Using Videoconferencing Technology to Enhance Classroom Observation Methodology for the Instruction of Preservice Early Childhood Professionals

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Abstract

To learn about and become acclimated to the environment in which they someday plan to work, preservice teachers and pre-professional daycare providers are typically required to conduct onsite observations. Traditionally, these observations require that the pre-professional spend a required number of hours studying the dynamics of the real-world classroom. Although there are clear benefits to this practice, there are also limitations. In one educational program, videoconferencing technology was used as a means to offset these limitations and, more important, to enhance the benefits of this necessary practice. Results from this study indicate that remote video observations were preferred by participants in most aspects over those conducted onsite and produced quantifiably richer and more effective observation experiences. (Keywords: videoconferencing, classroom observation, teacher education, early childhood)

Requiring preservice teachers to observe the dynamics of the real-world classroom is a mandated component of accredited teacher education programs in the United States (National Council for the Accreditation of Teacher Education 2006). The benefits of such vicarious learning experiences for the preservice teacher have been heralded so extensively that field-based observations have become a core and critical component in the education of future teachers (Guyton & McIntyre, 1990; Feinman-Nemser & Remillard, 1996). Typically, this practice initially requires that the preservice teacher in the early stages of teacher preparation spend a required number of hours as a silent observer of the rich and varied activities in school and classroom settings, thus learning from and becoming acclimated to the environment in which he or she will someday work (Wajnryb, 1993).

Although the advantages of such a practice are apparent, the practice itself presents limitations and problems that are inconvenient at best and impair effectiveness at worst. For example, the logistics of acquiring cooperating schools to conduct observations (site agreements, legal technicalities, etc.), coordinating observation periods, and traveling to and from the site present a certain degree of inconvenience. In addition to these potential inconveniences, merely having one or more preservice teacher candidates physically present in a classroom can be disruptive and intrusive to the children present, causing the dynamics, behaviors, and conditions to change. Doing so alters the realism and authenticity of the classroom. In addition, the presence of college student observers can disrupt the programmatic plans of the facility staff. More specifically, children can be easily distracted away from games and activities and even normal classroom routines when an interesting "stranger" is present in the room. This can be frustrating for the teachers who have worked hard to develop a programmatic plan for the day that is now being interrupted. Such problems are further compounded when one considers the number of teacher candidates and the number of observations involved each semester; the negative impact on a well-designed program, as well as children's behavior, can be severe.

In spite of these and other drawbacks, the benefits of onsite classroom observation have been commonly perceived as outweighing its detractions. However, one educational program at a small public liberal arts university is using videoconferencing technology as a means to offset the above detriments and, more important, to potentially enhance the benefits of classroom observation.

Although similar attempts to utilize video technology as a means of unobtrusive, remote classroom observation have been studied since the early days of closed-circuit television (Weiss, 1962; Altenhein, 1963), the limitations of that technology (e.g., cost, complex installation and operation requirements, limited picture quality, etc.) impeded successful, large-scale adoption by teacher education programs despite the benefits and effectiveness identified in these early implementation studies. Later, with the advent of videoconferencing technology and its potential to offset many of the limitations of closed-circuit television, investigations into that technology's potential to remotely link schools of education with the real-world classroom continued. Whether used as a means for observing student teachers (Binner, 1998; Falconer & Lignugaris/Kraft, 2002) or, as in the current study, to allow preservice educators to view live classrooms remotely rather than through onsite observation (Kinnear et al., 2002; Pemberton et al., 2004), the use of videoconferencing technology has been shown to offer many distinct and important advantages in both convenience and effectiveness when compared with onsite observation (Kent & Simpson, 2010; Kinnear, McWilliams, & Caul, 2002; Marsh et al., 2010; Pemberton, Cereijo, Tyler-Wood, & Rademacher, 2004; O'Conner et al., 2006–2007).

In spite of these benefits, videoconferencing technology has not

been widely adopted by educators for purposes beyond its use as a tool for distance education (Wiesemes & Wang, 2010). Speculation as to the reasons why, although extremely important, is outside the focus and intent of the current study. Instead, this paper reports on the successful implementation of videoconferencing technology that offers a convenient, cost-effective, and, in some aspects, pedagogically superior method of providing observation experiences to preservice educators. The equipment used is easy to operate and relatively inexpensive and uses readily available broadband Internet connections. From this standpoint, further investigation and consideration of the utility and potential of this instructional tool are critical for teacher education programs.

Project Overview

An existing course platform was used to test the utility of this technologically based instruction methodology. The course was an undergraduate child development course that provided a comprehensive overview of early human development and stressed the developmental needs and behaviors of children in relation to the various domains of development (physical, cognitive, social, emotional, etc.). To fulfill course requirements, students were required, on four separate occasions, to observe preschool children (3- and 4-year-olds) attending a campus-based Child Study Center (CSC). For each observation assignment, the instructor provided a set of written guidelines that directed the students to focus on a different developmental domain each time: physical, cognitive, social, and/or emotional. They also provided worksheets with developmentally appropriate information concerning each domain and observational note-taking forms to each student. In addition, they provided verbal instructions regarding the scientific observation methodology (i.e., how to carefully observe children's behavior and methodically record it in small time segments) in class. Assignment materials that students turned in consisted of three parts: a one-page summary of their observations within the appropriate developmental domain, answers to 10 questions regarding specific aspects of the appropriate developmental domain, and their handwritten scientific observation notes.

In prior semesters, students in this course have been required to conduct observations onsite at the CSC. Thus, each semester, nearly 60 students had to schedule and attend four onsite one-hour observations, resulting in a logjam of available slots for observation and a steady stream of obtrusive observers in the CSC classrooms. The obvious problems associated with this approach are compounded by two additional factors. First, the CSC has no observation room(s). In other words, when "large" college students enter the classrooms full of "small" preschool children, all the children immediately notice their presence, thus contaminating the natural environment. Second, different types of "observations" are conducted in this facility. For some education classes, students are required to visit the CSC for the sole purpose of interacting with the children (e.g., get on the floor and build towers with them, sit at the table with them and color, interact with them during their creative play, etc.). Thus, the children in this facility are somewhat conditioned to having college student visitors who are there to play with them. This creates a difficult situation for students who have a different educational intent for their visit and have been instructed to remain unobtrusive and unattached and warned not to interact with the children during their visit, as they are constantly confronted by children's attempts to draw them into play situations. However, with the installation of discreetly located, Internet-based cameras and a microphone in the classroom, the ability to remotely and unobtrusively observe the classroom activities becomes possible.

Videoconferencing Equipment

The equipment installed at the CSC was standard and relatively simple videoconferencing technology that included two remote-controlled cameras capable of panning, tilting, and zooming (necessary to capture multiple perspectives and all classroom areas) and one omnidirectional microphone. A compatible videoconferencing system located in a large multimedia classroom on campus also allowed the user to connect to, via Internet protocol, and control the cameras and microphone in the remote CSC classroom. The students in the multimedia classroom can then simultaneously view and hear the preschoolers in the remote classroom as the live video feed is projected through a large-format LCD projector onto a very large screen in the front of the classroom. This setup allowed the students, along with the professor, to observe the children and teachers in the CSC classroom inconspicuously and without intrusion. Because images and audio of the students in the CSC were captured, transmitted, and recorded during the remote observation process, verification of media consent was necessary. As is typical in most schools today, parents of CSC students had granted this permission as part of the registration process.

Potential Benefits

The typical traditional observation scenario (onsite observation, or OSO), in which preservice child educators physically visit the classroom and attempt to observe and record events in a "vacuum," may actually be more damaging than helpful. When undergraduate students in the early part of their education are placed into a new environment and told to observe, they are frequently disoriented, not really knowing what to look for or how to interpret what they see (Ben-Peretz & Rumney, 1991). This can result in a waste of the use of this time the sense that they may not learn anything of value from the professor's perspective. An even worse-case scenario could be that the inappropriate conclusions drawn by ill-equipped and inexperienced observers could contribute to false perceptions and attitudes that could be difficult to undo. In contrast, the live video observation (LVO) method allows an entire class to collectively observe the classroom along with their profes-

sor. This collective element can have a profound impact on students' ability to observationally mine the classroom environment. In this type of arrangement, not only does the professor manage the observational experience, including what is observed and how it is interpreted, but the students can also openly comment on and discuss with their fellow classmates and their professor what they are viewing, thus creating a more dynamic observation session (Marsh et al., 2010). During the times the LVO method has been implemented to date, it was not uncommon for students to direct one another's attention to specific children as they demonstrated or failed to demonstrate one or more of the developmental behaviors currently being studied or to openly comment on or question events that transpired. Such interactive learning, where students benefit from each other's observations and vigorously build on each other's ideas, is simply not possible using the traditional method.

Additionally, using the LVO method, the course instructor can also be present and facilitate the observation sessions by fielding questions, providing guiding comments as live events occur, and controlling the cameras to hone in on specific actions and behaviors the children are demonstrating. In effect, it is possible for the instructor to not only comment on the students and activities in the remote location, but also to guide the pre-professional candidates as they learn and practice scientific observation methodology. For example, in the previously conducted LVO sessions, the instructor has taken the opportunity to remind students of the specific behaviors on which to focus and then point out specific instances of that behavior when it occurred. Further, the instructor has also been able to correct student misconceptions during the observation session and redirect their thinking when it was inaccurate or strayed—all valuable teaching and learning opportunities that are not possible in the typical OSO setting.

It is important to remember that the children in the school classroom are oblivious to and undisturbed by events occurring in the LVO classroom, therefore creating a much more natural classroom climate for observation. The ability afforded by the LVO method to maintain the naturalistic environment provides a plethora of observational opportunities. Because the environment is not tainted by the presence of one or more observers, the observed behavior provides a much more valid and reliable sample with which the nature of children's behavior can be studied and understood. And, although the children are unaware that they are being observed, the teachers in the remote classroom are not. This allows, when appropriate, the course instructor to prearrange activities with the teachers that coincide precisely with lessons and behaviors being studied by the college students (e.g., when studying cognitive development, children can be asked to use manipulatives, complete puzzles, play problem-solving games, and complete tasks that require various levels of thinking). By doing so, the students in the observation classroom all observe identical and pertinent activities rather than the varied, random, and potentially irrelevant activities they might observe if they had to individually visit the school throughout the day to conduct solo OSOs. Also, the coordination (between professor and facility staff) of one LVO a month rather than multiple visits every day by individual college students allows for much smoother program planning and implementation at the CSC, as there are not nearly constant interruptions. In turn, this leads to a much more cohesive and effective educational program for the children.

In addition, there is added benefit because the student's written reports regarding their observation are not only uniform (i.e., they all observed and reported on the same activities and behaviors), but the professor now has the ability to grade knowledgeably. In other words, in fulfillment of a typical OSO assignment, students' papers would not only be different from each other (i.e., they all observed at different times and, consequently, reported on different activities), but also the professor would have no way to verify whether they observed what they say they observed or, more important, whether what they thought they saw should be interpreted the way they were interpreting it. However, in an LVO environment, the students' papers all report on the same set of activities and behaviors and, most important, the professor was present during this observation and can document the accuracy of student reports.

Another benefit of the LVO method has to do with scheduling. Attempts to incorporate OSO requirements into college courses are often severely hampered by scheduling difficulties. The logistics of scheduling so many student visits into such limited scheduling slots can be extremely difficult for both students and school staff. Childcare facilities and schools are only open on certain days of the week, usually only during the daytime hours, and there are even some days when they are not open at all or when visits are not practical (e.g., testing days) or even possible (e.g., field trip days). In addition, college students have busy schedules that are rarely conducive to freeing up large chunks of time during the day for OSOs, particularly when the observation site is located off campus. Often, scheduling a site visit requires a student to miss another class or miss work for that day. For those classes that do not have access to a campus-based school, OSOs may require considerable travel over long distances. This may present a problem, not only because such travel is inconvenient, but also because of the increasing cost of gasoline and the fact that some students do not have any means of transportation at all. All of these problems are eliminated when using the LVO method, which allows observations to be conducted during regularly scheduled class time, thus eliminating the need for schedule revisions and/or transportation arrangements. In addition, if a student must miss class the day of an LVO, this technology provides the capability of recording these sessions, thus allowing students to make up this observation by watching the recorded LVO. This also allows the professor to build a considerable library of video segments highlighting children's activities and behaviors

Table 1. Independent Samples t-Tests on Content Analysis Comparing OSO and LVO Students: Scientific Observation Notes (Wave 1)

	OSO			LVO				
	n	*M*	*SD*	*n*	*M*	*SD*	*t*	*p*
Quantity of OBDs	84	9.40	5.08	77	12.87	5.71	-4.08	.000
Quantity of Interpretations	74	9.51	5.08	73	12.79	6.01	-3.58	.000
Quantity of Words in OBDs	79	182.16	135.28	70	223.87	119.86	-1.98	.049
Quantity of Words in Interpretations	69	178.09	112.69	66	255.89	205.66	-2.71	.008

$p < .05$

*Note: These analyses compared one section of a course (n = 20) in which students completed only OSOs to another section of the same course (*n *= 21) in which students completed only LVOs.* Students in each section completed four total assignments. Thus, the sample sizes for each analysis represent the total number of assignments completed and submitted by students (pairwise deletion was used to handle missing data).

that can be used in any number of educational settings.

Method

The purpose of this project was to test a technologically enhanced approach to the classroom instruction of preservice teachers and pre-professional daycare providers to facilitate the merging of traditional teacher education (onsite, classroom-based observation of children's behaviors; OSO) with modern technology (remote observation through videoconferencing; LVO). In addition, the study sought to make progress in the development of an effective protocol for the utilization of the videoconferencing technology used in this manner. We used a quasi-experimental design that involved using two sections of the same course as test and control groups.

Participants

We collected data for this study from college students enrolled in two simultaneously offered sections of an upper-level child development course during three consecutive academic terms. The study involved three waves of data collection (one wave per academic term). In the first wave, students in the first section ($n = 20$) were required to schedule and conduct four onsite one-hour observations (onsite observations, OSOs) throughout the semester at the Child Study Center (CSC) on campus, whereas students in the second section ($n = 21$) conducted the same number of observations remotely using videoconferencing technology (live video observations, LVOs). Thus, the students in the first section intentionally were not introduced to the LVO process, and those in the second did not participate in the OSO process. In the second wave of the project, students were intentionally required to participate in both types of observations. Consequently, the students in both sections (Section 1, $n = 17$; Section 2, $n = 23$) conducted two OSOs and two LVOs each. In the third and final wave of the project, students from both sections of the class (Section 1, $n = 24$; Section 2, $n = 16$) participated only in LVOs.

Materials

The data for this project came primarily from two sources: (a) handwritten scientific observation notes submitted by students in partial fulfillment of the assignment requirements, and (b) a two-page, 37-item self-report survey assessing student perceptions of and reactions to the observation process.

Measures

During the first wave of the project, we made a quantitative comparison of the written materials of both groups based on length, detail, and relevancy to course content. In this comparison, we counted the number of course-relevant behaviors (i.e., behaviors exhibiting or illustrating developmentally appropriate activity) each participant reported on his or her observation form. In addition, we conducted a simple word count of observation descriptions and interpretations merely to determine if one type of observation method produced more prolific accounts of observed behaviors. More specifically, we developed four quantitative measures that were intended to act as proxies for the richness of the learning environment that these preprofessional students experienced.

Quantity of OBDs. When students were instructed in scientific observation methodology, they were taught to record their observations in measurable segments, called Observational Behavioral Descriptions (OBDs). Thus, they recorded their handwritten notes on structured forms, requiring them to record these segments (OBDs) and then interpret the developmental significance of each observed segment. In an attempt to quantify the difference between the two groups (OSO and LVO), we postulated that having more OBDs would be an indication of a richer observational experience in the sense of seeing more during the observation period. For example, if a student went to the CSC to observe and, though verbally instructed in class about what to observe prior to the assignment, was uncertain of the types of behaviors to record in their OBDs, this student may record only one important behavior in a 15-minute period. However, if a different student was sitting in class participating in an LVO and listening to the professor continually talking about what was being observed on the screen, this student may record 5–10 important behaviors in a 15-minute period. Thus, the number of OBDs per student was recorded.

Quantity of developmental interpretations. Again, in an attempt to identify a difference between the groups, we hypothesized that having more interpretations would indicate a fuller, deeper understanding of what was observed. Therefore, we recorded the number of interpretations per student.

Quantity of words in OBDs. Similarly, we summed the number of words per OBD for each student, based on the proposition that a richer observational experience would result in a greater abundance of words to describe what was observed.

Quantity of words in interpretations. Finally, we developed a similar measure for the students' interpretations by summing the number of words as a proxy for depth of understanding during the observational experience.

Perceptions of observational experience. At the end of each academic term during which the project took place, we administered a survey probing student self-reports on perceived strengths and weaknesses of the observation method in which they participated. This survey contained five demographic items (course section, age, sex, matriculation status, and major) and 16 statements that we designed to explore students' perceptions of their observational experiences. We carefully worded these items to be group-specific (OSO or LVO) and parallel. Thus, we included each of these 16 items twice in the survey—once for those who had completed OSOs and again for those who had completed LVOs—for a total of 32 parallel-worded items. For example, we asked LVO students to respond to the statement, "I felt the camera limited what I could observe in the classroom." Of course, this statement did not apply to OSO students, as a camera was not involved in their observation. Instead, we asked OSO students to respond to the parallel yet situation-specific statement, "As an onsite observer, it was always easy to see all important behaviors taking place in the classroom." Students responded to each of these statements using a Likert-type scale ranging from 1("strongly disagree") to 5 ("strongly agree") (see Appendix, pp. 107–108). In the first wave of data collection, students in different sections of the class filled out different sections of the survey (i.e., students in the OSO-only section of class filled out the OSO portion, whereas students in the LVO-only section filled out the LVO portion of the survey). In the second wave, all students filled out both sections, as they all participated in both methods of observation. In the third wave, students filled out only the LVO portion of the survey. When necessary (as, for instance, with the example above), we reverse-coded items to ensure that they were equivalent in directionality. One set of items (items 15 and 31 on Appendix A) were not parallel and were, therefore, excluded from the paired samples analyses.

Table 2. Independent Samples t-Tests Comparing OSO and LVO Students: Perceptions of Observation Experiences (Wave 1)

	OSO (n = 20)		LVO (n = 21)			
Item	*M*	*SD*	*M*	*SD*	*t*	*p*
1. Instructor's comments helpful	3.15	.99	4.48	.60	-5.22	.000
2. Student comments helpful	3.60	.82	4.14	.66	-2.35	.024
3. Classroom comments enlightening	3.55	.95	4.48	.60	-3.76	.001
4. Ability to ask questions beneficial	3.65	.93	4.29	.56	-2.63	.013
5. Distracting to the children	2.75	1.07	1.75	.64	3.59	.001
6. Observed behaviors congruent with the class material	3.85	.49	4.05	.38	-1.44	.157
7. Confused about what to observe	2.80	.95	2.00	1.00	2.62	.012
8. Observation was accurate depiction of behavior	3.70	.73	4.29	.72	-2.59	.014
9. Camera limited viewing ability	3.20	1.01	3.48	1.08	-.85	.402
10. Ability to zoom beneficial	2.95	1.00	4.19	.51	-4.97	.000
11. Sound quality hindered observation	2.40	.94	3.95	.67	-6.11	.000
12. Observations during class hours beneficial	3.60	1.10	4.71	.78	-3.76	.001
13. No travel required beneficial	3.40	1.27	4.71	.72	-4.05	.000
14. Prearranged activities more beneficial than free play	3.10	1.12	3.90	.89	-2.56	.015
15. Alternate observation method more beneficial	2.90	1.25	2.71	1.01	.53	.603
16. Observations important part of class	3.90	1.12	4.33	.58	-1.57	.125

$p < .05$

Note: These analyses compared one section of a course (n = 20) in which students completed only OSOs to another section of the same course (n = 21) in which students completed only LVOs.

Analytic Strategy

We conducted two sets of analyses. The first involved using independent samples *t*-tests to examine the hypothesized richness of students' learning experiences by comparing OSO and LVO students regarding the quantity of OBDs, developmental interpretations, and words in each of these categories. The second set of analyses involved scrutinizing students' perceptions of their observational experiences by using independent samples t-tests (Wave 1), paired sample t-tests (Wave 2), and single sample t-tests (Wave 3) to compare OSO and LVO students on the 16 survey items.

Results

Analyses Related to Richness of Learning Experience

Results from analyses involving an initial content analysis quantitatively comparing students' assignment materials in an effort to identify which group (OSO vs. LVO) had experienced a richer learning environment (see Table 1) indicated that students participating in LVOs tended to produce more descriptive and lengthy documentation of their observations. More specifically, LVO students produced significantly more OBDs and developmental interpretations than OSO students. In addition, LVO students were found to provide fuller descriptions and interpretations of their observations than OSO students, as they used significantly more words in both.

Analyses Related to Perceptions of Observational Experience

Wave 1. Table 2 reports results from mean-level analyses (independent samples t-tests) comparing students' self-report ratings of their observational experiences in Wave 1. In general, these comparisons revealed that students exposed to the LVO methodology reported higher levels of enthusiasm about the benefits of this approach while conducting behavioral observations. For example, LVO students reported that instructor comments, peer comments, general class discussion, and the ability to ask questions during the observation period were more beneficial to their overall observational experience. LVO students also more strongly agreed that this methodology was less distracting for the children in the CSC, indicated

Table 3. Paired Sample *t*-Tests Testing Students: Perceptions of Observation Experiences (Wave 2)

	OSO (n = 40)		LVO (n = 40)			
Item	*M*	*SD*	*M*	*SD*	*t*	*p*
1. Instructor's comments helpful	3.41	.85	4.44	.55	-7.34	.000
2. Student comments helpful	3.82	.64	4.18	.51	-2.88	.006
3. Classroom comments enlightening	3.90	.64	4.21	.70	-2.08	.044
4. Ability to ask questions beneficial	3.41	.91	4.10	.60	-4.84	.000
5. Distracting to the children	3.67	.96	2.81	1.02	6.96	.000
6. Observed behaviors congruent with the class material	4.03	.55	4.11	.61	-.77	.446
7. Confused about what to observe	2.46	.97	2.41	1.02	.50	.623
8. Observation was accurate depiction of behavior	4.00	.56	3.95	.61	.53	.599
9. Ability to see everything in the classroom	3.74	.89	2.84	1.08	4.08	.000
11. Sound quality hindered observation	2.38	.94	2.95	1.15	-2.47	.018
12. Observations during class hours beneficial	3.03	1.09	4.38	.82	-5.43	.000
13. No travel required beneficial	3.55	1.01	4.68	.53	-6.52	.000
14. Prearranged activities more beneficial than free play	3.41	.99	3.85	1.01	-2.99	.006
15. Alternate observation method more beneficial	3.26	1.09	3.00	.95	.90	.376
16. Observations important part of class	4.00	.51	4.08	.62	-.68	.498

$p < .05$.

Notes: Item 10 was excluded from these analyses because the items in the two sections of the survey were not parallel. These analyses utilized two sections of the same course (Section 1, n = 17; Section 2, n = 23) in which all students completed 2 OSOs and 2 LVOs. Thus, all 40 students recorded their perceptions of both methodologies.

feeling less confused about the types of behaviors they were to observe during each session, more strongly affirmed that observing the children by means of live video was an accurate depiction of true developmental behavior, and reported benefitting from the ability to zoom the camera in on specific children and activities. In addition, the LVO students confirmed that this observational methodology was more convenient for their schedules and for the fact that they did not have to travel to conduct their observations and that being able to collectively observe prearranged, structured activities that the children performed was more beneficial than a less structured free-play environment. However, LVO students did report significantly less ability to hear clearly during their observations.

Wave 2. In analyses on the second wave of data, we compared mean-level ratings on the same 16 items by students who had been exposed to both methodologies. Because each student in each section of this class participated in both types of observations and therefore answered questions related to both types, these analyses involved the use of paired-samples t-tests, whereby each student's answer to an item regarding their OSO experience was directly compared to their answer on the corresponding item regarding their LVO experience. As noted in the Measures section above, we excluded one pair of items from these analyses because they were not parallel in thought. Table 3 reports the results of these analyses, which seem to indicate a pattern of student perception that there was clear benefit to using the LVO methodology as opposed to the OSO methodology. Students reported that hearing comments from the instructor, peers, and general classroom discussion during the observation sessions, as well as having the ability to ask questions, were more beneficial aspects of the LVOs. Students also reported that the LVO methodology was less distracting for the children and more convenient in terms of both time and travel. Again, student responses confirmed that the ability to view prearranged structured activities afforded by LVOs was more beneficial than free-play observations during OSOs. However, students did indicate that it was more difficult to see and hear during the LVOs compared to the OSOs.

Wave 3. As all students in both sections of the class during the third wave of the project participated only in LVOs (i.e., no students participated in OSOs), we analyzed these data using a single sample t-test. As a response of "3" on the survey indicated being "Neutral," the value of 3 was used as the test statistic. Thus, any mean that was significantly different from 3 was considered important. Patterns of responses in this wave of data (see Table 4) continued to reinforce the idea that LVOs were beneficial for students, as all but two of the items were statistically significant in the expected direction. The two items that did not reach significance in a positive sense (though they also did not reach significance in a negative sense) were the items related to being able to see and hear clearly everything that goes on in the classroom using the LVO methodology.

Discussion

The findings of the current investigation represent an initial attempt to test a new classroom methodology for the effective observation of preschool children's developmentally noteworthy behavior. Results from the current study suggest that this methodology shows promise for improving college professors' ability to expose preservice teachers to an environment where important developmental aspects of children's behavior can be effectively highlighted without disrupting the naturalistic environment of the classroom setting. For example, a content analysis of students' assignment materials revealed that those students who had participated in LVOs exhibited a greater ability to interact with what they had observed and provide more extensive reports on the observed behaviors, as evidenced by the fact that their summaries were lengthier and more descriptive. Presumably, this implies that the instructor's running narrative of the events being observed on the screen, as well as the additional comments of classroom peers, enhanced the observational experience. In essence, such instructor and peer feedback provide additional sources of information and knowledge that allowed the individual student observers to go beyond their own limited capabilities. This supports previous findings by Van

Horn (1999), Hoveland, and Chandler (2008) and Marsh et al. (2010), which indicate that simultaneous observations and discussions among instructor and students are beneficial to this learning process. These feedback sources helped students see and understand things that were taking place in front of them that they typically may not have understood without such assistance. Both sets of analyses (independent samples t-tests as well as paired samples t-tests) reported above seem to confirm this, as the LVO experience was considered better in both because of the ability to receive instructor and peer comments, participate in class discussion, and ask questions when necessary. Thus, this study provides evidence for the fact that LVOs may provide a promising approach to the observation of children's developmental behaviors by creating an "open forum" atmosphere where observed activities may be freely discussed. Such an atmosphere would never be possible by sending students directly into the classroom to observe children, as any verbalizations—even the simplest question—would only draw attention to the observers and take away from their already limited attempts to be unobtrusive.

The convenience factor was another aspect of LVOs that students repeatedly described as strongly beneficial. In today's educational environment, students are often pulled at both ends. On the one hand, their academic requirements are heavy and must be taken seriously; on the other hand, their personal obligations, work, and sometimes even family cannot be ignored. Students often hold jobs out of financial necessity, and some are mothers and fathers who find it difficult to arrange for childcare, not to mention the dilemma they face simply trying to spend time with their children and family. This situation is only exacerbated when course assignments require extracurricular visits to schools. Of course, such visits are often necessary, and any curricular change made as an attempt to accommodate such personally difficult situations would represent only an inappropriate lowering of educational standards. However, the LVO methodology may represent an acceptable compromise whereby students' schedules can be accommodated at the same time that educational value is improved. In other words, this approach may represent a "win-win" situation where students receive a reprieve from schedule overload while simultaneously implementing a more effective observation experience.

Table 4. One Sample *t*-Tests Testing Students: Perceptions of LVO Experiences (Wave 3; $n = 40$)

Item	*M*	*SD*	*t*	*p*
1. Instructor's comments helpful	4.70	.46	23.17	.000
2. Student comments helpful	4.05	.71	9.30	.000
3. Classroom comments enlightening	4.38	.71	12.16	.000
4. Ability to ask questions beneficial	4.34	.78	10.60	.000
5. Distracting to the children	1.65	.83	-10.24	.000
6. Observed behaviors congruent with the class material	4.28	.64	12.60	.000
7. Confused about what to observe	1.75	.71	-11.18	.000
8. Observation was accurate depiction of behavior	4.20	.82	9.22	.000
9. Ability to see everything in the classroom	2.90	.84	-.75	.457
10. Ability to zoom beneficial	4.38	.54	16.10	.000
11. Sound quality hindered observation	2.73	.99	-1.76	.086
12. Observations during class hours beneficial	4.88	.34	35.41	.000
13. No travel required beneficial	4.95	.22	55.88	.000
14. Prearranged activities more beneficial than free play	3.70	1.04	4.25	.000
15. Alternate observation method more beneficial	2.05	.82	-7.37	.000
16. Observations important part of class	4.44	.68	13.18	.000

$p < .05$.

Note: Test statistic was 3 = Neutral. These analyses utilized two sections of the same course (Section 1, n = 24; Section 2, n = 16) in which all students from both sections completed only LVOs. Thus, all 40 students recorded their perceptions of their LVO experiences.

There were several items on the student survey that allowed for limited reliability checks. For example, the survey asked students whether the behaviors they observed were congruent with what they had been taught in class. Ideally, on such an item, there should be no difference between students who experienced the LVO and OSO experiences, and, if such a difference existed, it may imply that one of those groups was more effectively instructed than the other, giving rise to concerns about methodological bias. On this particular item, however, we found no between-group differences, thus seeming to indicate that differences in the effectiveness of the methodologies were not attributable to differences in the level of instruction associated with each group.

Two important weaknesses of the LVO methodology were made apparent in this investigation, and these were also noted by in other studies using videoconferencing technology for classroom observations (Kinnear, McWilliams, & Caul, 2002; O'Conner et al., 2006). First, students expressed frustration that sometimes their view of the classroom was limited. This limitation was evidenced in several different ways. Sometimes students felt like they were "at the mercy of" the camera operator (i.e., instructor or teaching assistant) and could not view behaviors that were taking place in other areas of the room that were not currently being captured by the camera. At other times, they expressed frustration because they felt like they were unable to get the "big picture" of the classroom because there were not enough cameras or camera angles. Such frustration is understandable, yet may represent simply a "difference" from onsite observation or a transitional factor to which students may adjust over time (i.e., after experiencing a number of LVO sessions). When considered in context, though this is a legitimate weakness that could be addressed simply by the addition of more cameras in the room (the videoconferencing system in use allows for three more camera inputs), observing children onsite may not be

that much better. In other words, if, as an observer, one is sitting in a corner of the room, certain areas of the room—perhaps several, in fact—are not visible from that position. In addition, when engaged in an onsite observation, one will naturally focus on specific behaviors or interactions to the exclusion of others that are taking place simultaneously. The argument that students should be afforded freedom to choose which children to observe at any moment in time may not be educationally credible, as the point of the assignment is to teach them which behaviors and/or interactions are the most important and why. Thus, the student complaint that their viewing content is being censored by the whim of the camera operator/instructor may be simply illegitimate in light of the need for a trained professional to direct their observations to make the most of their educational experience. Again, the opportunity for this kind of direction is simply not possible by using onsite observations by individual students at random times.

The second weakness that the student participants in LVOs revealed was the poor sound quality of the video stream. Indeed, this was a legitimate complaint and one that is more difficult to solve. After considerable dialogue, there does not seem to be a technological solution that would provide improved sound quality for these LVOs. The problem with the sound is not that things cannot be heard, but rather that, during open-play periods, everything is heard at once. Once again, time and a little bit of practice can help an observer learn to sort out the "noise" and focus on some important information. From a teaching perspective, however, this weakness does not comprise a "fatal flaw" in the methodology. In fact, it is relatively minor. Most of the behaviors being observed do not depend on hearing them to be understood. Most of the time during an LVO, the professor is talking anyway, and the ability to hear what the children may be saying at any given time has very limited value. Indeed, "actions speak louder than words" and, in this case, the students can easily interpret the children's behaviors without having to hear every word or verbal interaction.

Conclusion

In this side-by-side comparison of traditional onsite and technology-based remote observation methods, the evidence indicates that the latter was as effective as the traditional observation method and, by most measures, more so. Not only did study participants prefer the LVO in terms of convenience and the unprecedented opportunities for open discourse during the live observations, but, in comparison with OSOs, these participants also had richer, more authentic, and more pedagogically effective observation experiences. Clearly, these findings alone offer reasonable support for future study and implementation of remote video observation. In addition, prevailing factors such as increasing gasoline prices and scheduling difficulties due to traditional and nontraditional students' greater work and family commitments add considerably to the case in favor of the LVO and its capacity to offset these concerns. Another important contributing factor in favor of LVO use is that an Internet infrastructure robust enough to provide adequate bandwidth for two-way audio and video transmission is, today, almost commonplace and readily available to most universities and public schools, whereas only a few years ago, insufficient bandwidth would have prevented or greatly limited the widespread implementation of videoconferencing equipment for LVO use. Also worthy of mention is the LVO's potential to expand the type and range of classrooms available for observation. For instance, through this technology, it now becomes possible for students to observe a wide and very diverse range of classroom settings that were previously logistically and geographically prohibitive. In short, conditions are now favorable for serious consideration of this alternative and more effective method of conducting educational observations. The marked benefits of live video observation reported in this study in conjunction with the increasing impediments to traditional observation methods and the, as of yet, fully unexplored potential of using videoconferencing technology in this capacity collectively support this technology-enhanced observation method.

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Appendix
Sample Survey Administered to Class Students

Instructions: Please respond to each of the following questions or statements. All responses will remain anonymous.

Demographic Information

1. **Age:** _____
2. **Sex:** ○ Male ○ Female
3. **Status:** ○ Freshman ○ Sophomore ○ Junior ○ Senior
4. **Number of live-video observations in which you participated as part of this class:** _____
5. **Number of on-site observations in which you participated as part of this class:** _____

Participant Perceptions (Live-Video Observations)

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1. The instructor's comments during the observation period were helpful.	○	○	○	○	○
2. The comments of other students during the observation were helpful.	○	○	○	○	○
3. Sometimes classroom comments by the instructor or other students enabled me to see behaviors I may not have seen on my own.	○	○	○	○	○
4. Observing in this format was good since it allowed me to ask questions during the observation if necessary.	○	○	○	○	○
5. This type of observation can be distracting to the children in the CSC.	○	○	○	○	○
6. The behaviors I observed were congruent with the behaviors discussed in class (i.e., what I saw was consistent with what was taught in class).	○	○	○	○	○
7. I was confused about what types of behaviors I was supposed to observe.	○	○	○	○	○
8. I believe I got an accurate depiction of preschool children's development and behavior through this type of observation.	○	○	○	○	○
9. I felt the camera limited what I could observe in the classroom.	○	○	○	○	○
10. It was beneficial to be able to zoom in with the camera on specific activities.	○	○	○	○	○
11. The sound quality during the video observation hindered my ability to accurately observe the children.	○	○	○	○	○
12. It was helpful to me that I did not have to schedule extracurricular visits to the CSC in order to observe (i.e., observations were conducted during normal class hours).	○	○	○	○	○
13. It was helpful to me that I did not have to travel a great distance to conduct these observations.	○	○	○	○	○
14. The times when pre-arranged activities were conducted in the classroom were more beneficial for observation than the free play times.	○	○	○	○	○
15. I believe on-site observations were more beneficial than the live-video observations.	○	○	○	○	○
16. Overall, live-video observations were an important part of this class.	○	○	○	○	○

Participant Perceptions (On-Site Observations)

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1. It would have been beneficial to have the instructor present during my observation to offer insight concerning the behaviors that took place.	○	○	○	○	○
2. During my observation, it would have been beneficial to openly discuss, with fellow students, the behaviors that were taking place.	○	○	○	○	○
3. Being able to verbally interact with the instructor or other students during my observation would have enabled me to observe behaviors I may not have seen on my own.	○	○	○	○	○
4. It would have been beneficial to have the instructor present during my observation so that I could ask questions concerning the behaviors that took place.	○	○	○	○	○
5. This type of observation can be distracting to the children in the CSC.	○	○	○	○	○
6. The behaviors I observed were congruent with the behaviors discussed in class (i.e., what I saw was consistent with what was taught in class).	○	○	○	○	○
7. I was confused about what types of behaviors I was supposed to observe.	○	○	○	○	○
8. I believe I got an accurate depiction of preschool children's development and behavior through this type of observation.	○	○	○	○	○
9. As an on-site observer, it was always easy to see all important behaviors taking place in the classroom.	○	○	○	○	○
10. During my observation periods, I often interacted with the children.	○	○	○	○	○
11. I often could not hear what children in the CSC were saying.	○	○	○	○	○
12. It was convenient to schedule extracurricular visits to the CSC in order to observe.	○	○	○	○	○
13. It was convenient to travel to the CSC in order to observe.	○	○	○	○	○
14. The times when pre-arranged activities were conducted in the classroom were more beneficial for observation than the free-play times.	○	○	○	○	○
15. I believe live-video observations were more beneficial than the on-site observations.	○	○	○	○	○
16. Overall, on-site observations were an important part of this class.	○	○	○	○	○