Re-imagining Teacher Supervision Using Mobile Computing Technology: Project RITE's Distance Observation Solution

Matthew Schmidt
University of Cincinnati

Penny Cox
University of Florida

James McLeskey
University of Florida

Abstract: This article describes a low-cost distance observation system developed for the University of Florida under a 325T grant. The system uses iPad Mini tablets to live stream pre-service teachers' field-based teaching to supervisors who are geographically distant. Using mobile data plans coupled with a variety of peripherals, this system overcomes many known limitations of distance observation using mobile devices. In this article, we describe the current system, including hardware and software components. We also provide a cost/benefit analysis that compares our system with traditional observation, with results suggesting that distance observation can result in significant cost savings over traditional observation methods. Ramifications of distance observation are discussed.

KEYWORDS: distance observation, mobile technology, pre-service teachers, Professional Development Schools

NAPDS NINE ESSENTIALS ADDRESSED:
2. A school–university culture committed to the preparation of future educators that embraces their active engagement in the school community;
4. A shared commitment to innovative and reflective practice by all participants; and
5. Engagement in and public sharing of the results of deliberate investigations of practice by respective participants

The setting is Mrs. Yoshimura's third grade classroom at Pahala Elementary, a small, rural K-12 school on the Big Island of Hawaii. As students file in to class, they are not surprised to see Ms. Mahina preparing to give the lesson. Ms. Mahina has been a teacher intern for the third graders this whole first quarter. Ms. Mahina is planning to teach a lesson to the third graders entirely on her own as part of her field experience. The students have been learning about sustainability and aquaponics, and they seem excited to continue working on their projects with Ms. Mahina.

Ms. Mahina is concentrating on an iPad Mini tablet at the front of the room. She has attached the iPad to a small tripod and she has affixed a small lens and a wireless microphone receiver to the iPad Mini.

"Can you hear me now?" she asks through her wireless lapel microphone. Then she looks at the iPad screen and nods. "OK, great," she says, "Are you receiving video as well?" She again looks at the iPad screen and nods. "OK then, I think we can go ahead and get started!"

"Who're you talking to?" asks Kimo, one of the boys in the class.

"Oh, why, that's my eSupervisor, Kimo," Ms. Mahina replies. "She's on Oahu and she's going to watch our lesson today."

Makana, another student, chimes in, "How can she watch our lesson from Oahu? That's a different island!"

Ms. Mahina holds up the iPad for the class to see. "I'm broadcasting my lesson to my supervisor over the Internet; she can see and hear us, even though she is in her office at the university."

"But Mrs. Yoshimura says our Internet at school is too slow for videos," remarks Makana. "How come you can do videos?"

"Well, I'm not using the school's Internet. This iPad is connected using the cellular network, just like a smartphone," replies Ms. Mahina.

"That's cool, I guess," says Makana. He does not seem particularly impressed. Many of the students at Pahala use iPads and Chromebooks on a regular basis, especially in Mrs. Yoshimura's class, so it is no surprise to see Ms. Mahina using one.

Ms. Mahina begins the aquaponics lesson with the iPad placed stationary on the side of the classroom. Following this, students begin working on their group projects. Ms. Mahina moves from group to group, setting the iPad's tripod on each table as she interacts with students. At the end of the lesson, she returns to the front of the class and concludes the activities with the iPad back on the side of the classroom.

The next day, Ms. Mahina and her distance supervisor connect using a web conferencing app to debrief and review the supervisor's report of Ms. Mahina's performance.

What is Distance Observation?

The above scenario is one of many demonstrating how distance observation can be used to provide supervision and guidance to pre-service teachers engaged in field experiences online and at-a-distance. Distance observation is the use of electronic telecommunications technology to provide field-based observation to teacher interns who are not in the same location as the supervisor (McAdams & Wyatt, 2010). Pre-service, novice teachers need guidance as they translate research and training into practice in their classrooms (Billingsley, Griffin, Smith, Kamman, & Israel, 2009). Typically, this is achieved by supervisors overseeing teacher interns in classroom-based field experiences. However, due to the significant management, time, and travel associated with traditional models of field-based teaching observations, the costs to support such programs are high. Alternatively, substantial cost savings can be realized through distance observation using Internet-enabled mobile devices such as smartphones and tablets.

In addition to cost savings, distance observation for pre-service teachers enhances accessibility and convenience for both supervisors and pre-service teachers, and has the potential to provide opportunities that are not possible using more traditional observation methods. While interest in distance observation solutions is growing (e.g., Bolton, 2010; Hager, Baird, & Spriggs, 2012; Rock et al., 2009; Routier & Otis-Wilborn, 2013), understanding is limited (Routier & Otis-Wilborn, 2013). Some reports suggest that the technology is less intrusive than having a supervisor present;

that teleconferencing promotes enhanced collaborations between supervisors, pre-service teachers, and partner teachers; and that pre-service teachers are able to receive more timely feedback (Bolton, 2010; Rock et al., 2009, 2012). However, further work is needed to develop efficient and effective systems that re-imagine teacher supervision using mobile technologies while retaining needed features of traditional supervision methods. Challenges that limit current distance observation efforts include using school networks (Hager et al., 2012), audio that is difficult to hear (Rock et al., 2012), limited field-of-view, poor video (Gronn et al., 2013), and a general lack of mobility (Kelly & Bishop, 2013). However, application of new technologies with advanced capabilities mitigates many of these problems.

Observing Teachers from a Distance with the iPad Mini

Using common, off-the-shelf technology, we developed a cost-effective system for observing teacher interns at a distance as they perform their field-based teaching. With our system, we have attempted to overcome many of the problems outlined in the previous section. The system was developed as part of Project RITE (Restructuring and Improving Teacher Education), a 325T grant project at the University of Florida (UF) to prepare special education teacher graduates to meet the Highly Qualified (HQ) requirements of the Individuals with Disabilities Education Act (IDEA; 2004). The system centers on an iPad Mini attached to a small tripod for streaming audio and video to field supervisors over the Web. We provide a brief description of the system below. A complete description of the system is provided in Schmidt, MacSuga-Gage, Gage, Cox, and McLeskey (2015).

The iPad Mini is ultra-mobile, has outstanding battery life, and is quite small; however, despite its diminutive size, it is capable of recording and streaming with exceptionally high quality. The decision to use this device was based on cost, ease-of-use, quality and reliability of device, the iOS app ecosystem, and networking capabilities. We chose to use iPads with cellular connectivity because school networks often require special permission and sometimes have incongruent access policies, restrictive firewalls, and highly variable bandwidth availability at peak usage times. To increase reliability and ease-of-use, we opted to use a high-speed 4G LTE cellular network.

We also extended the capabilities of the iPad Mini through the use of a small tripod, a detachable wide-angle lens, and a wireless lapel microphone. The tripod provides stability while retaining mobility. The wide-angle lens allows the distance supervisor to see more of the classroom than with the stock lens. The wireless lapel microphone provides high-quality audio to the distance supervisor while at the same time allowing the pre-service teacher to have free range of motion. Audio and video are streamed at up to 1080p high definition quality. On the iPad, Wowza Media System's GoCoder app is used to encode the video stream. We use Wowza Streaming Engine to stream the video to a password-protected webpage in the university's learning management system, where it can be viewed by distance supervisors. A diagram of the system is provided in Figure 1.

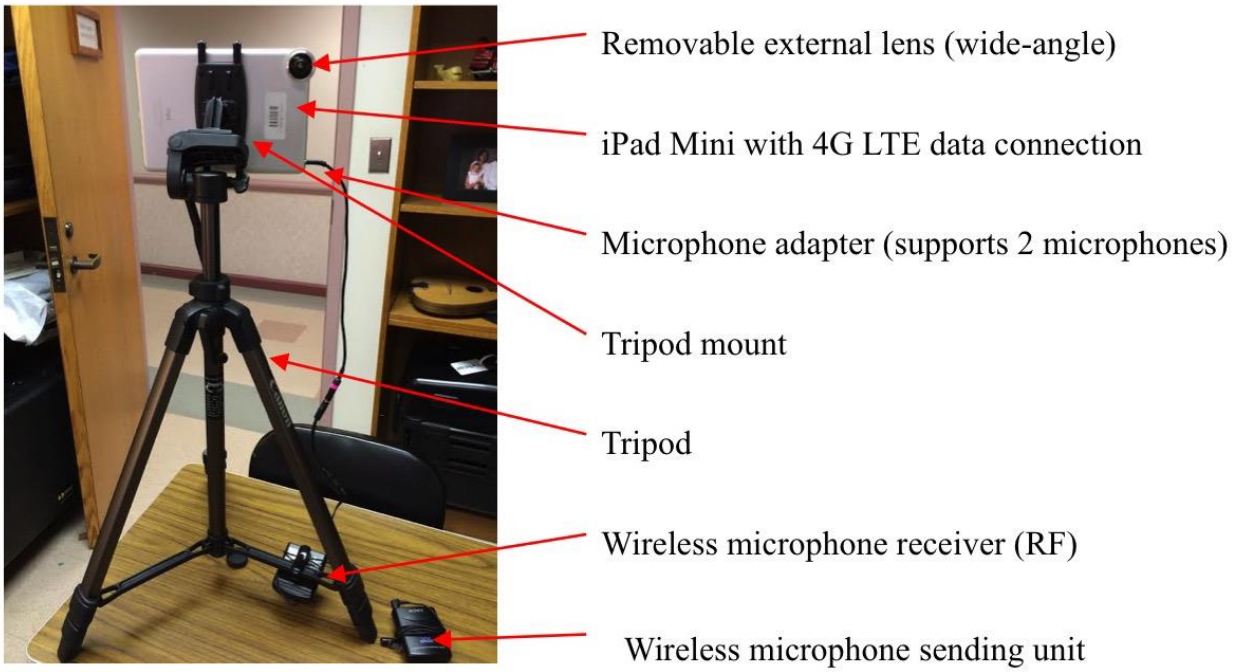

Figure 1. iPad Mini mounted to tripod with peripheral devices attached for distance observation.

Potential Cost Savings with Distance Observation

We performed a cost/benefit analysis that showed the distance observation solution has the potential for substantial cost savings. For this analysis, we compared supervisors' travel costs per year with the cost of implementing and supporting distance observation per year. To determine supervisors' travel costs, we calculated three 150 mile round trips per semester using standard mileage reimbursement and per-diem rates. To determine the cost of implementing and supporting distance observation, we calculated software, hardware, and service costs per year. Analysis suggests that in the short term, traditional observation is more cost-effective than distance observation. However, due to the technological nature of distance observation, economies of scale and related cost-savings can be realized with this approach that are not possible with traditional methods.

Assuming two years of use with the distance observation system, the total cost to observe a single pre-service teacher is $3,425. For traditional observation, the cost is $1,650. In this case, the distance observation solution costs more than traditional observation. Scaling up to five students over two years narrows this gap, with distance observation costing $10,650 and traditional observation costing $8,100. This trend continues, with greater cost savings for the distance observation solution being realized at scale. Using distance observation over four years for five students per year results in total costs of $17,100. For traditional observation, the cost is $33,000. With 100 pre-service teachers, the savings are even greater. In this case, traditional observation costs reach above $650,000, whereas distance observation costs remain below $200,000. This suggests that a greater than a 66% cost advantage could be achieved using distance observation.

This cost/benefit analysis provides compelling results, suggesting distance observation could provide substantial cost savings over traditional methods. An additional benefit is the time

that is saved by reducing travel for supervisors. However, the question of how this particular distance observation solution compares to traditional methods in terms of quality remains open. From a small-scale pilot, we found that the quality of supervisor comments on standard supervision forms was very similar. In addition, distance observers reported that audio and video were of sufficient quality to provide meaningful feedback to teacher interns. We are encouraged by these findings, but we also consider them to be inconclusive and limited. It is too early to say the degree to which distance observation might replace traditional methods in the short term. Nonetheless, we posit that distance observation can support pre-service teachers and supervisors today as a supplement to traditional methods. As our understanding of distance observation improves and technology continues to advance, it is not inconceivable that distance observation could begin to replace traditional observation methods.

Conclusion

Distance observation is of particular importance in a time when online and blended programs are steadily growing in popularity and, in some instances, supplanting traditional programs. For institutions considering moving teacher education programs into online and blended formats, distance observation warrants attention. While the question remains as to whether distance observation will fully replace more traditional methods, it is not unreasonable that programs which adopt distance observation methods could very well overtake programs that do not. Cost savings might play a role in this, but what will ultimately play a greater role is the overall quality of online and blended teacher preparation programs. Distance observation provides an avenue for improving teacher preparation programs by reducing the travel requirements of supervisors, thereby freeing up supervisors' time to focus on nurturing and mentoring pre-service teachers.

The argument that distance observation can contribute to improved teacher preparation is supported by research by Kopcha and Alger (2011). In their work exploring differences in knowledge, performance, and teacher self-efficacy between student teachers who engaged in distance supervision (which they call "eSupervision") and those who did not, they found that eSupervision students:

> [R]eceived fewer site visits by their supervisor, but had greater access to supervisory experiences mediated by technology (video reflection, online discussion, lesson plan EPSS, observation forms). The fact that they performed as well as their non-eSupervision peers on PIAR suggests that traditional supervision (i.e., a series of observations from a supervisor) may not be the only way to effectively supervise student teachers during the field experience. (p. 66)

This suggests that teacher preparation programs might be able to prepare teachers equally well without the use of traditional methods, and leaves the question open as to whether technology-mediated approaches can lead to improved outcomes. In a later article, Kopcha and Algers (2014) report substantial reductions in costs associated with traveling to school sites as well as statistically significant improvements for eSupervision teachers. They assert "[eSupervision S]tudents were exposed to a wider variety of issues, opinions, and underlying cognitive processes associated with teaching" (p. 56).

These findings provide some evidence that distance observation solutions can have financial impact while at the same time resulting in improved teacher preparation. However, while these findings are promising, more research is needed. Observing teachers, while very important, is but one component in the broader framework of pre-service teacher supervision and preparation. If distance observation has a role to play in distance supervision, we must determine just how it fits within this broader framework. Some researchers have begun to examine this question, including Kopcha and Algers' work (2011, 2014) and the work of researchers from UNC Charlotte investigating the Remote Observation of Graduate Interns (ROGI) program (Hartshorne, Heafner, & Petty, 2011, Petty & Heafner, 2009). In our own research and development, we continue to refine our technological approach, establish best practices, and identify error points. To this end, we are continuing small pilots at three sites and are in the process of bringing new pilot sites onboard. With this research, we hope to demonstrate that distance observation not only has widespread application and can be a cost-saving and efficient means of supporting pre-service teachers and supervisors, but also that it can play a role in a broader supervision framework that leverages technology innovations to meet 21st century educational needs.

References

Billingsley, B., Griffin, C. C., Smith, S. J., Kamman, M., & Israel, M. (2009). *A Review of Teacher Induction in Special Education: Research, Practice, and Technology Solutions. NCIIP Document Number RS-1*. National Center to Inform Policy and Practice in Special Education Professional Development.

Bolton, M. (2010). Fly on the wall: Using teleconferencing to supervise student teacher performance. *Journal of Open, Flexible and Distance Learning*, *14*(1), 62–76. Retrieved from http://www.jofdl.nz/index.php/JOFDL

Gronn, D., Romeo, G., McNamara, S., Teo, Y. H., Gronn, D., Romeo, G., … Teo, Y. H. (2013). Web conferencing of pre-service teachers' practicum in remote schools. *Journal of Technology and Teacher Education*, *21*(2), 247–271. Retrieved from http://www.aace.org/pubs/jtate/

Hager, K. D., Baird, C. M., & Spriggs, A. D. (2012). Remote teacher observation at the University of Kentucky. *Rural Special Education Quarterly*, *31*(4), 3–8. Retrieved from http://acres-sped.org/journal

Hartshorne, R., Heafner, T., & Petty, T. (2011). Examining the effectiveness of the remote observation of graduate interns. *Journal of Technology and Teacher Education*, *19*(4), 395- 422. Retrieved from http://www.aace.org/pubs/jtate/

Individuals With Disabilities Education Act, 20 U.S.C. § 1400 (2004).

Kelly, L., & Bishop, J. (2013). Remote video supervision in adapted physical education. *Journal of Physical Education, Recreation & Dance*, *84*(1), 26–29. doi:10.1080/07303084.2013.744945

Kopcha, T. J., & Alger, C. (2014). Student teacher communication and performance during a clinical experience supported by a technology-enhanced cognitive apprenticeship. *Computers & Education, 72*(2014), 48-58. Retrieved from https://www.journals.elsevier.com/computers-and-education/

Kopcha, T. J., & Alger, C. (2011). The impact of technology-enhanced student teacher supervision on student teacher knowledge, performance, and self-efficacy during the field

experience. *Journal of Educational Computing Research, 45*(1), 49-73. Retrieved from http://jrnledcompresearch.com/index.php/jecr

McAdams, C. R., & Wyatt, K. L. (2010). The regulation of technology-assisted distance counseling and supervision in the United States: An analysis of current extent, trends, and implications. *Counselor Education and Supervision, 49*(3), 179–192. Retrieved from http://onlinelibrary.wiley.com/journal/10.1002/(ISSN)1556-6978

Petty, T., & Heafner, T. (2009). What is ROGI. *Journal of Technology Integration in the Classroom, 1*(1), 21-27. Retrieved from http://www.ntejournal.com/journal.html

Rock, M., Gregg, M., Gable, R., Zigmond, N., Blanks, B., Howard, P., & Bullock, L. (2012). Time after time online: An extended study of virtual coaching during distant clinical practice. *Journal of Technology and Teacher Education, 20*(3), 277–304. Retrieved from http://www.aace.org/pubs/jtate/

Rock, M., Gregg, M., Thead, B. K., Acker, S. E., Gable, R. A., & Zigmond, N. P. (2009). Can you hear me now? Evaluation of an online wireless technology to provide real-time feedback to special education teachers-in-training. *Teacher Education and Special Education: The Journal of the Teacher Education Division of the Council for Exceptional Children, 32*(1), 64–82. Retrieved from http://journals.sagepub.com/home/tes

Routier, W., & Otis-Wilborn, A. (2013). Supervision in Distance Education: Technology for Reflecting, Evaluating and Learning in Teacher Education. In *World Conference on Educational Multimedia, Hypermedia and Telecommunications* (Vol. 2013, pp. 2251–2256). Retrieved from http://www.editlib.org/p/112285

Schmidt, M., MacSuga-Gage, A., Gage, N., Cox., P., & McLeskey, J., (2015). Bringing the field to the supervisor: Innovation in distance supervision for field-based experiences using mobile technologies. *Rural Special Education Quarterly, 34*(1), 37-43. Retrieved from http://acres-sped.org/journal

Dr. Matthew Schmidt is an assistant professor in the Instructional Design and Technology program in the College of Education, Criminal Justice, and Human Services at the University of Cincinnati. His research centers on the intersection of educational technology and special education. His work has explored the use of immersive technologies (e.g., video games, virtual worlds) and mobile learning to meet the needs of learners with special needs and their instructors.

Dr. Penny Cox is a member of the faculty in special education at the University of Florida and serves as the Graduate Coordinator for the special education program. She teaches courses within the Unified Elementary Proteach Program and in the Teach Well online masters program. She has 17 years of teaching experience in public schools in Florida.

Dr. James McLeskey is a professor in the School of Special Education, School Psychology, and Early Childhood Studies, and Director of the Center on Disability Policy and Practice in the College of Education at the University of Florida. His state and federal grants have addressed school reform and school improvement, preparation of teachers to meet the needs of a diverse range of students in general education classrooms, policy issues in special education, and preparation of leadership personnel in general and special education. His research interests

include comprehensive school improvement and developing effective, inclusive school programs; examining the practice of principals in supporting effective schools; improving teacher quality and teacher practice through the use of practice-based teacher education and high leverage practices; and policy issues influencing special education.