Running Head: Studying the Impact of Online

Studying the Impact of Online Professional Development on Educators' Technology Integration Skills

In Questions, Methods and Findings from Program Evaluations and Research Examining Digital Online Learning Projects. .

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Studying the Impact of Online Professional Development on Educators' Technology Integration Skills

Abstract

Schools have made extensive investments in technology infrastructure, but the impact of technology on improving teaching and learning is still in question. Many educational agencies are turning to online learning to supplement on-site offerings for educators. Models for effective professional development are described as authentic, active, sustained, individualized, intellectually coherent, fully integrated, and collaborative and include knowledge-construction, modeling, practice, and follow-up support. One aspect of online learning environments that has generated enthusiasm for building up sustainable reform is the development of communities of practice (CoP). The issues related to the effectiveness of online professional development, are examined in the context of one distance education initiative, the Supporting Teachers with Anytime/Anywhere Resources (STAR) Project. One of the primary evaluation challenges presented by an online professional development environment is related to developing meaningful measures of change in teachers' integration of technology. This paper describes the validation of one tool for measuring the transformative integration of technology into K-12 classrooms in Illinois. The percent consensus across the subscales for the video ratings ranged from 43-78%, for the online ratings ranged from 40-90%, and for the face-to-face ratings ranged from 80-96%. Methodological issues related to rater training and future research questions are presented.

Studying the Impact of Online Professional Development on Educators' Technology Integration Skills

In the first National Technology Plan, U. S. Department of Education (1996) states what has become known as the "four pillars" of successful technology use in schools. The first pillar is "All teachers in the nation will have the training and support they need to help students learn using computers and the information superhighway (p. 3)." A related benchmark appears in the Department's 2001 annual plan, "By 2001, at least 50 percent of teachers will indicate that they feel very well prepared to integrate educational technology into instruction (p. 63)." Many initiatives have emerged to answer this call, including many programs founded on distance learning as the primary tool for providing much needed training and support to classroom teachers.

The struggle to realize effective in-service teacher training is not new. Hiebert, Gallimore, and Stigler (2003) suggest two key barriers to a more research-based approach to reforming teacher practices. First, teachers are trained at universities and work in schools, both of which are conservative cultural institutions and slow to change. In addition, American education historically has looked for quick fixes. Schools have made extensive investments in technology infrastructure, but the impact of technology on improving teaching and learning is still in question. Becker (2000) co-conducted several studies of teacher pedagogical practices with technology, concluding that "computers are clearly becoming a valuable and well-functioning instructional tool," (p.29) but also agreed with critics that "computers have not transformed the teaching practices of a majority of teachers, particularly teachers of secondary academic subjects (ibid)."

With about 3.4 million teachers in public and private schools (U. S. Department of Education, 2004) and limited resources for professional development, many educational agencies are turning to online learning to supplement on-site offerings for educators. e-Learning has potential to help schools meet the NCLB requirements that all teachers in core academic topics are highly qualified by 2006 as well as address key challenges to teacher quality. It can serve both in-service and pre-service teachers, anytime, anyplace, and can be blended with other professional development approaches. But much remains to be done before high-quality e-Learning is available to all teachers. Support from policymakers is needed for development, removing barriers, funding innovation, and ensuring high-quality programs (Kleiman, 2004).

The full weight of accountability policies and initiatives are pressing on educators as they rely on the promise of online learning -- quality with flexibility. The "Anyplace, Anytime" mantra of online course developers is alluring. The reports of lower costs for online learning (which vary widely, ranging from 20% cost reduction up to 90% cost reduction) are also very tempting (Killion, 2000). The critical question that remains is whether online courses can provide a cost-effective and quality solution to new planning initiatives for professional development needs.

Not only are educators wooed by the practical benefits of online learning, but also they are growing in capacity to develop and participate in quality training experiences. There are many research and "best practice" resources available to online course developers (Klemm, 2000; Leach, 1996; Palloff & Pratt, 1999; Powers, 1997; White & Weight, 2000) Now the literature is beginning to emerge to help consumers understand the criteria for "quality" online learning as well as how to recognize it among the mass of professional development programs that is growing steadily (Hanson-Harding, 1999; Killion, 2000; 2002; Richardson, 2001; Sistek-Chandler, 2001; Yoder, 2001). These guidelines include standards for the program itself (e.g., appropriate content, skilled instructors) as well as understanding learner readiness (e.g., self-motivated and independent) for these environments (Killion, 2002; Manzo, 2002; Mather, 2000).

However, even the best online professional development does not guarantee improvement in student learning and achievement. Models for effective professional development are described as authentic, active, sustained, individualized, intellectually coherent, fully integrated, and collaborative (Moore and Barab, 2002). In short, models should include knowledge-construction, modeling, practice, and follow-up support (Killion, 2000). The final component listed, follow-up support, highlights the importance of infrastructure and planning, regardless of the medium for professional development. Educators need to thoughtfully consider the timing and content of professional development for individuals in the system. In addition, human and material resources need to be in place to sustain and expand the new practices learned. The idea of training in a box to be unleashed on participants is not congruent with effective reform through professional development. One aspect of online learning environments that has generated enthusiasm for building up sustainable reform is the development of communities of practice (CoP). The role of CoPs in online learning is to extend the learning beyond the material resources by cultivating sustained connections between learners.

Overcoming the challenges of creating, growing, and sustaining CoPs are central to realizing the full effect of online professional development. The enthusiasm for these virtual spaces rests in the seemingly endless opportunities for educators to connect and collaborate outside the boundaries of space and time. Researchers have blazed the trail in developing guidelines for cultivating the online relationships that are at the core of these communities, including models of successful networks (Riel & Levin, 1990) and their applications (Stevens & Hartman, 2002; Davis, 1997; Rogers & Laws, 1997). Frameworks specific to problem based learning, inquiry, and knowledge creation are prominent in the dialogue (Barab, Makinster, Moore, & Cunningham; 2001; Duffy, Dueber, & Hawley, 2002; Meyers, Davis, & Botti, 2002). Now, important questions are emerging that address the assumptions that these communities can (or should) thrive outside the context of the local education setting (Schlager & Fusco, 2003).

What are the tangible benefits of online learning communities for practicing K-12 teachers? Under what conditions do these learning communities act as catalysts to support, promote, or expand sustainable classroom reform? Schlager & Fusco (2004) argue that the sociocultural processes of a local education system's CoP must be well understood in order to create effective technology-mediated interventions. They characterize an effective CoP as an evolving, well-integrated entity that includes stakeholder groups across the system as well as highlight specific characteristics of CoPs which the technology infrastructure should address.

The issues related to the effectiveness of online professional development, are examined in the context of one distance education initiative, the Supporting Teachers with Anytime/Anywhere Resources (STAR) Project. STAR is a U.S. Department of Education Star Schools grant awarded to the United Star Distance Learning Consortium (USDLC; funded 2000-2005). USDLC is a well-established educational telecommunications consortium comprised of Western Illinois University, the Center for the Application of Information Technologies, the Illinois State Board of Education, North Carolina Department of Public Instruction, and their partners. Through a blend of distance learning technologies, the STAR Project seeks to provide quality educational programming to isolated and underserved learners and schools, with the goal of improving teaching and learning. One entity established to provide a stronger technology infrastructure is STAR-Online, an online professional development system. Through STAR-Online, the project serves several communities of practice: pre-service educators of the deaf, library media specialists, and K-12 classroom teachers seeking to integrate technology in the classroom. The TechKnowledgy Virtual Teaching and Learning Community (VTLC) is the STAR-Online professional development system designed to support teachers integrating technology (originally developed in 1997).

Each TechKnowledgy VTLC module is designed to take the educator through a reflective professional development experience where the teacher learns about a technology application online, develops an online lesson plan for integrating this technology in the classroom, performs the actual integration activity, and then reflects on the activity through an online share form. Educators are also encouraged to post their lesson plans and experiences to a database where other educators can access them as well as to participate in other virtual learning community activities.

One of the primary evaluation challenges presented by an online professional development environment is related to developing meaningful measures of change in teachers' integration of technology. Self-reports of implementation by themselves are not reliable indicators of classroom activity. In addition, measurable student outcomes in terms of engagement and technology proficiency are also directly related to the perceived effectiveness of the training. This paper describes the validation of one tool for measuring the transformative integration of technology into K-12 classrooms in Illinois. The data presented are a combination of three sources: first, an initial study of the adaptation of a classroom observation tool for rating video and online portfolios for thirty-six (36) cases; second, a follow-up study of twenty-four (30) new cases to extend the evidence of reliability and validity from the initial study; third, data from a face-to-face observation using the same classroom observation tool with twenty-seven (27) teachers participating in a separate federally funded technology integration study (Leaders In Technology Enhanced Schools Kit Project) are presented.

As online professional development opportunities become more available, the importance of establishing reliable and valid measures of classroom technology integration based on materials commonly and readily available as part of an online learning experience grows. This study of one instrument, the MTIMMS Technology Classroom Observation Instrument, began with the goal of establishing the concurrence of online portfolio technology integration ratings with video representations of classroom instruction of the same lessons. The paper presents the results of reliability tests for two waves of data.

Methods

Participants

The initial study to establish the reliability of the Video Technology Integration Instrument included video ratings of two lessons of eighteen (18) teachers by two raters. The follow-up study added two video lessons for (12) new teachers (same two raters). In total, there were thirty (30) teachers and sixty (60) online and video cases to rate.

The initial study to establish the reliability of the Online Technology Integration Instrument adapted for online portfolios included ratings of thirty six (36) teacher portfolios by two raters. The follow-up study added portfolios for twenty-four (24) new portfolios (same two raters).

Finally, teams of three raters completed the Face-to-Face Technology Integration Instrument in April and May 2004 in face-to-face observations of twenty-seven teachers in schools throughout the southern region of Illinois. There were twenty-nine raters assembled in teams of three observed twenty-seven (27) teachers (each rater observed an average of three (3) teachers). The MTIMMS observation tool was converted to an online survey to be completed during the observation using Pocket PC versions of the survey.

Instrument

The MTimms Technology Classroom Observation Instrument was originally developed for the Nebraska PT3 Catalyst Grant project. "The purpose of the instrument is to document the integration of technology into classroom teaching. The instrument records information about the style of teaching, the types of technology use, and the levels of technology integration" (Timms, 2001, p. 2). The original instrument was modified to make the scale of the items consistent across the domains (Clark & Oyer, 2003; see Appendix A). Some of the subscales were eliminated for the online ratings. The final instrument consists of three concepts rated in five minute intervals (classroom organization, cognitive activity, and student role) and four concepts rated once for the entire session (classroom management, technology integration, teacher technology use, and student technology use). The Video and Face-to-Face Technology Integration

Instrument have twelve (12) subscales and the Online Technology Integration Instrument has eight (8) subscales.

Design

In the initial study, scores on the twelve (12) subscales are combined to create a composite score. This score represents a Total Technology Integration Score for each teacher.

For video ratings, there are three types of items summed for the composite Technology Integration Score. First, mean ratings for items averaged across 5 minute intervals and two raters are computed. These items include general level of integration, proportion of students using technology, cognitive activity, student role, and student engagement. Second, the number of software and hardware types is summed for teachers and students. This total is converted to a 3 point scale. Finally, the mean ratings for level of student self-direction, integration of technology with the topic, and complexity of technology use across two raters are included in the composite score. See Appendix B for a summary of the items combined for the Overall Video Technology Integration Scale. In Appendix B, contains items combined for the Overall Online Technology Integration Scale.

In the follow-up study and the face-to-face study, further evidence of the validity of the MTIMMS Technology Classroom Observation instrument for video, online portfolio, and face-to-face ratings are presented. For these analyses, rather than transform the subscales into a composite score for each teacher, inter-rater consensus is computed in order to interpret the subscales using their original scale.

Results

In the initial study, reliability coefficients were computed for each subscale. The Overall Video Technology Integration scale showed acceptable reliability with $\alpha(36)=.7050$ for the 12 items. The Overall Online Technology Integration scale showed strong reliability with $\alpha(36)=.8128$ for the 9 items.

The Pearson correlation (one-tailed) for total technology integration between video rater 1 and video rater 2 was moderately strong, with $r(36)=.735$, $p<.01$.

The Pearson correlation (one-tailed) for total technology integration between online rater 1 and online rater 2 was moderate, with $r(36)=.684$, $p<.01$.

For the follow-up video and portfolio ratings as well as the face-to-face observations, the researchers computed the reliability of each subscale independently rather than as a composite score (see Table1 in Appendix C). The percent consensus across the subscales for the video ratings ranged from 43-78% ($\overline{X}_{VRConsensus}$=64%). The percent consensus across the subscales for the online ratings ranged from 40-90% ($\overline{X}_{ORConsensus}$=63%). The percent consensus across the subscales for the face-to-face ratings ranged from 80-96% ($\overline{X}_{FTFConsensus}$=89%).

Differences in inter-rater consensus between the initial and follow-up study for both online and video ratings were computed (see Table 2 in Appendix D and Table 3 in Appendix E). For online ratings, percent consensus was essentially the same in the initial and follow-up study for classroom organization, cognitive activity, and interaction subscales. Ratings improved in the follow-up study for general technology integration, technology integration with topic, and complexity of technology use. Finally, ratings in the follow-up study were lower for student autonomy.

For video ratings, percent consensus was comparable between the initial and follow-up study for cognitive activity, interaction, teacher technology use, and proportion of students using technology. Ratings improved for student technology use, complexity of technology use, and classroom management subscales. Finally, ratings in the follow-up study were lower for classroom organization, student role, student engagement, general level of technology integration, student autonomy, and technology integration with the topic.

Discussion

Because online professional development opportunities are becoming more available, the importance of establishing reliable valid measures of classroom technology integration that are based on materials commonly and readily available as part of an online learning experience is increasing. The study of one instrument, the MTIMMS Technology Classroom Observation Instrument, began with the goal of establishing the concurrence of online portfolio technology integration ratings with video representations of classroom instruction of the same lessons. The ultimate goal of this analysis is to capitalize on data that are readily available (online portfolios) for judging the levels of technology integration occurring in the classroom. Establishing inter-rater reliability is a first step in this process.

Though the composite score in the initial study showed promising levels of reliability between raters for both the video and online integration scores, the consensus on the individual subscales for the follow-up study indicate more work is needed to make this tool useful. There were three subscales on the video ratings that showed acceptable reliability: teacher technology use (technology not used, presentation, demonstration, or assisting students), student technology use (no technology used, one application used, two or more applications used), and proportion of students using technology (no students, some students, about half, most, or all students). There were two subscales on the online ratings that showed acceptable reliability: interaction (completely teacher led, teacher-student balanced, completely student led, mostly individual student work) and student technology use (as described above).

The face-to-face observations showed very high levels of consensus between the teams of three raters (twenty-nine (29) different raters in all). Because the tool was originally created for face-to-face classroom observations, this is not too surprising. These results give strong evidence of the value of this tool for assessing technology integration through direct observation.

There were some differences between the initial study and the follow-up in terms rater agreement. For video ratings, percent consensus was comparable between the initial and follow-up study for cognitive activity (receipt of knowledge, applied procedural knowledge, or knowledge construction), interaction, teacher technology use, and proportion of students using technology. Ratings improved for student technology use, complexity of technology use (simple, moderately complex, advanced use of technology), and classroom management (repeated management problems, a few management problems, or no management problems) subscales. Finally, ratings in the follow-up study were lower for classroom organization (students working in small groups, pairs, whole class, or individually), student role (passive / little response, active response, co-construct meaning), student engagement (low, moderate, or high engagement in activity), general level of technology integration (not used, add-on, partially integrated, or fully integrated), student autonomy (tasks are highly prescriptive, tasks allow some degree of self-direction, or students are able to guide and shape their own learning), and technology integration with the topic.

For online ratings, percent consensus was essentially the same in the initial and follow-up study for classroom organization, cognitive activity, and interaction subscales. Ratings improved in the follow-up study for general technology integration, technology integration with topic, and complexity of technology use. Finally, ratings in the follow-up study were lower for student autonomy.

Clearly, the reliability of this technology integration tool is not yet fully acceptable. However, the positive results on the face-to-face observation using teams of three raters establish its potential for use by multiple raters. There are several possibilities for why raters struggled with this task. First, in post-analysis, the ratings showed a slight bias in the individual raters. In analysis of four subscales (cognitive activity, student role, student engagement, and general level of technology integration, the scores for Rater 1 were more than twice as likely to be higher than those for Rater 2 for two of the subscales (for the other two subscales there were no trends for either rater). While the raters both had backgrounds as teachers, they were working full-time on grant funded technology projects (other than STAR) at the time of the rating. These influences need to be examined in training and ratings need to compared and negotiated early on in the rating process. Finally, the length of time for the ratings was too long. Because the raters had other obligations, they needed a longer period of time for rating the videos and portfolios. A shorter time frame would improve consistency within raters as well as between raters.

If the reliability and validity of these measures for video, online portfolios, and face-to-face observations can be established, there are several research questions of interest. In terms of understanding the connections between specific online professional development experiences, educators might study the relationships between teachers' plans for technology integration (through online portfolios and other artifacts) and their actual integration in the classroom. How do technology proficiency and level of experience with transformative uses of technology influence these relationships? With modifications to the training and process for rating video and online portfolios, these tools may yet become valuable resources for understanding the issues related to effective, appropriate uses of technology.

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Appendix A

Summary of the MTIMMS Technology Classroom Observation Instrument

Concepts to Rate in 5 Minute Intervals		
Class organization		(Indiv studs, pairs of studs, small groups, whole class, stud presentations)
Cognitive activity	**Cognitive activity**	Receipt of knowledge
		Applied procedural knowledge
		Knowledge construction
		Other (specify)
	Interaction	Completely teacher-led
		Teacher-student balanced
		Completely student-led
		Mostly indiv. student work
Student role	**Student role**	Passive/ little response
		Active response
		Co-construct meaning
	Student Engagement	Low engagement
		Moderate engagement
		High engagement
	Student Technology Integration	Highly prescriptive
		Some self-direction
		Studs guide learning
		Not Observed

Concepts to Rate Once – At End of Session		
Class management		No management probs
		A few probs
		Repeated manage probs
Technology Integration	**Technology Integration**	Not used
		Add-on
		Partially integrated
		Fully integrated
	Topic Integration	Does not contribute
		Somewhat contributes
		Strongly contributes
	Technology Complexity	Simple use
		Moderately complex
		Advanced use
Teacher's Technology Use	**Teacher's Technology Use**	Not used
		Presentation
		Demonstration
		Assisting students
	Teacher's Technology Proficiency	N/A
		Novice
		Intermediate
		Advanced
Teacher Tech Use – Soft/Hard		Check off software and hardware use in session.
Student Technology Use	**Student Technology Use**	Not used
		Single Application used
		2 or more applications used
	Average Student Technology Use	Record the percentage of students who used technology in the lesson.
Student Tech Use – Soft/Hard		Check off software and hardware use in session.

Rating Tool Glossary

Protocol for Using the MTIMMS Technology Classroom Observation Instrument

Purpose

The purpose of the instrument is to document the integration of technology into classroom teaching. The instrument records information about the style of teaching, the types of technology use, and the level of technology integration. The variables measured by the instrument are based upon the International Society for Technology in Education (ISTE) National Educational Technology Standards for Teachers, and informed by research on the use of technology in education. In particular, the ISTE standards/performance indicators addressed are *II. Planning and Designing Learning Environments and Experiences, and III. Teaching, Learning, and the Curriculum*.

Overview of the observation instrument

The instrument used in ratings has two parts:

- Background sheet (hard copy) used to record basic information about the class and lesson observed.
- Online rating instrument used to capture observations on the different activities in the classroom as the lesson is being taught.
- Attachments may be included, such as still photos of technology use by students and teachers during the period of instruction, handouts/directions to students, and student artifacts produced during the period of instruction.

<table>
<tr><th colspan="3">Concepts to Rate in 5 Minute Intervals</th></tr>
<tr><td colspan="2">Class organization</td><td>Check all that apply for each 5 minute period.
(Indiv studs, pairs of studs, small groups, whole class, stud presentations)</td></tr>
<tr><td rowspan="8">Cognitive activity</td><td rowspan="4">Cognitive activity</td><td>Receipt of knowledge - Includes unassisted work, lectures, worksheets, questions, board work. One right answer kind of instruction.</td></tr>
<tr><td>Applied procedural knowledge -Includes such things as skill building and performance. It may be interactive or done in front of a group. This instruction is more open-ended, some interpretation. Judge whether information is more or less important.</td></tr>
<tr><td>Knowledge construction - Includes such things as comprehension building, knowledge generation, inventing, pre-writing activities, problem solving, co-construction of meaning, organizing, revising, elaborating, constructing conceptual maps, and describing. It involves transformation of information.</td></tr>
<tr><td>Other (specify) - Record other cognitive activities; e.g., Classroom organizational activities such as preparing a work space.</td></tr>
<tr><td rowspan="4">Interaction</td><td>Completely teacher-led – The teacher dominates interactions. Little interaction by students with the teacher or by students with other students.</td></tr>
<tr><td>Teacher-student balanced – There is an equal sharing of interactions being directed by teacher and students.</td></tr>
<tr><td>Completely student-led – The students dominate interactions. Students interact with students about the lesson activities. Discussions may be wide ranging but on topic.</td></tr>
<tr><td>Mostly indiv. student work – Students primarily working individually</td></tr>
</table>

Concepts to Rate in 5 Minute Intervals		
Student role	**Student role** Note: if a student is presenting, focus on that student to rate.	Passive/ little response - Students mainly receive knowledge through activities such as lectures, directions, viewing video. Students may answer some questions at prompting of teacher.
		Active response - In teacher-led discussions students provide input to open-ended questions and elaborated talk occurs. Can include student presentations and active engagement in solitary activity.
		Co-construct meaning - Students initiate dialogue with fellow students or the teacher and/or construct their own meaning from the lesson activity. This can also be an individual activity.
	Student Engagement	Low engagement -Most of the students are not focused on the learning tasks. They may be doing things unrelated to the learning or confused about what they should do.
		Moderate engagement - At least half of the students are focused on the learning tasks, but some are easily distracted or confused and a minority may not be on task.
		High engagement - Nearly all of the students are focused on the learning tasks. Most of the activity in the classroom is relevant to the tasks.
	Student Technology Integration	Highly prescriptive - Students make few decisions or decisions are not substantive
		Some self-direction - Students are allowed to guide some of their own learning activities and make a few substantive task-related decisions.
		Studs guide learning - Students make important decisions during the learning activity.
		Not Observed – No technology use by students observed in this 5 minute rating interval

Concepts to Rate Once – At End of Session		
Overall Session Rating 1		
Class management		No management probs - No management probs or or 1-2 small problems that are dealt with smoothly and without disruption to classroom activities.
		A few probs - Problems somewhat distracting but these are dealt with reasonably quickly
		Repeated manage probs - Repeated probs or problems that exist are not dealt with effectively; management issues are distracting or substantially occupy teacher.
Technology Integration	**Technology Integration**	Not used - No use of computer or related technology for productivity (e.g., word-processing, electronic portfolios), communications (e.g., e-mail, videoconferencing), research (e.g., Internet searches, CD-ROMs), or problem-solving/decision-making (e.g., spreadsheet, Computer Aided Design) is observed.
		Add-on - Limited use of computer or related technology by students and teacher. The use of the technology is simplistic, not well integrated into the lesson, and does not support learning in a meaningful way.
		Partially integrated - Moderate use of computer or related technology by students and teacher. Technology is used in a single way for productivity, communications, research or problem-solving/decision making to support learning.
		Fully integrated - Extensive use of computer or related technology by students and teacher. Technology is used in multiple, complex ways that promote learning through productivity, communications, research or problem-solving/decision making.
	Topic Integration	Does not contribute – use of technology is not essential in reaching primary learning outcomes.
		Somewhat contributes – technology uses plays important role, but other lesson activities are the focus of the learning.
		Strongly contributes - technology use plays vital role in students reaching desired learning outcomes. It is essential.
	Technology Complexity	Simple use - Limited tech use, simplistic, not well integrated, low learning impact
		Moderately complex - Moderate tech use, partially integrated, used in a single way to support learning.
		Advanced use - Extensive tech use, fully integrated in multiple, complex ways that promote learning.

<table>
<tr><th colspan="3">Concepts to Rate Once – At End of Session</th></tr>
<tr><th colspan="3">Overall Session Rating 2</th></tr>
<tr><td rowspan="8">Teacher's Technology Use - General</td><td rowspan="4">Teacher's Technology Use</td><td>Not used - The teacher did not use any computer or related technology.</td></tr>
<tr><td>Presentation -Teacher uses technology to make a presentation via a slide show, web pages, or other means. The teaching style is teacher centered.</td></tr>
<tr><td>Demonstration - Teacher uses technology to show students an activity that they will be doing themselves. The teaching style is teacher centered.</td></tr>
<tr><td>Assisting students - Teacher helps the students with their use of technology. The teaching style is student-centered.</td></tr>
<tr><td rowspan="4">Teacher's Tech Proficiency</td><td>N/A - Not applicable - teacher technology proficiency not observed.</td></tr>
<tr><td>Novice - Unable to troubleshoot simple probs; unfamiliar with many features of soft/hardware</td></tr>
<tr><td>Intermediate - Able to troubleshoot some probs; familiar with most soft/hardware features</td></tr>
<tr><td>Advanced - Troubleshoot all probs efficiently; familiar with all soft/hardware features</td></tr>
<tr><td colspan="2">Teacher Tech Use – Soft/Hard</td><td>If you’re unsure how to classify software or hardware that you see being used, just write it out under “Other” and we’ll classify later.</td></tr>
</table>

<table>
<tr><th colspan="3">Concepts to Rate Once – At End of Session</th></tr>
<tr><th colspan="3">Overall Session Rating 3</th></tr>
<tr><td rowspan="4">Student Technology Use - General</td><td rowspan="3">Student Technology Use</td><td>Not used</td></tr>
<tr><td>Single Application used</td></tr>
<tr><td>2 or more applications used</td></tr>
<tr><td>Average Student Technology Use</td><td>Record the percentage of students who used technology in the lesson.</td></tr>
<tr><td colspan="2">Student Tech Use – Soft/Hard</td><td>If you’re unsure how to classify software or hardware that you see being used, just write it out under “Other” and we’ll classify later.</td></tr>
</table>

Appendix B

Overall Video Technology Integration Scale		
Item	**Original Scale**	**Composite Score**
Proportion of Students Using Technology	(1) No students use technology during this interval (2) Some use technology during this interval (about 25%) (3) About 50% use technology during this interval (4) Most use technology during this interval (about 75%) (5) 100% use technology during this interval	Mean Proportion of Students Using Technology score for 9 intervals across rater 1 and rater 2
Cognitive Activity	(1) Receipt of knowledge (2) Applied procedural knowledge (3) Knowledge construction	Mean Cognitive Activity score for 9 intervals across rater 1 and rater 2
Student Role in the Lesson	(1)Passive / little response (2)Active response (3)Co-construct meaning	Mean Student Role score for 9 intervals across rater 1 and rater 2
Student Engagement	(1)Low engagement (2)Moderate engagement (3)High engagement	Mean Student Engagement score for 9 intervals across rater 1 and rater 2
Student Role with Technology	(1) Tasks are highly prescriptive; students make few decisions or decisions are not substantive (2) Tasks allow some degree of self-direction; students are allowed to guide some of their own learning activities and make a few substantive task-related decisions. (3) Students are able to guide and shape their own learning. They make important decisions during the learning activity.	Mean Student Role with Technology across rater 1 and rater 2
General Level of Integration	(1) Not used (2) Add-on (3) Partially integrated (4) Fully integrated	Mean General Level of Integration score for 9 intervals across rater 1 and rater 2
Technology Integration with Topic	(1) The computer activity does not contribute noticeably to the desired learning outcome. (2) The computer task somewhat contributes to the desired learning outcome, but may not be a strong use of the technology, or the same goals may have been accomplished more effectively with another activity. (3) The computer task strongly contributes to the desired learning outcome.	Mean Technology Integration with Topic across rater 1 and rater 2
Complexity of Technology Use	(1) Simple use of technology (2) Moderately complex use of technology (3) Advanced use of technology	Mean Complexity of Technology Use across rater 1 and rater 2
Student Software Types: WP software, DB software, SS (spreadsheet) software, Presentation, Email, Online chat, Browser, DTP, Multimedia playing, Multimedia authoring, Graphics, Web course, Web authoring	(1) Low – 0 Types (2) Moderate – 1-2 Types (3) High – 3 or more Types	Mean number of software types used in the across rater 1 and 2 recoded into 3 point scale.
Student Hardware: Computer, Computer Projector, Printer, Camera, CD ROM, CD-R/W, Scanner, Distance Room AV	(1) Low – 0 Types (2) Moderate – 1-2 Types (3) High – 3 or more Types	Mean number of hardware types used in the across rater 1 and 2 recoded into 3 point scale.

Overall Video Technology Integration Scale		
Item	**Original Scale**	**Composite Score**
Teacher Software: WP software, DB software, SS (spreadsheet) software, Presentation, Email, Online chat, Browser, DTP, Multimedia playing, Multimedia authoring, Graphics, Web course, Web authoring	(1) Low – 0 Types (2) Moderate – 1-2 Types (3) High – 3 or more Types	Mean number of software types used in the across rater 1 and 2 recoded into 3 point scale.
Teacher Hardware: Computer, Computer Projector, Printer, Camera, CD ROM, CD-R/W, Scanner, Distance Room AV	(1) Low – 0 Types (2) Moderate – 1-2 Types (3) High – 3 or more Types	Mean number of hardware types used in the across rater 1 and 2 recoded into 3 point scale.

Overall Online Technology Integration Scale		
Item	**Original Scale**	**Composite Score**
General Level of Integration	(1) Not used (2) Add-on (3) Partially integrated (4) Fully integrated	Mean General Level of Integration score for 9 intervals across rater 1 and rater 2
Cognitive Activity	(1) Receipt of knowledge (2) Applied procedural knowledge (3) Knowledge construction	Mean Cognitive Activity score for 9 intervals across rater 1 and rater 2
Student Role with Technology	(1) Tasks are highly prescriptive; students make few decisions or decisions are not substantive (2) Tasks allow some degree of self-direction; students are allowed to guide some of their own learning activities and make a few substantive task-related decisions. (3) Students are able to guide and shape their own learning. They make important decisions during the learning activity.	Mean Student Role with Technology across rater 1 and rater 2
Technology Integration with Topic	(1) The computer activity does not contribute noticeably to the desired learning outcome. (2) The computer task somewhat contributes to the desired learning outcome, but may not be a strong use of the technology, or the same goals may have been accomplished more effectively with another activity. (3) The computer task strongly contributes to the desired learning outcome.	
Complexity of Technology Use	(1) Simple use of technology (2) Moderately complex use of technology (3) Advanced use of technology	Mean Complexity of Technology Use across rater 1 and rater 2
Student Software Types: WP software, DB software, SS (spreadsheet) software, Presentation, Email, Online chat, Browser, DTP, Multimedia playing, Multimedia authoring, Graphics, Web course, Web authoring	(1) Low – 0 Types (2) Moderate – 1-2 Types (3) High – 3 or more Types	Mean number of software types used in the across rater 1 and 2 recoded into 3 point scale.
Student Hardware: Computer, Computer Projector, Printer, Camera, CD ROM, CD-R/W, Scanner, Distance Room AV	(1) Low – 0 Types (2) Moderate – 1-2 Types (3) High – 3 or more Types	Mean number of hardware types used in the across rater 1 and 2 recoded into 3 point scale.
Teacher Software: WP software, DB software, SS (spreadsheet) software, Presentation, Email, Online chat, Browser, DTP, Multimedia playing, Multimedia authoring, Graphics, Web course, Web authoring	(1) Low – 0 Types (2) Moderate – 1-2 Types (3) High – 3 or more Types	Mean number of software types used in the across rater 1 and 2 recoded into 3 point scale.
Teacher Hardware: Computer, Computer Projector, Printer, Camera, CD ROM, CD-R/W, Scanner, Distance Room AV	(1) Low – 0 Types (2) Moderate – 1-2 Types (3) High – 3 or more Types	Mean number of hardware types used in the across rater 1 and 2 recoded into 3 point scale.

Appendix C

Table 1

Total Percent Inter-rater Consensus in Initial and Follow-Up Studies for Video, Online Portfolio, and Face-to-Face Teacher Ratings

	% Inter-Rater Consensus		
	Video	Online	Face-to-Face
MTIMMS Subscale*	(n=60)	(n=60)	(n=27)
Cognitive Activity	58	57	80
Interaction	43	77	86
Student Autonomy	65	55	88
General Level of Integration	62	63	96
Technology Integration w/Topic	57	67	95
Technology Complexity	63	55	89
Teacher Technology Use	78	40	89
Student Technology Use	77	90	96
Classroom Management	60	n/a	93
Student Role	55	n/a	86
Student Engagement	65	n/a	82
Proportion of Students Using Tech	89	n/a	93*

*n=15 for this analysis

Appendix D

Table 2

Percent Inter-Rater Consensus for Initial Study (n=36) and Follow-Up Study (n=30) on Online Portfolio Ratings

Online Rater Agreement		% Inter-Rater Consensus Initial Study (n=36)	Follow-Up Study (n=24)	Total (n=60)
Classroom Organization				
Raters Disagree	% within study	31	33	
	% of Total			32
Raters Agree	% within Wave of ratings	69	67	
	% of Total			68
Total	% within Wave of ratings	100	100	
	% of Total			100
Cognitive Activity				
Raters Disagree	% within study	42	46	
	% of Total			43
Raters Agree	% within Wave of ratings	58	54	
	% of Total			57
Total	% within Wave of ratings	100	100	
	% of Total			100
Interaction				
Raters Disagree	% within study	22	25	
	% of Total			23
Raters Agree	% within study	78	75	
	% of Total			77
Total	% within study	100	100	
	% of Total			100
Student Autonomy				
Raters Disagree	% within study	39	54	
	% of Total			45
Raters Agree	% within study	61	46	
	% of Total			55
Total	% within study	100	100	
	% of Total			100

Table 2 continued

Percent Inter-Rater Consensus for Initial Study (n=36) and Follow-Up Study (n=30) on Online Portfolio Ratings

Online Rater Agreement		% Inter-Rater Consensus		
		Initial Study (n=36)	Follow-Up Study (n=24)	Total (n=60)
General Level of Integration				
Raters Disagree	% within study	39	33	
	% of Total			37
Raters Agree	% within study	61	67	
	% of Total			63
Total	% within study	100	100	
	% of Total			100
Level of Technology Integration with Topic				
Raters Disagree	% within study	44	17	
	% of Total			33
Raters Agree	% within study	56	83	
	% of Total			67
Total	% within study	100	100	
	% of Total			100
Complexity of Technology Use				
Raters Disagree	% within study	50	38	
	% of Total			45
Raters Agree	% within study	50	63	
	% of Total			55
Total	% within study	100	100	
	% of Total			100

Appendix E

Table 3.

Percent Inter-Rater Consensus for Initial Study (n=36) and Follow-Up Study (n=30) on Video Ratings

		% Consensus		
		Initial Study (n=36)	Follow-Up Study (n=24)	Total (n=60)
Classroom Organization				
Raters Disagree	% within study	42	58	
	% of Total			48
Raters Agree	% within study	58	42	
	% of Total			52
Total	% within study	100	100	
	% of Total			100
Cognitive Activity				
Raters Disagree	% within study	42	42	
	% of Total			42
Raters Agree	% within study	58	58	
	% of Total			58
Total	% within study	100	100	
	% of Total			100
Interaction				
Raters Disagree	% within study	58	54	
	% of Total			57
Raters Agree	% within study	42	46	
	% of Total			43
Total	% within study	100	100	
	% of Total			100
Student Role				
Raters Disagree	% within study	42	50	
	% of Total			45
Raters Agree	% within study	58	50	
	% of Total			55
Total	% within study	100	100	
	% of Total	60	40	100

Table 3. continued

Percent Inter-Rater Consensus for Initial Study (n=36) and Follow-Up Study (n=30) on Video Ratings

		% Consensus		
		Initial Study (n=36)	Follow-Up Study (n=24)	Total (n=60)
Student Engagement				
Raters Disagree	% within study	31	42	
	% of Total			35
Raters Agree	% within study	69	58	
	% of Total			65
Total	% within study	100	100	
	% of Total			100
General Level of Integration				
Raters Disagree	% within study	25	58	
	% of Total			38
Raters Agree	% within study	75	42	
	% of Total			62
Total	% within study	100	100	
	% of Total			100
Teacher Technology Use				
Raters Disagree	% within study	22	21	
	% of Total			22
Raters Agree	% within study	78	79	
	% of Total			78
Total	% within study	100	100	
	% of Total			100
Student Technology Use				
Raters Disagree	% within study	36	4	
	% of Total			23
Raters Agree	% within study	64	96	
	% of Total			77
Total	% within study	100	100	
	% of Total			100
Proportion of Students Using Technology				
Raters Disagree	% within study	11	13	
	% of Total			12
Raters Agree	% within study	89	88	
	% of Total			88
Total	% within study	100	100	
	% of Total			100

Table 3. continued

Percent Inter-Rater Consensus for Initial Study (n=36) and Follow-Up Study (n=30) on Video Ratings

		% Consensus		
		Initial Study (n=36)	Follow-Up Study (n=24)	Total (n=60)
Classroom Management				
Raters Disagree	% within study	47	29	
	% of Total			40
Raters Agree	% within study	53	71	
	% of Total			60
Total	% within study	100	100	
	% of Total			100
Student Autonomy				
Raters Disagree	% within study	31	42	
	% of Total			35
Raters Agree	% within study	69	58	
	% of Total			65
Total	% within study	100	100	
	% of Total			100
Technology Integration with Topic				
Raters Disagree	% within study	39	50	
	% of Total			43
Raters Agree	% within study	61	50	
	% of Total			57
Total	% within study	100	100	
	% of Total			100
Complexity of Technology Use				
Raters Disagree	% within study	42	29	
	% of Total			37
Raters Agree	% within study	58	71	
	% of Total			63
Total	% within study	100	100	
	% of Total			100