teacher and it was great (PT) My supervisor never missed an observation and I think I even got more time with her through technology connection. Sometimes it was hard to set up though (ST)
4. Learned about technology	16	2	
5. Would use the equipment again	16	2	I loved using this way to have observation and will use it for English lessons (PT, ST)
6. Had an excellent experience with teleconferencing	14	1	
7. Prefer in-person supervision	1	0	
8. Student teacher behaviour was normal, not artificial	16	2	Definite advantage to using the teleconferencing
9. Forgot the equipment was in the room (focus is on teaching)	15	0	I could not ignore the equipment but we are used to having it in the room; it didn't bother me but I could not forget it (both PT)

If student teachers and students change their behaviour when there are distracting changes in the environment, it is important to assess the level of intrusion of teleconferencing technology equipment versus in-person visits (Ardley, 2009, Richter et al., 2009). Data in Table 2, lines 1, 2, and 10, shows that when asked about the intrusiveness of the equipment in the room, only one student teacher said the teleconferencing equipment was distracting (line 2), and none of them thought the equipment was so intrusive it disrupted their lesson focus. Based on the perceptions of this small sample of respondents, it can therefore be concluded that observation via teleconferencing was far less intrusive and distracting than a physical presence in the classroom. With less distraction, the potential for students and student teachers to have ‘natural’ interactions is maximised.

Behavioural changes are difficult to assess using survey research as a methodology. All respondents stated they did not change their teaching when the technology was used, and all but one student teacher stated they forgot the equipment was being used (see Table 2, line 10). Neither partner teacher forgot the equipment was in the room, but they both stated they did not feel it was intrusive or that it changed student behaviour. In total, 16 of the 18 respondents reported more genuine behaviour of both student teacher and students when they were observed via computer monitor. An interesting and unexpected finding was that the supervisor found the student teacher’s behaviour to be more ‘normal’ and natural—much more natural than the artificial behaviour exhibited during in-person supervision. Furthermore, both of the partner teachers commented there was a “definite advantage” in using the technology, and that it was actually “better for [student learning].”

Discussion and conclusion

Studies that looked at distance supervision, teleconferencing, and face-to-face observation have indicated that teaching and studying at a distance can be as effective as traditional supervision or instruction (see Moore & Thompson, 1990; Verduin & Clark, 1991). The survey data collected in this study supports the cited research and offers a set of interrelated concepts to guide potential users of distance supervision or teleconferencing techniques.

Concept 1: Supportive feedback

- Teleconferencing equipment offers a chance to observe actual teaching and learning situations. The student teacher is observed with minimal classroom disruption; therefore a clear picture of teaching performance is observed (Ardley, 2009).

- Reflection and critical feedback using actual teaching events provide the student teacher with the greatest amount of potential for growth in instructional methods. Teleconferencing allows supervisors opportunities to provide feedback in situations that give student teachers great potential for growth because the venue suits the needs of the student teacher and supervisor (Kong et al., 2009).

Concept 2: Non-invasive observation

- According to survey and interview results, partner teachers and student teachers experienced minor interruption. Fifteen of the 16 student teachers indicated they forgot they were being observed. The partner teachers were not able to forget the equipment was in the room, but both agreed the equipment was less intrusive than an in-person visit.

Concept 3: Collaboration and expertise

- Teleconferencing provides a setting for dynamic, positive, and productive collaboration among partner teachers, student teachers, and college supervisors. Success depends on strong and successful partnerships between institutes of higher education and public schools that foster the growth of professional learning communities Edwards et al., 2004; Hannon, 2009).
- The partnership between the selected schools and the institute of higher education focuses on developing potential teachers who are grounded in active research, reflective teaching practices, and use of technologies that help teachers and learners to be active members of the teaching profession (So & Kim, 2009; Barab et al., 2005; Barak & Dori, 2005).
- More than one college supervisor can observe a teaching and learning situation, and they can engage in professional discourse with each other and the student teacher. Content-specific questions that arise out of a teaching event can be addressed by a supervisor with specialised knowledge of the content observed.

Construct 4: Assessment

- Teleconferencing provides useful and timely information about the teaching and learning that happens in real time and in real classroom situations. Fax machines were used to receive student assignments quickly, and to provide timely feedback (Willis, 1993).

Summary

The author does not suggest that teleconference supervision should replace in-person supervision. As Anderson and Petch-Hogan (2001) found, “teacher training institutions have not responded quickly despite the findings of the United States Office of Technology (1995), which reported that 76% of college professors believed technology played an important role in teacher training...” (p. 1). So and Kim (2009) agree that student teachers have very little understanding about effective technology integration or use. The findings of this study provide insights into how teleconferencing could be used to expose pre-service and in-service teachers to technical tools. Most “...pre-service teachers can develop abilities to design successful, technology integrated lessons” with help from teacher preparation institutions on the use of such tools (So & Kim, 2009, p. 102). As Kauffman 1992, writes:

The benefits of collaborative efforts are manifold and enrich each triad member. Student teachers have the opportunity to incorporate fully both the theoretical and the practical into their teaching. Additionally, the partner teacher and the university supervisor create a working relationship based on mutual respect and understanding for each others’ expertise, perspectives, and roles (p. 1).

Further and more intense research is necessary to add to the body of knowledge regarding using teleconferencing to effectively supervise student teachers. While this study is a supplemental approach to using teleconferencing as a supervising tool, newer equipment that provides a permanent video of the observed lesson is now available and would add a great deal to the results of this study.

References

- Anderson, C. L., & Petch-Hogan, B. (July, 2001). The impact of technology use in special education field experience on preservice teachers’ perceived technology expertise. *Journal of Special Education Technology*. Retrieved December 23, 2009, from <http://www.highbeam.com/DocPrint.aspx?DocId=1P3:83117402>
- Annetta, L., & Symansky, J. A. (2008). A comparison of rural elementary school teacher attitudes toward three modes of distance education for science professional development. *Journal of Science Teacher Education*, 9(3), 1–16.

- Ardley, J. (2009). Unanticipated findings: Gains by cooperating teachers via video-mediated conferencing. *Journal of Computing in Teacher Education*, 25(3), 81–86.
- Barron, A. (2000). *A teacher's guide to distance learning*. Tampa: Florida Center for Instructional Technology, College of Education, University of South Florida.
- Barab, S., Thomas, M., Dodge, T., Carteaux, R., & Tuzun, H. (2005). Making learning fun: Questions Atlantis, a game without guns. *Educational Technology Research and Development*, 53(1), 86–107.
- Barak, M., & Dori, Y. J. (2005). Enhancing undergraduate students' chemistry understanding through project-based learning in an IT environment. *Science Education*, 89(1), 117–139.
- Barron, J. S., Schwartz, D. L., Vye, N. L., Moore, A., Petrosino, A., & Zech, L., et al. (1998). Doing with understanding: Lessons from research on problem- and project-based learning. *Journal of the Learning Sciences*, 7(3–4), 271–311.
- Bottino, R. M., & Silva, D. Y. (2007). Transforming classroom teaching and learning through technology: Analysis of a case study. *Educational Technology & Society*, 10(4), 174–186.
- Collins, B. C., & Grisham-Brown, J. (2001). Guidelines for distance learning content delivery. In B. L. Ludlow & E. Spooner (Eds.), *Distance education in special education: Personnel preparation applications*. Reston, VA: Council for Exceptional Children.
- Conole, G. (2004). E-learning: The hype and the reality. *Journal of Interactive Media in Education*, 12. Retrieved November 22, 2009, from <http://www-jime.open.ac.uk/2004/12/conole-2004-12-paper.html>
- Conole, G., & Culver, J. (2009). Cloudworks: Social networking for learning design. *Australasian Journal of Educational Technology*, 25(5), 763–782.
- Diaz, D. P., & Cartnal, R. B. (1999). Students' learning styles in two classes: Online distance learning and equivalent on-campus. *College Teaching*, 47(4), 130–135.
- Dufor, R., DuFor, R., & Eaker, R. (2008). *Revisiting professional learning communities at work: New insights for improving schools*. Bloomington, IN: Solution Tree.

- Edwards, R., Nicoll, K., Solomon, N., & Usher, R. (2004). *Rhetoric and educational discourse: Persuasive texts?* London: RoutledgeFalmer.
- Gao, P., Choy, D., Wong A. F., & Wu, J. (2009). Developing a better understanding of technology based pedagogy. *Australasian Journal of Educational Technology*, 25(5), 714–730.
- Grable, C., Kiekel, J., & Hunt, A. (2008). Digital pre-service teacher education: Field experiences as a possible augmentation to the traditional brick and mortar field experience. *Journal of Education, Informatics and Cybernetics*, 1(1). Retrieved November 22, 2009, from <http://www.journaleic.com/article/view/3392/2464>
- Hannon, J. (2009). Breaking down online teaching: Innovation and resistance. *Australasian Journal of Educational Technology*, 25(1). 14–29.
- Kauffman, D. (1992, May). *Supervision of student teachers*. Retrieved January 12, 2007, from <http://www.ericdigests.org/1992-4/student.htm>
- Kong, S. C., Schroff, R. H., & Hung, H. K., (2009). A web enhanced video system for self reflection by student teachers using a guiding framework. *Australasian Journal of Educational Technology*, 25(4), 544–558.
- Lesley, M. K., Hamman, D., Olivarez, A., Button, K., & Griffith, R. (2009). I'm prepared for anything now: Student teacher and cooperating teacher interaction as a critical factor in determining the preparation of “quality” elementary reading teachers. *Teacher Educator*, 4(1), 40–55.
- Moore, M. G., & Thompson, M. M., (with Quigley, A. B., Clark, G. C., & Goff, G. G.). (1990). *The effects of distance learning: A summary of the literature*. Research Monograph No. 2. University Park, PA: Pennsylvania State University, American Center for the Study of Distance Education.
- Pierson, M. E. (2001). Technology integration practice as a function of pedagogical expertise. *Journal of Research on Computing in Education*, 33(4), 413–430.
- Richter, O. A., Backer, E. M., & Vogt, S. (2009). Review of distance education research (2000 to 2008): Analysis of research areas, methods, and authorship patterns. *The International Review of Research in Open and Distance Learning*, 10(6), 1–16.
- Riel, M., and Becker, H. J. (2000). *The beliefs, practices, and computer use of teacher leaders*. Presented at the annual meeting of the American Educational Research Association, New Orleans, LA.

- Shifflet, M., & Brown, J. (2006, December 22). The use of instructional simulations to support classroom teaching: A crisis communication case study. Retrieved November 22, 2007, from <http://www.thefreelibrary.com/The+use+of+instructional+simulations+to+support+classroom+teaching%3a+a+...-a0153749069>
- So, H., & Kim, B. (2009). Learning about problem based learning: Student teachers integrating technology, pedagogy, and content knowledge. *Australasian Journal of Educational Technology*, 25(1), 101–116.
- Strauss, S. (1993). Teachers' pedagogical content knowledge about children's minds and learning: Implications for teacher education. *Educational Psychologist*, 28(3), 279–290.
- United States Congress, Office of Technology Assessment. (1995). *Teachers and technology: Making the connection*. OTA-EHR-616. Washington, DC: United States Government Printing Office.
- Verduin, J. R., & Clark, T. A. (1991). *Distance education: The foundations of effective practice*. San Francisco, CA: Jossey-Bass.
- Wei, Y., & Johnes, J. (2005). Internet tools in teaching quantitative economics: Why gaps between potential and reality? *Journal of Further and Higher Education*, 29(2), 125–141.
- Willis, B. (1993). *Distance education: A practical guide*. Englewood Cliffs, NJ: Educational Technology.
- Zeichner, K. (2006). *Professional development school partnerships: A place for teacher learning*. Retrieved February 12, 2010, from <http://www.newhorizons.org/spneeds/inclusion/staff/zeichner.htm>

Biographical note



Dr Marcia Bolton

Dr Bolton earned her doctorate in Education Administrative Leadership in 2004. She has 28 years of public school teaching administration and is currently finishing her fifth year of teaching and supervising, as clinical assistant professor and Director of Student Teaching and Interns.