

FOLLOWING A TECHNOLOGY TRAINING WORKSHOP: EFFECTS OF A WEB-BASED SUPPORT SYSTEM

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Abstract

What are the effects on classroom technology integration when teachers who have received formal technology training are further supported with a web-based after-training support system? This ethnographic study explores this question by taking a look some of the teachers who participated in an institution's teaching and technology workshop. Data were collected through interviews and informal conversations with the teachers. The teachers were interviewed twice: once before they were introduced to the support system and again, toward the end of the study, after they had the opportunity to use the support system, in order to determine what effects, if any, the after-training support system had on the teachers' levels of classroom technology integration. Additional data collection methods consisted of the following: observations of the teachers as they taught in their classrooms and document analysis of teaching materials and students' work. Findings suggest that teachers who use an after-training support system increase their instances of high-level classroom technology integration. Further supported by this investigation is that assistance from school administration is critical to the success of classroom technology integration.

Keywords: High-level technology integration, High-order intellectual skills , Low-level technology integration

1. INTRODUCTION

As more and more schools, both public and private, push to integrate technology into the classrooms, the current teacher population must be retrained to use this technology effectively. In response to this demand for professional development, technology workshops are springing up at various institutions of higher learning. Most of these workshops, which typically occur during the summer months and last from one to four weeks according to Hu (1999), rigorously trained the teachers who reported that "they learned a lot, they had networked with other teachers, and they were planning to integrate the knowledge and skills they acquired in training once they got back to school" (p. 1754). But once the teachers return to their schools, what happens then? Does the training from the workshop alone adequately prepare the teachers to integrate technology into the classroom, or would an after-training support system make a difference in how fully teachers integrate technology?

This study takes a look at some of the teachers who participated in an institution's teaching and technology workshop and begins to explore answers to the following:

What are the effects of a teaching and technology workshop with an after-training

support system on classroom technology integration?

2. THE AFTER-TRAINING SUPPORT SYSTEM

The support system offers pedagogical and technical one-on-one and web site support. The study's participants have been encouraged to voluntarily access the web site at <http://web.presby.edu/~watkins/T&TI>.

The components of the web site are as follows: an *Institute Content* page that links to the pedagogical materials of the Teaching and Technology Institute which includes the course syllabus and the presentation slides, a *Best Practices* page that offers a different tutorial every month as well as suggestions on using presentation software (in this case, Microsoft PowerPoint) for high-level methods of technology integration, a *Collaborative Ideas* page where participants submit to me their suggestions and methods for classroom technology integration which I then post to the *Collaborative Ideas* web page, a *Discussion Forum* where the participants may ask questions of each other and discuss topics, a *Mentor* page where a participant may schedule one-on-one pedagogical and technical support with me, and a *Resources* page with links to educational web sites. Further detail on the web

pages for the after-training support system is supplied in subsequent paragraphs within this section.

Institute Content Web Page

The *Institute Content* web page includes links to the teaching materials, specifically the course syllabus and the presentation slides, that the professors used in the summer of 2000. According to Schnackenberg, et al. (1999), teachers must receive post-training pedagogical support. Access to the Institute's pedagogical materials offers the participants familiar examples of technology integration that they may utilize for their classroom technology integration.

Best Practice Web Page

Educators agree that teachers need examples of best teaching practices (for example, Baines, et al., 1998). The *Best Practices* web page suggests teaching methods using Microsoft PowerPoint that produce high-level technology integration. PowerPoint was chosen since the teachers used PowerPoint to create their instructional materials in the Teaching and Technology Institute. Furthermore, PowerPoint is widely used in K-12 schools, mainly due to its versatility and ease of access.

The specific components of the *Best Practices* web page are the following: a new tutorial every month on a particular PowerPoint topic, the criteria for high-level technology integration, examples where students use PowerPoint as a presentation tool and for assessments, and a sample PowerPoint presentation that uses hyperlinks within the presentation.

Znamenskaia, et al. (1999) found that teachers completed a training workshop with a superficial understanding of PowerPoint; that is, they only saw PowerPoint as a presentation tool for teachers. Models for high-level uses of PowerPoint along with a definition of high-level integration may prompt the participants of this study to envision uses of PowerPoint that were not addressed in the Teaching and Technology Institute. According to Hu (1999), the support web site should "provide guidance and suggestions on curriculum and activity design and technology uses" (p. 1755).

Collaborative Ideas Web Page

Hu (1999) further suggests that the support web site "build a cyber-community" of participants. The *Collaborative Ideas* web page is intended to do just that. The participants are encouraged to send me their suggestions or methods for classroom technology integration, which I then post to the *Collaborative Ideas* web page.

Discussion Forum

Hu (1999) also suggests providing a forum so that teachers may network with one another. Where the *Collaborative Ideas* web page reflects the suggestions from the participants for classroom technology integration, the purpose of the *Discussion Forum* is to

provide a place for the teachers in this study to ask questions and discuss topics with each other. An additional difference between the *Discussion Forum* and the *Collaborative Ideas* web is that the participants may independently post their messages to the *Discussion Forum*.

Mentor Web Page

Mentors can lend tremendous assistance toward achieving the goal of integrating technology into the curriculum (Cole, 1999). Similarly, Burton and Danielson (1999, p. 53) advocate "face-to-face" and "on-the-spot" pedagogical and technical support. The participants may schedule one-on-one assistance with me through the *Mentor* web page.

Resources Web Page

"Provide selected quality resource links on the Internet" (Hu, 1999, p. 1755) as they relate to classroom technology integration. The *Resources* web page contains links that offer technologically integrated lesson plans and activities for grades K-12, on-line tutorials, links to professional organizations in educational technology, as well as links to technology-grant writing companies. The *Resources* web page provides access to additional methods of technology integration for all of the teachers in this study. However, the *Resources* web page has been designed primarily for the teacher who wants to integrate technology but may not have access to PowerPoint.

3. THE INVESTIGATION

The Teaching and Technology Institute met for one week in July of 2000 from 8:30 a.m. until 5:30 p.m. at Claxton College. Nineteen teachers from both public and private schools attended the Institute.

The participants of this study are seven of the nineteen teachers. The seven teachers are white, middle-class females who reside in the area surrounding Claxton College. Of the seven teachers, five teach at public schools and two teach at a private school. The grades taught by the seven teachers range from first to high school.

Data were collected through interviews and informal conversations with the teachers. The teachers were interviewed twice: once before they were introduced to the support system and again, toward the end of the study, after they had the opportunity to use the support system, in order to determine what effects, if any, the after-training support system had on the teachers' levels of classroom technology integration. Additional data collection methods consisted of observations of the teachers as they taught in their classrooms and document analysis of teaching materials and students' work.

This section details the effects on classroom technology integration when teachers participate in a Teaching and

Technology Institute with an after-training support system.

Included in this section are the following: descriptions of the teachers, assertions based on the initial teacher interviews which took place before introducing the teachers to the after-training support system, vignettes that are intended to give the reader an idea of how some of the teachers in this study integrate technology into their teaching, and assertions based on the final teacher interviews which took place after the teachers had been given the chance to use the after-training support system.

The Teachers

Carol, a veteran teacher of twenty-five years, is the media specialist for a high school of over 1700 students, grades nine through twelve.

Hanna, a teacher for nine years, teaches fourth and fifth grades at a private school and has sixteen students in each grade.

Kim appears to be the ideal first-grade teacher: sweet, patient, and soft-spoken. Kim teaches all subjects to her self-contained, first-grade class.

Natalie, a teacher for ten years, teaches both fourth and fifth grade students in one classroom. Natalie has twelve students in each grade.

Rachel teaches seventh-grade mathematics. Rachel has taught for nine years, but this is her first year at this particular middle school.

Sara teaches fourth-grade language arts and social studies; she has been teaching for four years.

Trina, a third-grade teacher at a private school, has sixteen students in her classroom this year. Trina has two years of teaching experience.

Initial Interviews

Prior to introducing the seven teachers to the after-training support system, I conducted initial in-depth interviews with the teachers in August and September of 2000.

The following set of questions guided these interviews.

- ◆ Why did you take the Teaching and Technology Institute?
- ◆ According to you, what does the phrase *integrating technology into teaching* mean?
- ◆ Could you describe to me some of the ways that you integrate technology into your teaching?

At the end of each initial interview, I would introduce the teacher to the after-training support system. The instances where the teachers' students use high-order

intellectual skills of *Analysis*, *Synthesis*, and *Evaluation* through technology are labeled according to the criteria outlined in the *Rubric for High-Level Technology Integration* (Table 1).

Assertions: The teachers who participated in this study gave three main reasons for taking the Teaching and Technology Institute: (1) four of the teachers (Carol, Kim, Rachel, and Sara) said that they wanted to learn how to create multimedia presentations; of those four, three of the teachers (Carol, Kim, and Rachel) specifically said that they wanted to learn how to use PowerPoint, (2) learning more about technology, in general, was the main reason given by two of the teachers (Natalie and Trina), (3) while re-certification and South Carolina's technology requirement for teachers were given as additional reasons by two of the teachers (Carol and Trina), only one teacher, Hanna, gave re-certification and the technology requirement as her primary reasons for taking the workshop.

Comments from a few of the teachers, specifically Natalie, Trina, and Rachel, suggest that they feel more comfortable with technology in general as a result of the workshop. "I've learned shortcuts," Trina told me. Similarly, Rachel said, "And I just think the more computer courses you take, you'll see that everything's pretty much the same. It just gets a little bit better." Neither Natalie nor Trina even knew that they had PowerPoint on their home computers until after taking the Teaching and Technology Institute.

Six out of the seven teachers whom I interviewed said that the concepts that they learned from the Teaching and Technology Institute were applicable to their teaching. Hanna was the only teacher who said that the concepts were not applicable to her teaching area.

Since the primary emphasis of the workshop was preparing and delivering PowerPoint presentations, the teachers' comments typically suggest that they had learned some of the low-level integration techniques for using PowerPoint in the classroom. Only one teacher, Kim, saw PowerPoint as a tool not only for teachers, but for her students as well. Kim wanted to use PowerPoint as a replacement tool for the word processor to let her first-grade students publish their writings; "just let them go in, create a little storybook..., and then just show it..."

During the initial interviews, I asked all of the teachers in the study to define "integrate technology into teaching." The answers ranged from the very specific from Rachel, "showing them how to use a computer, the things that they're going to do every day," to the more general, "using the technology that's available to you whether it's the TV or the VCR or the overhead or the computer," as per Sara.

Even before introducing the teachers to the after-training support system, the comments from four of the teachers, specifically Kim, Hanna, Natalie, and Trina, suggest that they integrate technology through high-level methods. For the students of these classes, the specific methods include: publishing writings with computers (*Synthesis*), reading-level assessment through computerized tests (*Evaluation*), problem solving with computers (*Evaluation*), and using the Internet to write stories (*Synthesis*) and to make reading “more personable” (*Analysis*). Listed below is a graph that shows the number of instances of high-level classroom technology integration for each teacher prior to using the after-training support system (Figure 1).

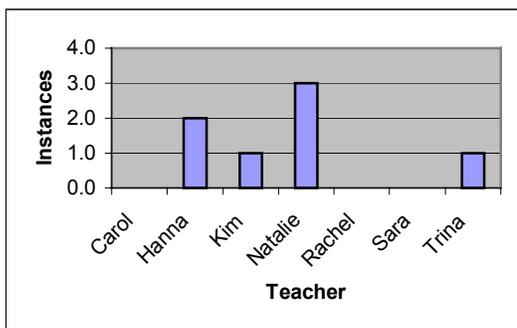


Figure 1. Number of Instances of High-Level Classroom Technology Integration for Each Teacher Prior to Using the After-Training Support System.

Observations

Observations of the seven teachers were conducted throughout the fall of 2000 and the spring of 2001. My observations focused on how each teacher integrated technology into her teaching. The two vignettes that follow are based on my observations of Hanna and Kim.

Hanna: Hanna Malloy’s sixteen fifth-grade students are writing short stories. At the beginning of class, Mrs. Malloy tells her students, “Pick a topic, something that happened to you, and write a story about it. Remember to follow the five steps of writing: (1) prewriting, (2) drafting, (3) revising, (4) proofreading, and (5) publishing. When you get to the publishing step, you may take turns using the classroom computer to type your story, add an appropriate graphic, and print your story out.”

VIGNETTE: COOPERATIVE PUBLISHING

Mrs. Malloy, squatted beside Callie’s desk, was helping Callie with her punctuation. “Why do you need a comma here?” asked Mrs. Malloy. “Oh, I know,” responded Callie, “because it could really be two sentences if I took out the ‘and’.” “Very good, Callie,” says Mrs. Malloy.

Meanwhile Josh was reading his story entitled “Hunting for Deer” to Kirk. “What do you think,” Josh asked when he had finished reading his story. “Not bad,” answered Kirk. “Now listen to mine,” Kirk says. He begins to read to Josh.

Amber was seated at the classroom computer. She was using the Creative Writer word processor to type her story entitled “The Alligator and Me.” “Mrs. Malloy, I want to put a picture of an alligator in my story,” Amber calls out. Mrs. Malloy finishes helping Forest with his punctuation and paragraphs, then she head toward Amber. Before she can reach Amber, Kylie stops her, and asks, “Can you draw a picture of a goat? My story’s about a mean goat, and I want to draw a picture of a goat.” “I don’t draw very well, Kylie,” Mrs. Malloy responds. “Try looking in the encyclopedia,” suggests Mrs. Malloy. Kylie heads off toward the shelf of encyclopedias. Mrs. Malloy finally reaches Amber. She shows Amber how to insert a picture of an alligator into Amber’s story, then she shows Amber how to print the story. “You can color the alligator, Amber,” Mrs. Malloy suggests. Amber agrees that the alligator would look better with some color so she heads toward the marking pencils.

Next, it’s Callie’s turn to use the computer. She begins typing her story, “My Grandpa’s Farm.” “Mrs. Malloy, can I put a picture of a barn in my story?” Callie asks. “Yes, you may,” answers Mrs. Malloy. “Amber, would you please show Callie how to put a picture of a barn into her story,” asks Mrs. Malloy. Amber, who has just finished coloring her alligator, walks toward Callie. “It’s really easy. Watch, I’ll show you, then you can do it,” says Amber. Callie watches Amber; then she tries inserting a picture of a barn. “It is easy!” exclaims Callie. “I colored my alligator green,” says Amber. “I think I’ll color my barn brown and red,” says Callie. This time, Callie heads toward the marking pencils. Amber selects a sheet of yellow construction paper and begins gluing her story to the construction paper.

Kirk is the next person to use the computer. He starts typing his story, “The Bad Horseback Ride.” Meanwhile, Mrs. Malloy suggests to Amber that she hang her story on the wall outside of the classroom. “The sticky stuff that you need is in a basket on my desk,” Mrs. Malloy says to Amber. Amber finds the sticky stuff and goes into the hall to hang her story. Callie, who has finished coloring her barn, walks over to Kirk who is typing his story into the computer. “Do you want me to show you how to put a picture in your story?” asks Callie. “Sure,” answers Kirk.

Kim: A few days before, Kim Dunbar’s first-grade class gathered around the oldest tree in the schoolyard and had their picture taken with a digital camera. Kim then inserted the picture into a PowerPoint presentation. Each of her thirteen first-graders has written a sentence about the tree. Today, Kim is helping

each student type his or her sentence onto a slide in the PowerPoint presentation.

Eventually, Kim will show the PowerPoint presentation to her first-graders so they can read their “tree” story together. Kim also wants to print the PowerPoint slides and create a “tree” story booklet for each student.

VIGNETTE: TREE STORY

“Ok, sweetie, type in your sentence,” Mrs. Dunbar says to Amelia. Amelia begins typing her sentence. Amelia has trouble finding some of the keys, and Mrs. Dunbar has to remind her about punctuation and capitalization. “Press the shift key, then type the letter,” Mrs. Dunbar says. Amelia does as she is instructed and the resulting letter is capitalized. Amelia grins. Finally, Amelia has typed her entire sentence onto the PowerPoint slide.

“That’s really good, sweetie,” says Mrs. Dunbar. “Now, read your sentence to me,” Mrs. Dunbar instructs Amelia. Amelia begins, “The tree grows bigger than me.” Mrs. Dunbar hugs Amelia. “That’s very good, Amelia,” says Mrs. Dunbar. “You can go back to your seat and work on your story about Henny Penny,” Mrs. Dunbar says to Amelia. Amelia returns to her table, sits down in her chair, and begins working on her Henny Penny story.

“Jacob, it’s your turn,” Mrs. Dunbar says. Jacob scrambles out of his chair, grabs the paper with his sentence about the tree, and heads over toward Mrs. Dunbar and the classroom computer.

Eventually, each first grader types a sentence into the PowerPoint presentation.

Several days later, Mrs. Dunbar and her thirteen first graders assemble around the classroom computer to read their “tree” story from PowerPoint. Tricia begins the story by reading from the first PowerPoint slide, “This is a story about the oldest tree in our schoolyard.” Darryl reads the next slide, “The tree is also the tallest tree in our schoolyard.” “We stood under the tree and had our picture taken,” Kristen reads. The children continue reading until each first grader has read his or her sentence.

“That was so much fun, Mrs. Dunbar. When can we read using the computers again?” asks Nancy. “Very soon,” answers Mrs. Dunbar.

Final Interviews

After the seven teachers had the opportunity to use after-training support system, I conducted final in-depth interviews with the teachers in April of 2001.

The following set of questions guided these interviews.

- ◆ How often did you access the Teaching and Technology Institute’s Support System for help?
- ◆ Here is a printout of the Teaching and Technology Institute’s Support System. As you look at each item from the Support System, describe to me how you have used an item or how you plan to use an item to integrate technology into your teaching.
- ◆ What was lacking from the Teaching and Technology Institute’s Support System that should be included?

The instances where the teachers’ students use high-order intellectual skills of *Analysis*, *Synthesis*, and *Evaluation* through technology are labeled according to the criteria outlined in the *Rubric for High-Level Technology Integration* (Table 1).

Assertions: The teachers in this study ranged in using the after-training support system from “three to four times” as per Hanna to “twice a week” as per Trina. The following details which components of the after-training support system that the seven teachers either used or plan to use.

Rachel and Sara used the *Presentation Slides* from the *Institute Content* web page. Rachel accessed the *Presentation Slides* to “refresh [her] memory on how to do something in PowerPoint.” Sara accessed the *Presentation Slides* “when [she] was trying to make presentations or when [she] was trying to update.” According to Sara, “just being able to have access to [the *Presentation Slides*], even after the class [the Teaching and Technology Institute] was over, helped a lot.”

Per the suggestion on the *Best Practices* web page, “Let Your Students Use PowerPoint,” Rachel plans “to show [her] students how they can use PowerPoint for math.” Kim’s students use PowerPoint to “publish their stories.” However, Kim was utilizing this high-level technology integration method before using the after-training support system.

Sara completed the tutorial, *Create A Tutorial For Your Students Using Microsoft PowerPoint*, from the *Best Practices* web page and created a tutorial for one of her social studies’ topics. Sara showed the tutorial to her students using one of her school’s portable PowerPoint projection systems.

Hanna and Rachel applied one of the high-level classroom technology integration methods found on the *Collaborative Ideas* web page. The model for the high-level method that Hanna and Rachel utilized from the *Collaborative Ideas* web page is listed below.

Mrs. Edwards has only one computer attached to both a scanner and a printer in her classroom. She first teaches one student how to scan, then that student teaches another student, until all of the students in the class have had the opportunity to create something using the scanner.

Specifically, Hanna’s students, who were instructed to add an “appropriate graphic” to their stories, taught one another how to incorporate graphics into their published writing (*Synthesis*). Rachel’s students also modeled the same high-level method by teaching each other how to download a screensaver (*Synthesis*).

Sara and Trina used *Kathy Schrock’s PuzzleMaker* from the *Collaborative Ideas* web page to create word searches for their students’ spelling words.

Carol plans to show the teachers at her school the teaching strategies on the *Collaborative Ideas* web page.

None of the teachers in this study used either the *Discussion Forum* or the *Mentor* web pages. Rachel, however, indicated that she would like to see the *Discussion Forum* used more frequently.

The teachers in this study used the *Resources* web page more frequently than any other component of the after-training support system. Carol accessed professional journals from the *Resources* web page. Hanna and Trina used the *Resources* web page to access the teaching materials from *Scholastic*. Kim and Natalie accessed the teaching materials from *Kathy Schrock’s Guide for Educators*, also found on the *Resources* web page. Sara accessed the teaching materials from both *Scholastic* and *Kathy Schrock’s Guide for Educators*. Sara also accessed *ERIC*, *South Carolina Education*, and *U.S. Department of Education*.

Listed below are two graphs. The first graph (Figure 2) shows the number of instances of high-level classroom technology integration for each teacher subsequent to using the after-training support system. The second graph (Figure 3) shows the number of teachers who used each web page from the after-training support system.

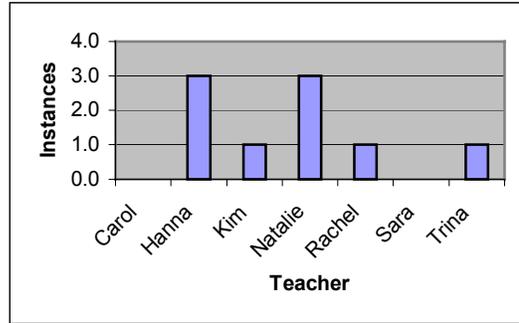


Figure 2. Number of Instances of High-Level Classroom Technology Integration for Each Teacher Subsequent to Using the After-Training Support System.

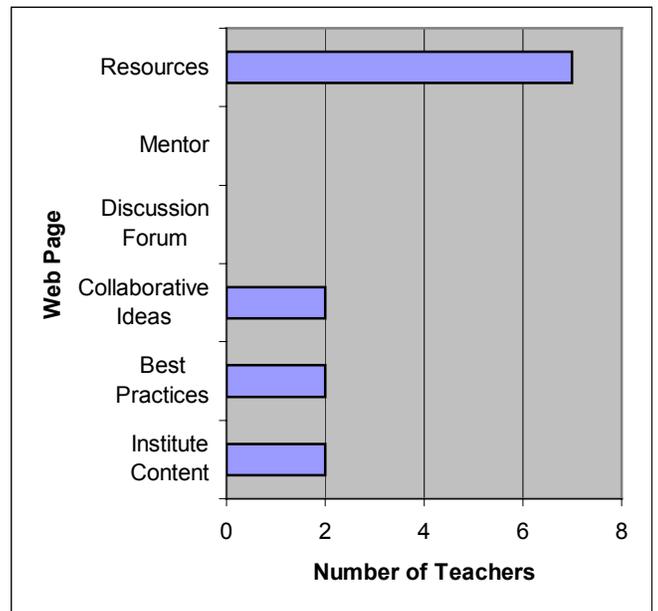


Figure 3. Number of Teachers Who Used Each Web Page from the After-Training Support System

Recommendations made by the teachers for enhancing the after-training support system include the following.

Hanna suggested that I add “samples of students’ work that they’ve done” to the after-training support system.

Kim’s suggestion was that I add a “place where we could ask you questions, sort of like a tips and tricks of PowerPoint.”

Trina suggested that I add the link www.coreknowledge.com to the after-training support system so that teachers could

access “detailed lesson plans and good ideas for teachers.”

4. CONCLUSIONS

Prior to using the after-training support system, Kim was the only teacher who envisioned PowerPoint as a tool for her students. Since using the after-training support system, Rachel now also visualizes PowerPoint as a tool that her students can use, specifically for math.

Even though all seven of the teachers who participated in this study used components from the after-training support system, only Hanna and Rachel indicated an increase in the instances of high-level technology integration subsequent to using the after-training support system, specifically by applying one of the teaching methods found on the *Collaborative Ideas* web page. Listed below is a graph that shows the number of instances of high-level classroom technology integration for each teacher, both before and after using the after-training support system (Figure 4).

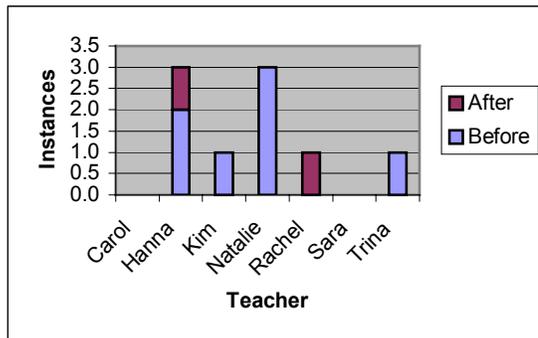


Figure 4. Number of Instances of High-Level Classroom Technology Integration for Each Teacher, Both Before and After Using the After-Training Support System

Moreover, comments from the teachers suggest that had the after-training support system been made an integral part of each teacher’s curriculum, the teacher would likely have used the after-training support system more often.

“I just kept thinking, if I didn’t have so much else to cover, I could spend more time exploring the web site [the after-training support system],” as per Hanna.

Rachel’s comments indicate a similar concern.

I know this sounds awful, but there are so many math things to cover; and I just don’t feel like PACT puts computer stuff on there so I barely use them [the computers in class].

When PACT is over, I’ll do more with technology then.

Natalie expressed the following frustration with trying to integrate technology into her teaching.

Our school took a full-time teacher out of the classroom, made her a technology person, and then split her duties between us and [another elementary school]. Now, whenever I need help from her [the technology person], most times I either can’t find her or she’s something totally not related to computers, like answering the phone in the office.

My biggest frustration with computer use is [the] lack of computers in the classroom. I have twenty-five students and one computer.

Even though Hanna and Trina have both been promised PowerPoint for their classroom computers by their school’s administrators, neither teacher has yet received PowerPoint for her classroom computer.

At the beginning of the school year, Sara was promised an Internet-connected classroom computer with access to PowerPoint by her school’s administrators. Sara still had not received her classroom computer.

Throughout most of this study, Kim’s computer was not working properly.

The children published their stories using PowerPoint just so that they could “flip through” the screens so that they could read each other’s stories. But I lost all of that when my computer crashed this last time. I’ve learned now to do backup files.

Support from the school administration is critical to the success of classroom technology integration, according to Cole (1999), Moallem and Micallef (1997), and Rogers (1999). “Administrators provide leadership, act as role models, usually are the major change agents in schools, and they provide the needed resources for the program” (Cole, p. 11). Marcinkiewicz (1996) further supports this with his statement,

In order for teachers to adopt computers, there needs to be a perception generated by the professional environment that computer integration is expected. This can be

established by modeling use by administrators, colleagues, students, and the profession. A work environment that would be equipped and faculty training and support would also be available (p. 471).

When teachers receive the needed support from school administration, technology training will be continuous and will raise the teachers' technology integration from a basic level to high-level methods. Further analysis of this study's data leads to speculation that until teachers themselves are comfortable with integrating technology at higher levels into their teaching, their students cannot be expected to think at the higher levels when learning through technology.

TABLE 1

Rubric for High-Level Technology Integration

Analysis Level	Synthesis Level	Evaluation Level
With the assistance of technology, the teacher has created a learning environment where the student must <i>analyze</i> (distinguish, detect, employ, restructure, or classify) the information that relates to the topic(s) being taught.	With the assistance of technology, the teacher has created a learning environment where the student must <i>synthesize</i> (write, produce, plan, design, derive, or combine) the information that relates to the topic(s) being taught.	With the assistance of technology, the teacher has created a learning environment where the student must <i>evaluate</i> (argue, decide, compare, consider, or contrast) the information that relates to the topic(s) being taught.

REFERENCES

Baines, L., Deluzain, R. E., & Hegngi, Y. (1998). "The state of the 'Net in secondary classrooms: Rhetoric and reality." WebNet 98 World Conference of the WWW, Internet, and Intranet Proceedings (pp. 2-6). Orlando, FL. (ERIC Document Reproduction Service No. ED 427 685).

Burton, J. K., & Danielson, J. A. (1999). "A support system for instructional technology in higher education: the housecalls program of Virginia Tech's College of Human Resources and Education." Educational Media and Technology Yearbook, 24, 51-56.

Cole, H. (1999). Implementing Instructional Technology in Schools (pp. 1-30). (ERIC Document Reproduction Service No. ED 437 018).

Hu, J. (1999). "The after-training support: Using Internet technology to help and connect in-service teachers in their teaching and professional development." SITE 99: Proceedings of the Society for Information Technology & Teacher Education (pp. 1754-1757). San Antonio, TX.

Marcinkiewicz, H. R. (1996). "Motivation and teachers' computer use." In Proceedings of Selected Research and Development Presentations at the 1996 National Convention of the Association for Educational Communications and Technology (pp. 467-472). Indianapolis, IN. (ERIC Document Reproduction Service No. ED 397 818).

Moallem, M., & Micallef, S. (1997). "Instructional technologists at public schools: A study of the role and effectiveness of technology resource teachers." Proceedings of Selected Research and Development Presentations at the 1997 National Convention of the Association for Educational Communications and Technology (pp. 233-252). Albuquerque, NM. (ERIC Document Reproduction Service No. ED 409 856).

Schnackenberg, H. L., Luik, K., Nisan, Y., & Servant, C. (1999). "Teacher In-Service Training, Technology, and Front-End Analysis. A Needs Assessment Report." Paper presented at the Annual Convention of the Association for Educational Communications and Technology (pp. 1-14). Houston, TX.

Znamenskaia, E., Guan, Y., & Young, M. F. (1999). "Teacher In-Service Multimedia Training: A View of Outcomes from a Situated Learning Perspective." Paper presented at the Annual Convention of the Association for Educational Communications and Technology (pp. 1-41). Houston, TX.