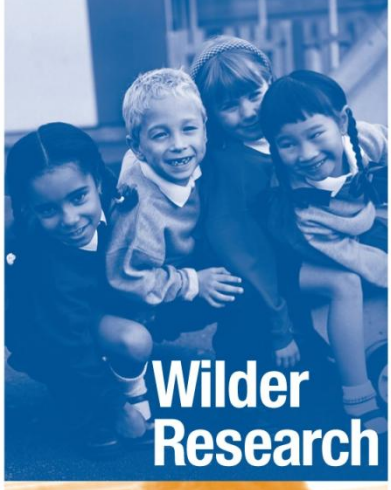

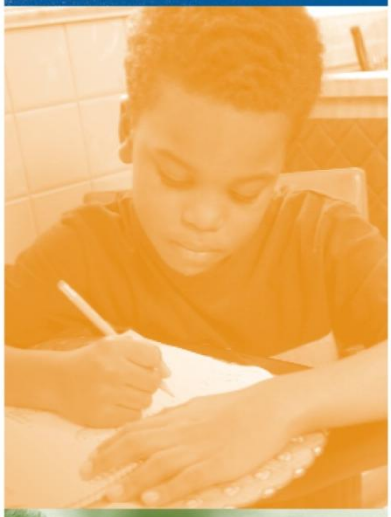

Evaluation of Professional Development through Technology

An initiative of the Minneapolis Public Schools

JUNE 2011

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Summary

Minneapolis Public Schools (MPS) contracted with Wilder Research to evaluate the Professional Development through Technology (PDT2) program. This new model of professional development consisted of online courses and virtual learning communities (VLCs) intended to increase technology integration in the classroom. By providing professional development through an online format, the PDT2 model was designed to better meet teachers' time, place, and learning style needs.

Evaluation overview

The evaluation addresses two key questions:

- Evaluation Question 1: How effective is the PDT2 model in meeting the professional development needs of teachers?
- Evaluation Question 2: To what extent did PDT2 increase the level of technology integration in participating teachers' classrooms?

The evaluation addresses these questions using surveys of teachers and students, classroom observations, interviews with teachers, and participation data from program records.

Findings

Effectiveness of PDT2 in meeting teachers' needs

Teacher participation. A total of 163 teachers participated in PDT2 to some degree, including 28 percent who had five or more hours of participation (high dosage), 48 percent who had one to nearly five hours (low dosage), and 25 percent who had less than one hour (no dosage – excluded from analyses). Of all these teachers, 141 participated in at least one online course and 57 participated in at least one of the virtual learning communities (VLCs). The online courses component of PDT2 engaged teachers more successfully than the VLCs component, with teachers spending more time in the courses. Teachers who had very little PDT2 participation mostly attributed this to being too busy. Other reasons for low participation or engagement included that the program was not intensive enough, with too few requirements for participation and a lack of consequences for non-participation. Also, some teachers struggled with the technology.

Satisfaction with online courses. At least 9 out of 10 teachers agreed that the online course they took met or exceeded their expectations, was of high quality, had an effective facilitator, was the right length, would improve their teaching, and that they would recommend the course to other teachers. Most teachers reported that the online format is

more convenient (time and location), less expensive, and provides the freedom to work at one's own pace, compared with traditional face-to-face workshops.

Other strengths and challenges of PDT2. Teachers frequently mentioned content-specific materials and sharing and learning from other teachers as strengths of PDT2. Challenges included: generating online discussion, the need for more direction in VLCs, lack of time to participate, lack of real-time support, struggles with technology, and PDT2 not meeting personal learning-style needs.

Impact of PDT2 on the level of technology integration

Increases in technology knowledge and skill. About half of the teachers (51%) who participated in this evaluation reported an increase in their knowledge of the technologies that can be used in the classroom. However, teachers' knowledge about technologies that students can use to learn about specific content areas did not increase. Close to half of the teachers (44%) reported an increase in their skills in using technology, although their students tended not to notice such an increase. In addition, over half the teachers (56%) reported that they increased their capability to integrate technology into their classrooms.

Changes in use of technology. Teachers did not substantially change their objectives for technology use during the study period. The most frequently observed reasons teachers used technology in the classroom were to present information and to demonstrate or model a skill. Teachers' most frequent objectives for students' computer use were: finding out about new ideas or information, presenting information, and mastering skills just taught. The number of hardware and software technologies used did not change during the study period, but the number of web applications used by teachers and students increased. This was due in part to greater use of Moodle. Teachers reported an increased frequency in creating and maintaining web pages or Moodle sites for their classes. Students also reported increases in their web-based activities, including completing assignments online using Moodle. Teachers confirmed students' greater use of the Internet for research, communication, and creating web pages or web sites. Students' use of computers also increased for other purposes such as writing, presenting information, producing graphs or charts, and problem-solving.

Class time spent using technology. Students increased the amount of time they used computers for learning in class during the study period. Classroom observations indicated that use among all students increased from 41 percent of class time during the pre-test observation to 74 percent during the post-test observation, which is an average increase of 17 minutes per class period. Similarly, observations indicated that teachers increased their use of technology for teaching by an average of 14 minutes per class period.

Increased interplay of technology, content, and pedagogy. To truly integrate technology into instruction, teachers must understand and negotiate the interplay of technology, content, and pedagogy (teaching approaches). Almost 4 in 10 teachers surveyed reported an increase in teaching lessons that appropriately combined technology, content, and pedagogy. Classroom observations also noted instances of more sophisticated technology integration (i.e., using technology to transform instruction) at post-test.

Caution in interpreting results. The increases in use of technology and technology integration found during the study period should not necessarily be attributed to PDT2 alone, especially given the relatively low levels of teacher participation in PDT2, and the lack of consistent evidence for greater impact among those with higher participation. Other factors that could lead to increased technology use might include: a) improvements in practice that typically occur over the course of the school year, b) involvement of teachers in other technology trainings, and c) fewer problems with getting technology to work (as supported by classroom observations).

Issues to consider

- It is convenient to participate in online professional development, but it is also easy for it not to be a priority, as the relatively low levels of participation indicate. To achieve higher participation levels, stronger incentives to participate, clearer expectations, and more accountability may need to be part of the program. A few participants suggested that a shorter, more intensive program experience might be more effective than a longer, less intensive one.
- It may take time for VLC participation levels to grow. Participation may improve as teachers learn to use technology and become more comfortable with the format.
- Keep content as applied as possible (i.e., less theoretical content). Teachers are looking for applications they can use in their classrooms in the short-term.
- Use VLCs more for sharing and learning among the teachers, especially among those teaching the same grade or subject. That is, promote more authentic discussion rather than activities such as reading and commenting on an article.
- On the other hand, some teachers wanted a more structured program with real-time support. For example, send reminder e-mails, expect participants to write something the first couple of days and respond the next couple of days (versus once a month).
- Have face-to-face meetings, especially the first one, before online meetings or discussions. Teachers felt that knowing one another beforehand is helpful in fostering online discussions.
- Offer courses by technology skill level. The program currently presumes a certain basic skill level.

Introduction

Program description

Beginning in the summer of 2010, Minneapolis Public Schools (MPS) implemented a new professional development model called Professional Development through Technology (PDT2). The goal of PDT2 was to better meet teachers' time, place, and learning style needs by providing professional development in an online format. The PDT2 model consisted of the following components:

- Online professional development courses addressing technology integration in specific content areas
- Extended learning through virtual learning communities (VLCs) in which participants developed and shared activities and resources

PDT2 was funded by a competitive sub-grant awarded to MPS by the Minnesota Department of Education with funds from the Enhancing Education through Technology (Ed-Tech) State Program, funded by the United States Department of Education through the American Recovery and Reinvestment Act of 2009.

In total, 10 online courses and five VLCs were offered (see Figure 1). Most of the online courses began in late September and lasted seven weeks, although some were as short as five weeks. The VLCs offered an extended learning opportunity, lasting about 23 weeks, from November 17 to April 29.

1. PDT2 offerings and schedule

	Start date	End date
Online Courses		
ActiveInspire Level One Skills	Oct. 27	Dec. 3[a]
Blended Moodle – August	Aug. 16	Oct. 3
Blended Moodle – October	Oct. 6	Nov. 12
Instructional Approaches for Teachers of English Language Learners	Sep. 29	Nov. 16
Leading Schools in a Web 2.0 World	Sep. 29	Nov. 16
Solving Systems of Equations	Sep. 29	Nov. 3
Supporting Student-Centered Learning with WebQuests 2.0	Sep. 29	Nov. 16
Transforming the Classroom with Project-Based Learning	Sep. 29	Nov. 16
Using Digital Portfolios to Foster Student Learning	Sep. 29	Nov. 16
Using Technology to Help Students Become Better Researchers	Oct. 12	Nov. 23
Virtual Learning Communities		
AVID[b]	Nov. 17	Apr. 29
English Language Arts	Nov. 17	Apr. 29
Math	Nov. 17	Apr. 29
Science	Nov. 17	Apr. 29
Social Studies	Nov. 17	Apr. 29

[a] *End date was December 17 for those opting to continue with advanced topics.*

[b] *Advancement Via Individual Determination (college readiness).*

Both the online courses and the VLCs were hosted on Moodle, an e-learning platform. The content and format varied depending on the particular course or VLC. Typically, the facilitator would post articles, videos, tutorials, and other online resources, along with discussion questions. Participants would post their responses to the materials and read and respond to others' posts. Compared to the VLCs, the online courses were shorter, more intense experiences, typically with weekly assignments focused on learning a specific technology tool or skill. In contrast, the VLCs were longer and tended to have monthly, rather than weekly, assignments. VLCs were less focused and more generally geared toward providing teachers of the same content area the opportunity to develop and share ideas.

Background

Previous research indicates that technology integration in the classroom can have positive impacts on students, including increased motivation and self-esteem, increased proactivity in their own learning, greater collaboration with peers, improved attitude toward learning, improvements in technical skills, increased attention to audience, accomplishment of more complex tasks, increased use of outside resources, faster and increased learning, greater retention of learning, and higher academic achievement (Noeth & Volkov, 2004; Singh & Means, n.d.). In recognition of the importance of technology in preparing students for being productive members of an increasingly global and digital society, teachers in MPS are expected to integrate technology in their classrooms, as guided by standards set forth at the national (ISTE, 2007), state (MEMO, n.d.), and district (MPS, 2008) levels.

The positive impacts of technology integration are not due to the technology alone, but rather are dependent on the context in which technology is used, and in particular, "the specific student population, the software design, the educator's role, how the students are grouped, the preparedness of the educator, and the level of student access to the technology" (Noeth & Volkov, 2004, p.9). Technology is not an end in and of itself, nor is it merely a means for delivering instruction (Schrum et al., 2007). When integrated appropriately, technology has the potential to enhance both the content and delivery of instruction (Mishra & Koehler, 2006). True integration of technology requires higher order skills and depends on the complex interplay of the teacher's technological, pedagogical, and content knowledge domains (ibid).

Given the complexity and high level of skill needed to integrate technology, teachers need high quality professional development to build their motivation, knowledge, and skills (Noeth & Volkov, 2004). However, traditional workshops and one-time training sessions "have not been effective in making teachers comfortable with using technology or adept at integrating it into their lesson plans" (Knuth & Rodriguez, 2000, p.1). By differentiating professional development through online learning (i.e., online courses, virtual learning communities, and online resource repository), MPS hopes that the PDT2 model will better meet teachers' time, place, and learning style needs. It is also hoped that, as a result of effective professional development, the level of technology integration will increase in participating teachers' classrooms.

Evaluation purpose

The evaluation addresses two questions:

- How effective is PDT2 in meeting the professional development needs of teachers?
- To what extent has PDT2 increased the level of technology integration in participating teachers' classrooms?

Through this evaluation, MPS fulfills the Ed-Tech grant requirements for evaluation. In addition, the results of will help guide MPS in making important programmatic decisions to improve professional development and enhance technology integration district-wide.

Methods

Design

The two evaluation questions are addressed using several methods: surveys of teachers and students, classroom observations, interviews with teachers, and participation data from program records. First, the evaluation question concerning how effectively PDT2 meets teachers' development needs is addressed through a survey taken by teachers after they participated in online courses and an interview with teachers whose classrooms were observed. A shorter survey was also given to teachers who signed up but did not start the program, or who stopped their participation early.

Second, the evaluation question concerning the extent to which PDT2 increased the level of technology integration in teachers' classrooms was address through multiple methods and pre-post assessments. Teachers were surveyed about classroom technology integration before and after they participated in online courses. Selected classrooms were also systematically observed on a pre-post basis and follow-up interviews were conducted with teachers in observed classrooms.

In this evaluation it wasn't possible to have a comparison group (of teachers who did not participate in the program) to help determine whether changes that occurred during the study period could be attributed to PDT2. However, if consistent themes emerge about program effects across the different data sources used in the evaluation, this increases confidence in potential program impacts (known as "triangulation"). In addition, if teachers attribute changes in their practice to program participation and those with higher program participation have stronger results, these patterns lend additional strength to the possibility of program impacts.

Samples

All teachers who participated in PDT2 were invited to take web-based surveys (described below). In addition, a small sample of teachers was selected for more intensive data collection, including interviews, classroom observations, and surveys of students.

In discussion with MPS staff, it was decided that the small sample would be selected from the pool of Middle Years Laptop teachers who participate in the VLCs. Last spring, these teachers received special training and a set of laptop computers for use with their students. The rationale for focusing on this group of teachers had to do with concern over the amount of time it may take average teachers to adopt what they are learning and begin to implement it in their teaching. Because of the short time frame for this evaluation, we decided to focus on the Middle Years Laptop teachers for some intensive

aspects of this evaluation because they have already received some training in technology integration, and are therefore more likely to be motivated and better equipped to "hit the ground running" with potentially faster implementation of what they have learned. This increases our chances of observing the potential impact of PDT2.

To identify the sample for the more intensive data collection, Middle Years Laptop teachers were grouped into strata based on their proficiency level (basic, proficient, advanced), school (three schools with high participation), and whether they were new to the Middle Years Laptop program or returning from last year. Then, teachers from within each group were randomly selected. Ultimately, some replacements to the original sample had to be made due to teacher scheduling conflicts, so the final sample is not completely representative of every strata. Twelve teachers started in this group for more intensive data collection, but two dropped out part way through the evaluation, so the final sub-sample includes 10 teachers.

For each teacher in the intensive sub-sample sample, we asked them to suggest three class periods that would work with their schedule, and we randomly selected one class period per teacher to be the class that we would survey and observe. Some students ended up being in more than one class. For these students, we randomly selected only one of their surveys (or the survey with more complete responses, if this differed) so that the student would not have multiple survey records.

Data collection

We used multiple data collection methods to triangulate the results. Data collection instruments were developed based on a review of the literature and available instruments (see "technical details of study methods" in the Appendix). Figure 2 presents a summary of the data collection activities.

Surveys and response rates

See Figure 2 for information on all the surveys included in this evaluation (described below) including the number of teachers or students eligible to respond, the number of completed surveys, the response rates, topics covered, and dates of administration.

Technology Integration Survey for Teachers (TIS-T)

The Technology Integration Survey for Teachers (TIS-T) web-based survey asked teachers to self-report about their approach to teaching; their technology knowledge, skills, and abilities; and their technology use. In addition, the survey asked teachers about their students' use of technology in their classroom. It was administered to participating teachers via Survey Monkey twice during the course of this evaluation. The

post-test version of this survey also included questions that asked participating teachers to re-assess their status at baseline (retrospective pre-test). In this way, we have three points of data from this survey: pre-test data gathered at baseline, pre-test data gathered retrospectively at the time of post-test, and post-test data. See the technical Appendix for more information about these methods and the rationale for using them.

Technology Integration Survey for Students (TIS-S)

The Technology Integration Survey for Students (TIS-S) web-based survey asked students about how technology is used in the classroom by their teacher, by the students in general, and by themselves. It was administered to students in participating teachers' classrooms via Survey Monkey twice during the evaluation period.

Teacher Experience Survey for Completers (TES)

The Teacher Experience Survey for Completers (TES) web-based survey asked teachers for their impressions regarding the effectiveness of the PDT2 model at meeting their professional development needs (e.g., time, place, and learning style). This survey was administered via Survey Monkey to all teachers who completed any of the online trainings.

Of the teachers who responded to the TES, the majority participated in the Blended Moodle course (43%), the MPLS ActiveInspire Level One Skills course (14%), or the Using Digital Portfolios to Foster Student Learning course (14%).

Teacher Feedback Survey for Non-completers (TFS)

The Teacher Feedback Survey for Non-completers (TFS) is a web-based survey that asks teachers who discontinued their participation in the online trainings about why they discontinued their participation, and their suggestions for improving the online professional development model to better meet their needs and the needs of other teachers. It was administered to teachers in the "no dosage" group via Survey Monkey.

Classroom observations

Wilder Research developed a classroom observation protocol for this evaluation to assess classroom activities, interactions among students and between students and the teacher, and how technology is integrated, including what technologies were used, the level of integration with curricular objectives, teacher skill level in use, and ownership over technology (i.e., students' independence in using technology). Two Wilder staff members were trained by Wilder's project manager (Maxfield) to conduct the classroom observations using video footage of actual classroom activities.

Pre-test observations were completed twice each in 12 classrooms. Post-test observations were completed twice each in 10 of the original 12 classrooms. (Two of the original teachers were not able to participate in the post-training observations.)

Teacher interviews

Following the post-test classroom observation, Wilder Research staff completed in-person interviews with 11 teachers (10 who completed the classroom observation and one who did not). The teachers were asked about their experience participating in PDT2 and their experience integrating technology into their classroom.

Limitations of implementation

Data collection started later than was ideal due to delays in study approval, parental consent (passive), and school scheduling conflicts. Consequently, the pre-test period is not a true pre-test in the sense that professional development had already started by the time the pre-test surveys and observations were conducted. Nevertheless, MPS staff were confident that teachers would not yet have been impacted by the training and that the pre-test data collection period would reflect pre-training levels. Therefore, we use the term "pre-test" throughout the report even though the data were actually collected towards the beginning of the training, not prior to training. Also, due to the delay in collecting pre-test data, the pre-to-post window was shorter than ideal, making it more difficult to observe change.

2. Summary of data collection activities

Data collection activity	Sample and response rate	Information collected	Evaluation question addressed*	Schedule
Technology Integration Survey for Teachers (*web-based*)	Teachers who participated in online courses and/or VLCs Pre-test: 71 responded out of 115 invited (61%) Post-test: 63 responded out of 119 invited (53%) Both pre- and post-test: 48 responded out of 115 invited (42%)	Teaching approach; teacher's technology knowledge, skills, and abilities; teacher's use of technology in the classroom; and students' use of technology	Question 2	Pre-test: Oct.26-Nov.12 Post-test: Feb.14-25
Technology Integration Survey for Students (*web-based*)	Students in sample of classes selected for intensive data collection Pre-test: 257 responded out of 304 eligible (85%) Post-test: 181 responded out of 304 eligible (60%) Both pre- and post-test: 166 responded out of 304 invited (55%)	How technology is used by the teacher, by the class in general, and by themselves during class	Question 2	Pre-test: Nov.1-12 Post-test: Feb.14-25
Teacher Experience Survey (*web-based*)	Teachers who participated in online courses Post-test only: 42 responded out of 78 invited (58%)	Teacher's impressions regarding the effectiveness of the PDT2 model at meeting their professional development needs (e.g., time, place, and learning style)	Question 1	Fall course: Nov.22-Dec.3 Winter course: Jan.10-14
Teacher Feedback Survey (*web-based*)	Teachers who discontinued participation in online courses Post-test only: 15 responded out of 45 invited (33%)	Reasons for discontinuing participation, suggestions for improving PDT2	Question 1	Jan.10-21
Classroom Observations	Sample of classes selected for intensive data collection Pre-test: 12 classes Post-test: 10 classes	Technologies used by whom and for how long, objectives of technology use, level of integration with curricular objectives, skill level in use, student/ teacher ownership over technology, classroom organization and behavior	Question 2	Pre-test: Nov.8-12 Post-test: Feb.28-Mar.11
Interviews (*in person*)	Teachers of classes selected for intensive data collection Post-test only: 11 teachers	Experience participating in the PDT2 training, experience integrating technology in your classrooms, and suggestions for improving PDT2	Questions 1 and 2	Mar.14-18

**Question 1: How effective is PDT2 in meeting the professional development needs of teachers?*

Question 2: To what extent has PDT2 increased the level of technology integration in participating teachers' classrooms?

Analysis

To assess the impact of PDT2 on the level to which teachers integrate technology in their classrooms, data analysis focused on the assessment of change in technology use from pre-test to post-test. Researchers approached this study with two hypotheses: 1) that the level of technology integration would increase from pre-test to post-test, and 2) that teachers with greater participation (dosage) would demonstrate greater improvements than teachers with lower participation. When analyzing results, researchers used a directional (one-tailed) hypothesis. Consequently, statistically significant differences are reported only if they support the directional hypothesis.

A statistically significant difference is one that exceeds the amount of variation that could be expected by chance. Statistical significance is noted in this study where $p<.05$, meaning that there is less than a 5 percent probability that the finding resulted by chance. Statistical significance is a function of the magnitude of the difference between pre-test and post-test, the variability in responses at each time point, and the sample size. Given the large number of measures analyzed (over 80), we would expect the analyses to show a few statistically significant results due to chance alone. The statistical tests used in this evaluation are described in the Appendix (see "technical details of study methods").

In reporting the results, we focused on highlighting themes that emerged across data sources (triangulation). As a result, some results that did not fit into a theme are not reported in the body of the report.

To examine the degree to which dosage (the amount of training and participation) affects the outcome of interest (use of technology in the classroom), participating teachers were grouped into two categories: those that received a high dosage (5+ hours) and those that received a low dosage (1 hour to nearly 5 hours). (Teachers who had less than one hour were considered "no dosage" and are not considered in this outcomes analysis.) Outcomes, or improvements from pre-test to post-test of those teacher who had room for improvement at pre-test, were compared for teachers who had high dosage and those who had low dosage to further gauge program effects.

Finally, in addition to the quantitative analyses described above, we also completed qualitative analyses as we identified key themes throughout the classroom observations and teacher interviews.

Results

Effectiveness of the PDT2 model in meeting teachers' needs

The PDT2 model intends to meet teachers' professional development needs by providing professional development using an online format. The model addressed different needs related to learning style, place, and time by providing a flexible and customizable learning experience.

This section of the report synthesizes surveys and interviews to examine the effectiveness of the PDT2 model in meeting teachers' needs by exploring teachers' participation rates, satisfaction, reported strengths and weaknesses of the model, and continuing challenges.

Participation rates

Figure 3 shows the total number of participants in each online course and VLC, as well as the results by dosage level (for an explanation of how dosage was determined, see "technical details of study methods*"* in the Appendix). Participants in the *no dosage* category are those who were officially registered in the course but who had less than one hour of online participation. *Low dosage* describes participants with one or more hours but less than five hours of online participation. Participants with five or more hours of online participation are categorized as *high dosage*. Note that, while *no dosage* participants are counted in the participant totals here, they were excluded from our analyses of the technology integration outcomes due to their insubstantial participation.

A total of 163 teachers participated in at least one PDT2 offering. However, approximately one-quarter of those participants had no dosage. About half had low dosage and just over one-quarter had high dosage. A total of 141 teachers participated in at least one of the online courses and 57 teachers participated in at least one of the VLCs. Class sizes ranged from 6 to 29 teachers in the online courses and from 9 to 22 teachers in the VLCs.

Although the VLCs lasted substantially longer than the online courses (about 23 weeks versus 7 weeks), teachers typically spent less time in the VLCs than in the online courses. Nearly all the VLC participants spent less than five hours online even though the VLCs lasted 23 weeks. The majority of online course participants also spent less than five hours online, yet more than one-third participated for five or more hours.

3. PDT2 participation rates

	Total number of participants	No dosage[a]	Low dosage[b]	High dosage[c]
Online Courses	**141[d]**	**28 (20%)[e]**	**64 (45%)[e]**	**49 (35%)[e]**
ActiveInspire Level One Skills	23	2 (9%)	11 (48%)	10 (43%)
Blended Moodle – August	29	10 (34%)	17 (59%)	2 (7%)
Blended Moodle – October	24	7 (29%)	12 (50%)	5 (21%)
Instructional Approaches for Teachers of English Language Learners	15	7 (47%)	6 (40%)	2 (13%)
Leading Schools in a Web 2.0 World	19	5 (26%)	4 (21%)	10 (53%)
Solving Systems of Equations	14	3 (21%)	7 (50%)	4 (29%)
Supporting Student-Centered Learning with WebQuests 2.0	6	2 (n/a)	1 (n/a)	3 (n/a)
Transforming the Classroom with Project-Based Learning	9	1 (n/a)	1 (n/a)	7 (n/a)
Using Digital Portfolios to Foster Student Learning	14	3 (21%)	4 (29%)	7 (50%)
Using Technology to Help Students Become Better Researchers	8	1 (n/a)	3 (n/a)	4 (n/a)
Virtual Learning Communities	**57**	**25 (44%)**	**32 (56%)**	**-**
AVID[h]	9	6 (n/a)	3 (n/a)	-
English Language Arts	12	6 (50%)	6 (50%)	-
Math	9	5 (n/a)	4 (n/a)	-
Science	22	10 (45%)	11 (50%)	1 (5%)
Social Studies	19	11 (58%)	7 (37%)	1 (5%)
All PDT2 offerings	**163**	**40 (25%)**	**78 (48%)**	**45 (28%)**

Note. *Teachers could participate in more than one PDT2 offering.*

[a] *Less than 1 hour of participation.*

[b] *More than 1 hour, but less than 5 hours of participation.*

[c] *5 or more hours of participation.*

[d] *Unduplicated count of teachers that participated in at least one of the online courses.*

[e] *Average dosage for teachers who participated in more than one online course.*

Reasons for low levels of participation

Teachers in interviews and surveys mentioned a number of barriers to higher levels of program participation. Themes (with examples of participant comments) included the following:

- Too few requirements for participation

> "I was not as involved as I think I should have been. I've been involved in quite a few of online professional development experiences, and I've taught online for five years. My opinion was that it was lacking in intensity in a way that keeps your focus on it. Since it was something that was on my 'to do' list for one week of the month, it got lost in the shuffle from time to time."

- Lack of consequences for non-participation

> "People just felt like they didn't have anything to lose by not participating."

- Struggles with technology

> "I'm not a blogger or forum type person. It's extremely uncomfortable for me to do that. Even doing e-mail discussions back and forth is extremely uncomfortable for me."
>
> "Moodle was a real struggle for me – just getting the logistics and the management of it."

Other comments suggested that some of the Moodle courses may not have been relevant to participants (they felt it was too abstract or theoretical), and that this has been a barrier to higher participation for some. Another comment suggested that the lack of engagement of colleagues may have discouraged some more highly engaged teachers.

> "I was expected to log in once or twice a week. I did that, and more, at the beginning, and then as people did not respond, I also stopped logging in as frequently."

A short survey was sent out to teachers in the "no dosage" group to inquire why they stopped participating. Of the 15 who responded to survey, two-thirds (69%) reported that they began taking an online course but decided to discontinue their participation while one-third (31%) expressed interest initially but never began a course. When asked why they decided to discontinue (or never start) the course, nearly three-quarters (73%) reported that they became too busy, and a few (20%) reported that they would rather attend a face-to-face workshop. No teachers said they were not interested enough in the topics offered.

Satisfaction

The pattern of survey results suggests that, overall, teachers who spent more time doing online professional development were both more satisfied and more engaged with PDT2 than teachers who spent less time, although differences between the low and high dosage groups were not statistically significant. Nearly all teachers reported that the course either met or exceeded their expectations (93%). The small number of teachers (7%) who reported that the course did not meet their expectations had all spent a total of less than five hours doing online professional development (Figure 4).

4. Degree to which course met expectations

Based on your expectations for this course, which statement best describes your experience?	Total (N=42)	Dosage		Significance (Pearson X^2)
		High (N=17)	Low (N=25)	
This course did not meet my expectations	3 (7%)	-	3 (12%)	ns
This course met my expectations	23 (55%)	8 (47%)	15 (60%)	ns
This course exceeded my expectations	16 (38%)	9 (53%)	7 (28%)	ns

ns not statistically significant

Almost all of the teachers who took the Teacher Experience Survey agreed or strongly agreed that their facilitator was effective (93%), that the language was clear and easy to understand (90%), that the course was the right length (90%), that the information they learned will improve their teaching (95%), that the course was of high quality (93%), and that they would recommend the course to other teachers (90%) (Figure 5). The proportion of teachers who endorsed these statements, excepting the course length, was slightly lower (although not significantly so) among the teachers who spent less than five hours doing online professional development compared to those who spent five or more hours (Figure A4). In general, it is unclear whether more time spent led to higher satisfaction and engagement, or whether higher satisfaction and engagement led to more time spent.

5. Satisfaction with aspects of the course

Statement	N	Strongly disagree	Disagree	Agree	Strongly agree	Strongly agree + Agree
Overall, this course was of high quality.	42	-	7%	38%	55%	93%
The language used in the course was clear and easy to understand.	42	-	9%	36%	55%	90%
The course was the right length.	42	-	9%	52%	38%	90%
The facilitator was effective.	42	-	7%	29%	64%	93%
The information I learned in this course will improve my teaching.	42	-	5%	36%	59%	95%
I would recommend this course to other teachers.	42	-	9%	33%	57%	90%

Strengths and weaknesses

When they were asked to compare it with a traditional face-to-face workshop, teachers most frequently reported that the online course format is better in terms of the convenience of location, the expense, the ability to work at your own pace, and the convenience of timing (Figure 6). The following comments illustrate these strengths:

> I think it is positive that I don't have to get in my car and drive to another school to meet with all the science teachers… the flexibility of time and place is a real advantage.
>
> People can go at their own speed. In the past, going to technology training has been frustrating because I usually learn technology quicker than other people, because I have more experience with it, and I spend a lot of time sitting around. Having it online meant that I could finish the activities quickly and not have to wait around for others.

6. Comparison of online course format with traditional face-to-face workshop

How did the online course format compare to a traditional face-to-face workshop in the following respects:	N	Better	About the same	Worse
Convenience of timing	42	81%	19%	-
Convenience of location	42	100%	-	-
Expense	41	88%	12%	-
Ongoing connections to own classroom practice	41	61%	39%	-
Interactions with colleagues and mentors not available at my site	42	41%	52%	7%
Exposure to diverse perspectives	42	36%	50%	14%
Opportunity to collaborate with peers	42	38%	48%	14%
Opportunity to review discussion archives and summaries	42	64%	33%	2%
Time to be reflective	42	76%	19%	5%
Ability to work at your own pace	40	85%	10%	5%
Opportunity to experience using technology as a learner	41	71%	24%	5%
Resources for future use	41	71%	27%	2%

Low dosage teachers were less likely than high dosage teachers to indicate that the online format is better than the traditional workshop in two respects (Figure A5). First, the percentage of teachers who indicated that the online format is better than the traditional workshop in providing ongoing connections to their own classroom practice was significantly lower among low than high dosage participants (48% vs. 81%). Second, low dosage participants were less likely than high dosage participants (36% vs. 47%) to indicate that the online format is better in terms of interactions with colleagues and mentors not available at their site.

Additional frequently mentioned strengths of PDT2 include sharing and learning from other teachers and appreciation of content-specific materials. Fellow teachers and course materials both provided valuable resources not often exchanged because individual teachers are busy with their own schools and classrooms:

> My favorite part was sharing resources. There were some resources that other teachers used and shared that were relevant to what I am teaching in class that I was able to use. There were interactive websites or activities that were content specific, and then there were strategies to use, like using Comic Life, to present things. So even though the content wasn't exactly the same, I could get ideas about how to use Comic Life in my energy unit by hearing about how somebody else used it for their chemistry unit.

> I think having teachers being able to share what they're doing… I mean we live in this little glass bubble and these schools are a fish bowl. So we never get to see or talk to other professionals of our discipline from other schools. Once a year, we meet at the district-wide staff developments, but no professional discussion is really brought up when it comes to curriculum and so forth.

Additional weaknesses of PDT2 that were frequently mentioned by teachers include:

- Problems generating online discussion

  > We wanted people to have an online discussion over the course of a week. The time was open during the week, and what we realized is that a lot of people waited until the end of the week to go in, and while it was structured that way, the point was to go in more than once and have a conversation. So when people waited until the due date to make their first post, that didn't happen…I think sometimes people didn't realize how long the articles were, so they'd wait to go in there and then open it and it would be like, 'Oh my gosh, I can't read all these pages,' and close it and put it off till later.

- Time consuming process

  > It's a time issue. Half the time, I would do the VLC thing and half the times I wouldn't. Just because of all the stuff that is a priority. Yeah, there were definitely helpful responses, helpful conversations, but not always, I would say.

- Lack of clarity

  > It was not very specific about what we were to be doing or interacting about while we were interacting… it was very broad and general.

- Failure to meet learning style needs

  > I don't actually think it's my style yet, so I wouldn't say I'm converted. I would still want to stay with the traditional way. However, it is very clear to me that this is the future, and the opportunity to have laptops in the classroom, and you realize that there is a level of engagement that you get. So I know that I *have* to learn this.
  >
  > I learn better when at least part of the course is face-to-face and I can actually discuss real-time with a colleague of how something was done or sharing successes and frustrations. Online does not allow for this exchange.

- Lack of real-time support

  > If you get stuck, there is no one right there to help you solve your issue.

Overall, PDT2's strengths are in the value of its content and its participants, but its weaknesses are in the logistics and the structure of the program itself.

Continuing challenges

A few teachers expressed continuing challenges with implementing what they learned from the online professional development. This includes:

- Inexperience and discomfort with technology

> Because [the students] can type so fast and manipulate the machines a little easier and do things they are not supposed to do, I want a way to make sure that that doesn't happen. When they are speaking out loud, it is much easier to control your classroom. One thing about technology is that it takes away a bit of your control, but the kids actually produce some darn good products. Because my technology knowledge is to what I have been taught through these classes, the kids are a step ahead of me in many of these aspects. I feel uncomfortable, sometimes, getting out of my comfort zone.

Survey results also indicate that teachers' self-reported comfort level with planning for class lessons that involve students using technology during instruction did not significantly improve from pre-test to post-test (Figure A6).

- Struggles with implementation of new material

> In trying to get a lot of the new things going I'm aware of, like DIIGO, there are a dozen little bumps in the road that come up, like connectivity issues and student activity that's similar to the engagement issues that you had with pen and paper.

- Struggles encouraging student collaboration

> I would love to be better at having students collaborate with each other using technology. They are still working very independently, and I haven't used the forums with students or group lab projects. Even before there was a lot of technology, that was a challenge for me, and now that there is technology, it's still a challenge.

Level of technology integration

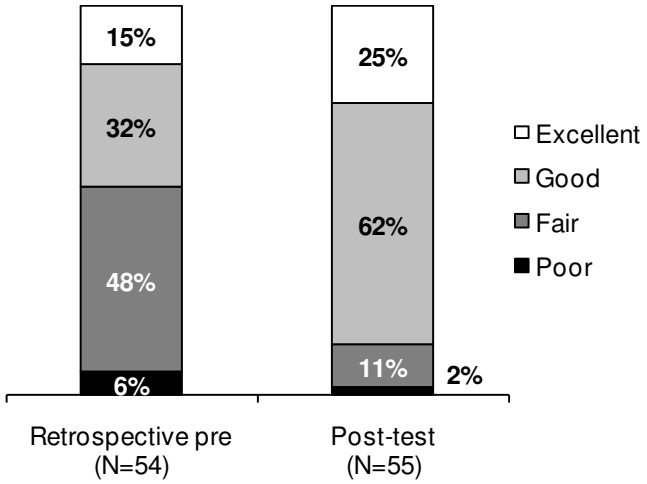
This section synthesizes results from surveys, interviews, and observations to shed light on the impact of PDT2 on teachers' integration of technology in their classrooms.

Technology knowledge and skills

Teacher's technology knowledge

Survey results indicate a significant increase in teachers' self-reported knowledge about the variety of different technologies that can be used in the classroom, both from pre-test to post-test, as well as from the retrospective pre-test to the post-test. Based on results from the retrospective pre-test, about half of the teachers (47%) rated their knowledge about technologies for classroom use as *good* or *excellent* back in November. This percentage increased significantly to 87 percent at post-test (Figure 7). When examined at the individual teacher level, results show that half of the teachers (51%) increased their self-rating of their knowledge from retrospective pre-test to post-test. On the other hand, teachers' self-ratings of their knowledge about technologies that students can use specifically for learning about their content area did not significantly improve from pre-test to post-test (Figure A16).

7. Teachers' ratings of their knowledge of technologies for classroom use



These findings are supported by interview results showing that the most commonly mentioned impact of PDT2 on teachers was that they gained an increased awareness of technology tools, resources, and strategies for technology integration.

> I definitely did get some new sites and new ways to use the computer. I don't feel like I got good at it, but now I'm definitely more aware of a lot of things I wasn't even aware of. I now see that there are just *tons* of sites out there, an overwhelming amount.
>
> It has given me the opportunity to discover new ways of integrating technology that I didn't know about before.
>
> The concept of Moodle is very interesting, and learning about the many things you could do on the site you created, if you knew how to, was the plus, I guess. I didn't even know what Moodle was, before that class, so becoming aware of it as a possible tool was good.

However, several teachers commented that sharing resources was the only valuable resource from their PDT2 experience and that the impact of the training was otherwise minimal.

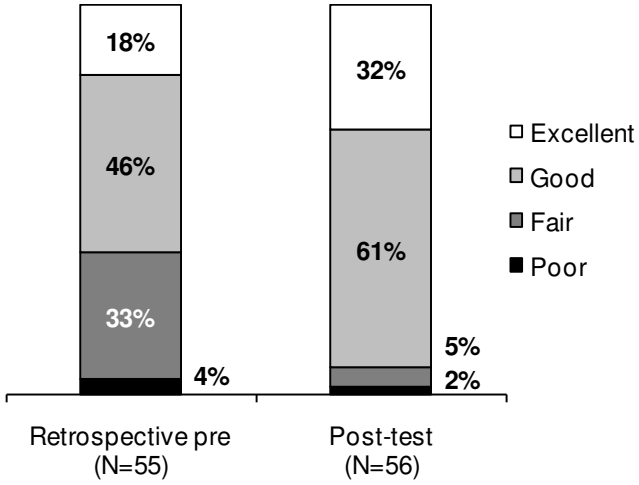
> I got one or two tips here and there that were good, but the impact was minimal.
>
> There might be specific websites that I went on just because I wanted the students to know about them, but other than that I can't say that there was anything specific.
>
> I have used a few websites that were recommended from there, but the impact has been minimal… because many of the prompts and comments did not relate to what I was teaching.

This was especially true of teachers in the VLCs, whereas teachers in the online courses were more likely to report learning a new skill.

Teacher's technology skill level

On average, teachers who participated in PDT2 showed a significant increase in their self-reported technology skill level, both from pre-test to post-test, as well as from the retrospective pre-test to the post-test. The percentage of teachers who rated their skills in using technology as either *good* or *excellent* increased from 64 percent based on the retrospective pre-test to 93 percent at post-test (Figure 8). Moreover, 44 percent of the teachers surveyed increased their self-rating of their skills from retrospective pre-test to post-test (Figure A16).

8. Teachers' ratings of their technology skills



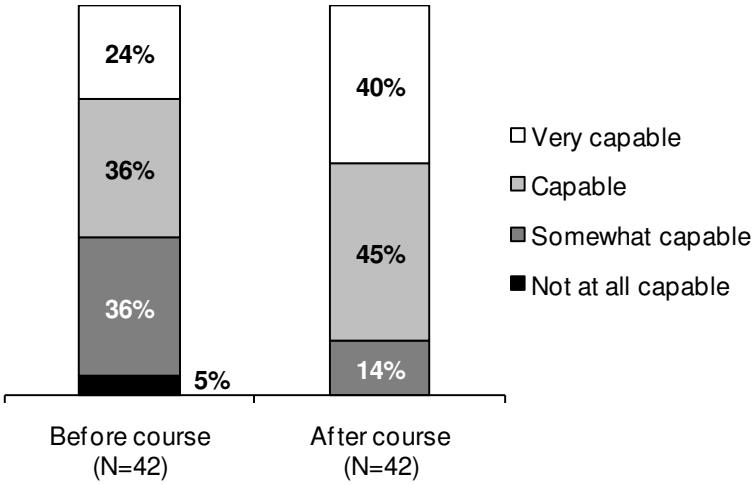
Teachers' survey responses provide some examples of ways in which their skills have improved:

> I am able to use the new Promethean software which has added uses. I have become better at having my students using the board to make my lessons more interactive.
>
> I can use Moodle now. You can't use it unless you take the course and sit through the videos.
>
> I am able to produce much more useful flipcharts because I am familiar with more of the software.

However, students did not typically notice an increase in their teacher's technology skills, with about two-thirds rating their teacher as *pretty good* at using technology both at pre-test (68%) and at post-test (65%) (Figure A8).

Teachers who took the Teacher Experience Survey were asked to rate their capacity to integrate technology both before and after participating in PDT2. Results indicate a significant difference between the before and after rating, with higher percentages rating themselves as *capable* or *very capable* after training (Figure 9). Among those who had room for improvement, 56 percent increased their self-reported capacity. The percentage who increased their capacity was notably larger among teachers who spent more than five hours doing online professional development (69%) compared with those who spent less than five hours (47%), although this difference was not statistically significant (Figure A7).

9. Teachers' ratings of their capacity to integrate technology



Students' technology skill level

Based on classroom observation results, students' level of technology skill did not seem to change significantly from pre-test to post-test. At both time periods, students were generally quite skilled and independent at using technology, with some assistance needed from the teacher, particularly when troubleshooting technical problems. Observers noted that students tended to wait for individual help from the teacher rather than seek help from skilled classmates. In some cases, this presented an inefficient use of classroom time. It is possible that teachers were hesitant to allow students to help each other, as this may present additional classroom management challenges with the loss of control. However, it is recommended to include students as partners in teaching technology skills (e.g., Hazell, 2004).

Technology use

Objectives of technology use

Survey and observation results indicate little change from pre-test to post-test in objectives for technology use. As shown in Figure 10, teachers were asked to select their three most important objectives for student computer use from a list provided (Figure A13). Results show that there was a significant increase from pre-test to post-test in the percentage of teachers who selected "finding out about ideas and information" as one of their top three objectives for student computer use (58% at pre-test vs. 73% at post-test). This was the most commonly selected objective at both time points. The next most commonly selected objective for student computer use was to present information to an audience, selected by 40-42 percent of the teachers at both pre-test and post-test.

10. Teachers' most important objectives for student computer use

Objective	Percentage that selected the objective[a]		Significance (McNemar)
	At pre-test	At post-test	
Finding out about ideas and information	26 (58%)	33 (73%)	*
Presenting information to an audience	19 (42%)	18 (40%)	ns
Mastering skills just taught	17 (38%)	13 (29%)	ns
Analyzing information	15 (33%)	12 (27%)	ns
Learning to work collaboratively	12 (27%)	9 (20%)	ns
Expressing themselves in writing	10 (22%)	15 (33%)	ns
Remediation of skills not learned well	10 (22%)	8 (18%)	ns
Improving computer skills	8 (18%)	14 (31%)	ns
Communicating electronically with other people	6 (13%)	4 (9%)	ns
Learning to work independently	5 (11%)	6 (13%)	ns
Other	3 (7%)	1 (2%)	ns

Source. *Technology Integration Survey for Teachers*

Note. *Teachers were asked to select their top three objectives from the list.*

[a] *Percentage of teachers that selected the objective as either their first, second, or third choice.*

* *p<.05*

Classroom observation results also support the finding that objectives for student computer use did not change significantly from pre-test to post-test (Figure A3). At both time points, the most commonly observed reasons why students used technology were to view information presented by the teacher and to learn content-related skills, facts, or concepts. The number of classrooms in which students were observed using technology for a higher order purpose (e.g., organizing or managing information, developing a project, conducting research, analyzing information) was four at pre-test and five at post-test (out of the 10 classrooms observed). There was a small increase in the average number of different purposes for student technology use that were observed in a single class period, increasing from 4.2 at pre-test to 5.3 at post-test.

Similarly, classroom observation results suggest teachers' purposes for technology use did not significantly change from pre-test to post-test (Figure A3). The most commonly observed reasons why teachers used technology were to present information to the students and to demonstrate or model a skill. At both pre-test and post-test, teachers used technology for about three different purposes (3.2-3.5), on average, during a single class period.

Technologies used

Observation results showed no significant change in the average number of hardware and software technologies used by teachers and students during class. On the other hand, observation results indicate a significant increase from pre-test to post-test in the number of web applications used by teachers and students (Figure 11).

11. Number of technologies used

Type of technology	Technology user	Average number of technologies used[a] Pre (N=10)	Post (N=10)	Pre-to-post change	Significance (Paired samples *t*)
Hardware	Teacher	3.78	3.78	0.00	ns
	All students	0.50	0.72	+0.22	ns
	Some students	0.17	0.22	+0.06	ns
Software	Teacher	1.06	1.44	+0.39	ns
	All students	0.11	0.17	+0.06	ns
	Some students	-	-	-	-
Web applications	Teacher	0.28	0.94	+0.67	**
	All students	0.17	0.61	+0.44	*
	Some students	0.56	0.89	+0.33	ns

[a] *The number of technologies used was averaged across the two observations conducted during the observation period and then averaged across the 10 classrooms observed*

ns not statistically significant

* *p<.05*

** *p<.01*

Observation and survey results alike confirm that this increase is due in part to the fact that teachers and students began using Moodle more frequently over the course of the evaluation period. Teacher survey results indicate a significant increase in the frequency with which teachers created and maintained web pages or Moodle sites for their classes (Figure A20). Survey and interview responses provided additional evidence of the increased use of Moodle:

> I have created a Moodle site that students are regularly visiting and using. I am working on adding new and different ways to assign work.
>
> PDT2 enabled me to create my own Moodle, which I use for a jumping-off point of all of the laptop work in my class.

> I used Moodle and many of the tools that go along with it for the first time this year. I'm still exploring some of the resources that Moodle has, but it is easy for students to use and figure out.
>
> I wouldn't have used Moodle this year had I not had that course. I didn't even know what it was before that course.

Likewise, students reported a significant pre-to-post increase in the frequency with which they completed assignments online (e.g., using Moodle), including online research, sending or receiving e-mails or instant messages related to class, practicing for tests or taking tests online, using online textbooks, viewing videos online, and making web pages or websites (Figure A12). Teachers also reported significant pre-to-post increases in the frequency with which their students conducted online research, used the Internet to communicate and collaborate with experts or peers in or beyond their school, and made web pages or websites (Figures A23-A30).

Time spent using technology

Students reported significant pre-to-post increases in their frequency of using computers in class, both independently and cooperatively with other students. Likewise, teachers reported a significant pre-to-post increase in the frequency with which students used computers while working in groups, but not while working individually (Figure A28). Observation results corroborate these findings. Results show that the average percentage of class time that *all students* in the class spent using technology *for learning* significantly increased from 41 percent at pre-test to 74 percent at post-test. This increase of 34 percentage points is equivalent to approximately 17 additional minutes of class time that all students spent using technology for learning (Figure 12).

Although students reported no significant increase in how often their teacher used technology when teaching, observation results suggest otherwise. Results show that at pre-test teachers spent one-third of the class period, on average, using technology for teaching. This increased significantly to an average of 61 percent of the class period at post-test, representing an increase of 28 percentage points, or approximately 14 additional minutes spent using technology for teaching (Figure 12).

These changes cannot necessarily be attributed to PDT2 alone, however. Other factors contributing to this observed increase in use of technology may include improvements in practice that typically occur over the course of the school year, involvement of teachers in other technology trainings, and fewer problems with the logistics of using technology, as confirmed by observation results.

12. Time spent using technology

Purpose of technology use	Who	Average percentage of class time spent using technology[a] Pre (N=10)	Post (N=10)	Pre-to-post change Percentage points	Minutes (approx.)	Sig. (Paired samples *t*)
Teaching/Learning	Teacher	33%	61%	+28	+14	***
	All students	41%	74%	+34	+17	**
	Some students	14%	6%	-8	-4	ns
Other[b]	Teacher	15%	14%	-1	-0.5	ns
	All students	10%	8%	-2	-1	ns
	Some students	11%	6%	-6	-3	ns
Total	Teacher	48%	70%	+21	+10.5	**
	All students	48%	78%	+30	+15	*
	Some students	20%	10%	-10	-5	ns

[a] *Class time and time spent using technology (in minutes) were summed across the two observations conducted during the observation period. The percentage of time spent using technology was calculated by dividing time spent using technology (aggregate number of minutes) by class time (aggregate number of minutes). Then, the percentage was averaged across the 10 classes that were observed.*

[b] *Other purposes include, for example, routine tasks, technology problems, recreation, etc.*

ns not statistically significant

* *p<.05*

** *p<.01*

Activities and assignments involving technology use

In addition to the web-based activities discussed above, students reported significant pre-to-post increases in how often they used technology to do the following: practice or review things they have learned, write stories or reports on the computer, analyze information, work on real-life situations or problems, and learn advanced computer skills. Students also reported significant pre-to-post increases in how often they used technology to make printed paper products, pictures or artwork, PowerPoints, and interactive presentations (Figure A12).

Teachers also reported significant increases from pre-test to post-test in how often students used technology to do the following things: present information to the class, visually represent or investigate concepts, improve their technology literacy, and produce graphs/charts and multimedia projects (Figures A23-A30). Lastly, teachers reported significant pre-to-post increases in how often they taught technology-related lessons

designed to: a) build students' familiarity with basic computer functions, and b) build students' understanding of ethical and legal issues related to technology use (Figure A21).

Intersection of technology, content, and pedagogy

To truly integrate technology into instruction, teachers must understand and negotiate the dynamic and complex interplay of technology, content, and pedagogy (Mishra & Koehler, 2006). Survey results indicate a significant increase in the frequency with which teachers choose technologies that enhance how they teach a lesson (i.e., pedagogy), both from pre-test to post-test, as well as from the retrospective pre-test to the post-test. The percentage of teachers who reported choosing technologies that enhance pedagogy on a *regular* or *very frequent* basis increased from 56 percent, based on the retrospective pre-test, to 82 percent at post-test. Results at the individual teacher level show that 44 percent of the teachers surveyed reported a higher frequency at post-test than at the retrospective pre-test (Figure A18).

Similarly, survey results indicate a significant increase in the frequency with which teachers choose technologies that enhance the content for a lesson. Based on results from the retrospective pre-test, half of the teachers (50%) reported choosing technologies that enhance content on a *regular* or *frequent* basis back in November. This percentage increased significantly to 84 percent at post-test. Moreover, 53 percent of the teachers surveyed reported a higher frequency at post-test than at the retrospective pre-test (Figure A18).

In addition, the frequency with which teachers reported teaching lessons that appropriately combined content, technologies, and teaching approaches increased significantly from retrospective pre-test to post-test, with 38 percent of teachers reporting an increased frequency over that time period (Figure A18).

Results from the classroom observations indicate that, in nearly all cases, teachers' integration of technology was well tied to curricular objectives both at pre-test and post-test. In addition, observers typically reported that the use of technology was a seamless part of the lesson at both observation periods. However, survey results indicate a significant increase from retrospective pre-test to post-test in the percentage of teachers reporting that an outside observer would have seen the technology activity as a seamless part of the lesson (Figure A1).

Observers also documented whether technology was used to replace, amplify, or transform practice based on the Replacement, Amplification, Transformation (RAT) framework. These categories are defined as follows (Hughes et al., 2006):

- **Replacement.** "Technology used to replace and in no way change established instructional practices, student learning processes, or content goals. The technology serves merely as a different means to the same instructional end. Most of the learning activities might be done as well or better without technology." (*Example*: Using an interactive whiteboard for the same purposes as a chalkboard)
- **Amplification**. "Technology used to amplify current instructional practices, student learning, or content goals, oftentimes resulting in increased efficiency and productivity. The focus is effectiveness or streamlining, *not* fundamental change." (*Example*: Using a word processor rather than written materials for instructional preparation)
- **Transformation.** "Technology used to transform the instructional method, the students' learning processes, and/or the actual subject matter. Technology is not merely a tool, but rather an instrument of mentality. The focus is fundamental change, redefining the possibilities of education. Most technology uses represent learning activities that could not otherwise be easily done." (*Example*: Using StorySpace software to write hypertext narratives)

It is important to note that the RAT framework is not a sequential stage model, but rather, teachers use technology across all three categories across time. Nevertheless, transformative uses reflect a more sophisticated level of technology integration, as they involve the complex interplay of technology, content, and pedagogy. For this reason, we were particularly interested in instances of teachers using technology in transformative ways. Results show a substantial increase in the number of instances of technology being used to transform instruction. At pre-test, there were no such instances, whereas there were five at post-test (Figure 13).

13. RAT framework

	Number of classrooms[a]		
Technology used as…	Pre (N=10)	Post (N=10)	Pre-to-post change
Replacement	10	9	-1
Amplification	9	8	-1
Transformation	0	5	+5

Note. *The sample size of 10 classrooms is too small to test for statistical significance.*

[a] *Number of classrooms (out of ten observed) in which the technology use category (R, A, or T) was observed in at least one of the two observations conducted during the observation period.*

Differences by dosage

To build evidence that the observed changes from pre-test to post-test may be attributed in part to the impact of PDT2, we examined whether participants who spent more than five hours on Moodle (i.e., high dosage) made greater improvements compared with participants who spent less than five hours (i.e., low dosage). The analysis was limited to include only those participants who had room for improvement at pre-test, and examined the percentage of low and high dosage participants that did indeed make an improvement.

Given the small sample size (especially for the high dosage group), our power to detect statistically significant differences between the low and high dosage groups was severely limited. Out of the few results that did emerge as being statistically significant, nearly all the findings were counter to our hypothesis, with a significantly larger percentage of the low dosage participants making improvements. When we examined the frequency distributions regardless of significance, we found some results in favor of the high dosage group, but there was no consistent trend.

Impacts of technology integration

Although outside the scope of this evaluation, the results do shed some light on potential impacts of technology integration on student engagement, classroom management, teaching approach, and classroom instruction.

Student engagement

A few teachers reported seeing improvements in student engagement as a result of integrating technology in class:

> You realize that there is a level of engagement that you get.
>
> My students are more on task.
>
> I had them doing a lot more reflecting because they could type right into the Moodle assignment tools, and they would actually do it, whereas if I had just given them a piece of paper they would do it maybe begrudgingly. But this time it was like, 'When do we use the computers?'…I was getting a lot more work from them.
>
> When I watched the class react [to digital media] and catch their attention, then I just realized... 'Yes, that's it!' Even if technology's purpose is just to get attention, I'm seeing it a little different. Half my job is getting the kids' attention and holding it as long as you can. Once you are holding their attention, you try to get the material in. To the extent you can use media and technology to get that attention and hold it longer, then that's what you do.

Results from the student survey support this finding. At both pre-test and post-test, the majority of students surveyed reported that the way their teacher uses computers and technology makes class *more interesting* and makes learning *easier* (Figures A9-A10).

Moreover, observers reported seeing generally high levels of student engagement during technology use both at pre-test and post-test (Figure A2).

Lastly, survey results show that the percentage of teachers who reported that their students were focused on learning, *not* on the technology, *most* or *all of the time* during lessons that included technology use increased significantly from retrospective pre-test to post-test (Figure A22) suggesting improvement in student engagement over time.

Classroom management

Students' ratings of student behavior during technology use were about the same at pre-test and post-test. That is, about two-thirds of the students surveyed reported that students behave *about the same as normal*. An additional one-third reported that students behave *better than normal*, when computers and technology are being used in class (Figure A11). Likewise, observation results indicate the majority of classes had minor or no classroom management issues during technology use (Figure A2). In the couple of classes that had significant problems, the classroom management issues did not seem to stem from technology use, but rather were observed throughout the entire class period.

While the majority of teachers rated their ability to organize and manage their classroom during activities that integrate technology as either *good* or *excellent* at both pre-test and post-test, almost one-quarter of the teachers rated their classroom management ability as only *fair*. Moreover, results indicate that teachers' ability to manage their classroom did not significantly improve from pre-test to post-test (Figure A2).

Teaching approach and classroom instruction

Research suggests that increases in the level of technology integration may stimulate changes in instruction. In particular, technology integration may encourage instruction to become increasingly student-centered and reforms-based, including increases in collaboration, problem solving, inquiry, and construction of knowledge (Stratham & Torell, 1996). To gauge whether such changes in instruction occurred in classrooms of teachers who participated in PDT2, the TIS-T survey asked teachers a number of questions about their teaching approach and instructional practice. These survey results show no significant changes from pre-test to post-test on any of the measures (Figures A14-A15), although teachers did report a significant pre-to-post increase in how often their students use inquiry-based strategies (i.e., asking and answering questions using multiple sources) (Figure A26).

Classroom observation results showed no significant change from pre-test to post-test in students' level of independence or ownership over their interaction with technology. Observers rated this measure on a scale ranging from complete teacher control to complete student independence. At both pre-test and post-test, ratings fell near the middle of the scale on average. In addition, observers rated the primary nature of student activity on a scale ranging from completely passive/receiving to completely active/producing. Once again, average ratings fell near the middle of this scale at both pre-test and post-test (Figure A2).

On the other hand, a few survey items did show significant increases from the retrospective pre-test to the post-test, including increases in the frequency with which teachers do the following: a) use technology to facilitate cooperative learning experiences, b) teach technology-related lessons that are designed to promote increased problem solving and critical thinking, and c) use technology to adapt instructional activities to students' individual needs (Figure A17). Survey and interview responses provide examples of such changes:

> PDT2 impacted my teaching by allowing me to recognize the importance of students' ownership of their work. The importance of reflection and capacity of the students to assess their own work. Placing the teacher as a guide instead of 'judge.'
>
> I learned the importance of making each assignment personal to the student.

Survey results show a significant increase in the frequency with which teachers use technology to manage or interpret student assessment data, but not in the frequency with which teachers provide alternative assessment opportunities (Figure A19). Nevertheless, other results show that some teachers are using technology for this purpose:

> Yes, PDT2 has impacted my teaching a lot. Like the assessment part I was speaking of: giving students different ways, addressing their learning styles. Where one student could write a paragraph on an electronic document, another one could take pictures and put them in Comic Life, which is more addressing a visual style. There are some things I know I will be using addressing their learning by auditory that I haven't started yet, but I have headphones now that I can start having kids listen to things. So there's a lot of being able to address different leaning modalities. And with sixth grade students, there is a great diversity in how well they write, their penmanship. For them to be able to type their thoughts and ideas is really changing how they learn. So I can ask for more writing, and the type of assignment I can give them has expanded because I know it is not going to be a challenge to them so much.
>
> The course helped me rethink how I could do a better job of assessing my students using the digital portfolio.
>
> I am much more encouraged to pursue methods of alternative assessment.

Issues to consider

It's convenient to participate in PDT2, but it's also easy for it not to be a priority as the relatively low levels of program participation indicate.

The following teachers' comments illustrate this point.

> I really liked the flexibility of the format, being able to go in at will, but that's both a plus and a minus. With a meeting you know you have to be there at this certain time and you can't put it off till later. Just because you have that flexibility you can't keep putting it to the bottom of your list of things you have to do.
>
> As far as the weaknesses, it is a time commitment, and I know with teachers, if they have a scheduled time for something it gets done, and sometimes if they don't have a scheduled time for something it gets pushed back and not because they are bad people but because there are so many things to do as a teacher. If you say today is staff professional development day and force me to be there, you know I'll get my professional development, whereas if you make it flexible like this, I think it can be more valuable, but teachers have to make time for it. There were some teachers in that group that that didn't work for. So it's not for everybody.

Some teachers suggested that stronger incentives to participate, clearer expectations, and more accountability are needed to achieve higher participation levels as illustrated by the following comments.

> I guess they have to figure out how this professional development online experience fits into a teacher's life and schedule. Is this taking the place of something else that we already have to do? If it's an added benefit, what's the motivation to get more teachers involved? Because 10 teachers in an online class is not as rich of an experience as it could be. It would be much better with 20. A larger group has more ideas, more excitement and discussion. For the VLC, I guess the motivation is having these laptops in your room. That's definitely a motivation. But for these other classes, I feel like we haven't quite figured out where they belong yet. So how do you get more people excited?
>
> Maybe clear expectations... For example, when I've done an online class before, it would be very clear, like, "You must post one new thing and you must comment on three people's posts." I don't feel like we really had that here… If they were more specific with it, more specific parameters, I may have had to do more and then would have become more engaged.

> I would have liked to see a bit more accountability. We *do* have a tool that many teachers want and they cannot have it, which is the laptop. So if I'm not accountable for that and the trainings they are offering so that I can increase my knowledge, then I feel that that's where we failed. There needs to be more accountability. We signed a contract. We got the laptops. The District is supporting us by providing more tech hours so people can fix the broadband. I think everybody was doing their part. *WE* failed.

Some teachers suggested that a shorter, more intensive program experience might be more effective than a longer, less intensive one.

> Maybe a short, intense experience might be more valuable than a drawn out experience.
>
> My opinion was that it was lacking in intensity in a way that keeps your focus on it. Since it was something that was on my 'to do' list for one week of the month it got lost in the shuffle from time-to-time.

It may take time for program participation levels (VLC use) to grow.

Some felt VLC participation might improve as teachers learn to use technology well and become more comfortable with the format.

> I think a VLC will be a really good thing after we've been using technology more often in class, because our big learning curve will be over, after even the first year or two. Then we'll know how to do all these things and won't have to spend all this time figuring out how to present to students and you can start having that special conversation. Then we'll be at a place where we're ready to go deeper and further. That's kind of the case with any professional development. You have to figure out how to practice it first in your classroom before you can have much conversation about it.
>
> The commitment level is a stumbling block for this format but I think that in time as people become more comfortable with the VLC format that will change.

Some teachers felt that as the number and diversity of participants increases, the program would become more attractive and interesting.

> Once you can get more people to participate from a wider range of folks, then that would be fantastic. It would be a real plus for me if there was more professional cross-fertilization from groups all over the country, in the same area.
>
> If we could get a broader community together to share, that would have an impact.

> Regardless of my lack of input, society as a whole needs this type of staff development, or professional development. I think this is the way to go as far as having teachers share things that they're doing and we need to open this dialogue for professional development, especially within our disciplines. It would also be good if you have access to other disciplines' same sharing areas, because activities and strategies come up in another discipline that you wouldn't have thought of and you can obviously apply it to yours.

Keep content as applied or practical as possible (less theoretical content).

Teachers indicated they are looking for applications they can use in their classrooms in the short-term.

> It would have to be all practical. If I had to spend a half hour doing an assignment for a VLC, I don't want to read an article and then write about what I learned. I would rather look at a lesson I'm doing next week and try to figure out how I can take one piece of technology and add it to that class. I want it to be applicable to what I'm doing next week or next month or sometime this year.
>
> The content in this VLC was more theoretical, which is alright, and the group brought the discussion back to what we were doing in our classrooms, which kept it grounded. But it would be better if the topics were about things you could use next month in your classroom, if it were more practical and related to the content you were teaching.

Use VLCs more for sharing and learning among the teachers, especially among those teaching the same grade or subject.

The following teacher comments illustrate this idea.

> I like the sharing part. Helping us enhance our curriculum through sharing is the way to go, not to say, "You need to do this by this day and please respond to this." It's more like I'm back in college and to me that's not what this is supposed to be for. I thought it was a development as far as improving our best practices, not as an assignment.
>
> If I was to do it over again, I would focus more on, "Who's teaching 6th grade right now and what are you doing?" That's what I'd like the District to do, to put me together in a VLC with other 6th grade science teachers. That would make it the most worthwhile!
>
> I think having a group of people teaching the exact same content would be helpful.

On the other hand, some teachers wanted a more structured program.

> It was not very specific about what we were to be doing or interacting about while we were interacting other than the first article that we read. That was very specific. The other times it was a very broad and general about how we were to interact. I like more guided and focused type of instructions.

> All the things we were supposed to do were in addition to our current workload. When I have to add that to what I'm doing I need more specific direction rather than taking the time to creatively deal with it. Some guided questions would have helped me. I do that for my students.

Have face-to-face meetings (especially the first one) before online meetings or discussions.

Teachers felt that knowing one another beforehand is helpful in fostering online discussions.

> You should know that group or somehow have connected with that group outside of just the online. Even if you're going to recommend curriculum and stuff, it's better if you know each other.
>
> Having VLCs made up of teachers who already know each other as professionals as much as possible. That makes a huge difference in the online experience.
>
> Whenever you have a face-to-face relationship, you carry that over into the online world, and that's a huge plus. The face-to-face connection keeps you motivated and keeps you on board.

Offer courses by technology skill level; the program presumes a certain basic skill level currently.

The following comments illustrate this suggestion.

> We mix a lot of levels in this school. I'm not necessarily sold on that mixing. I don't know that that helps me to be with really fast, high-level people in a virtual learning environment.
>
> Breaking down the classes to the level of the people. When they announced the Promethean course, I don't remember them saying basic Promethean skills. Then I wouldn't have signed up for it. Just separating them into the levels of the people so we are in the right category.
>
> A scaled system. Maybe a pre assessment and then the right tier for learning. Learners feel valued when you take into account their prior learning as valuable.
>
> If I had had more exposure to background knowledge – like a Web 2.0 class beforehand or web page design, or some of the more intermediate technology things – before the Blended Moodle or the VLC, these courses would have been more valuable.

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Appendix

Technical details of study methods

Technology Integration Survey for Teachers (TIS-T)

Technology Integration Survey for Students (TIS-S)

Technology Integration Observation Protocol (TIOP)

Teacher Experience Survey for Completers (TES)

Teacher Feedback Survey for Non-completers (TFS)

Interview Protocol

Additional figures

Technical details of study methods

Instrument development

The instrument development process began with a thorough review of the literature. Specifically, we searched the literature for models of technology integration and for observation and survey protocols that have been used for assessing the level of technology integration at the classroom level. From this effort, we learned how technology integration is defined and how it might be measured. This information helped guide us in our development of data collection instruments – surveys and observation protocols – aimed at assessing the level of technology integration.

Existing instruments were selected for consideration based on the following criteria:

- **Relevance to the current evaluation context**
  - Purpose: Teacher self-report of the extent to which they integrate technology in their classroom(s)
  - Population: K-12 in-service teachers in a variety of subject areas who are participating in online professional development
  - Mode: Pre/post web-based survey
- **Theoretical basis**
  - Importance of considering contextual factors (rather than simply the technologies used)
  - Complex interplay among knowledge domains of pedagogy, content, and technology (TPACK framework)
  - It is valuable to consider multiple dimensions of use: Using technology for preparation and planning, delivering instruction, accommodating individual student needs, assessment, professional purposes, etc.
  - Likewise, technology may be used replace, amplify, and/or transform teaching and learning (RAT framework)
  - It is more important for our purposes to capture how technology is actually used, and to what extent (versus knowledge, attitude, capacity, proficiencies, skills, tech literacy, etc.)
- **Alignment with standards**
  - National Educational Technology Standards for Teachers (NETS-T) (International Society for Technology in Education, 2008)

- Minnesota Educational Media Organization (MEMO) Information and Technology Literacy Standards (MEMO, 2009)
- Technology Standards for Minneapolis Public Schools Teachers (MPS, 2008-2011)
- enGauge 21st Century Skills (North Central Regional Educational Laboratory, 2003)

- **Thoughtful and rigorous development:** e.g., expert review, field tests, think alouds, reliability analysis, validity review, multistage/iterative review process; revisions driven by statistical inference, framework fidelity, and experience
- **Validity evidence:** Construct and content validity based on expert judgment, statistical inference (inter-item correlations, KR-20s and Alphas, discriminant analysis, factor analysis, etc.), and framework fidelity
- **Popularity of use:** Used in other studies, included in reviews, recommended by others in the field, etc.

Based on these criteria, the following survey instruments stood out as most promising:

- **TPACK:** Technological Pedagogical and Content Knowledge Surveys (Schmidt, et al., 2009; Archambault & Crippen, 2009)
- **LoTi:** Level of Technology Implementation (Moersch, 1995; Keller, et al., 2005)
- **SETDA:** State Educational Technology Directors Association Teacher Survey (SETDA/Metiri, 2004)

However, no single instrument served our multiple purposes, so instead of adopting an instrument in its entirety, we created a bank of the questions for review and selection. In addition to the three instruments above, we also included some questions from other instruments (USEiT, NETTS, TUET, TISCM, and TLC) that matched our content and format goals. Based on a thorough review, questions were adopted (or adapted), and response scales were developed that could be used consistently throughout the instrument. First drafts of the data collection instruments were shared with MPS staff for their review, and their feedback was addressed before the instruments were finalized. In addition, the TIS-T, TIS-S, and TIOP instruments were tested before being used in the field.

Traditional pre-test versus retrospective pre-test

In the traditional pre-post design, pre-test ratings are collected before the respondent begins participating in the program, and post-test ratings are collected afterwards. This design can suffer from *response shift bias* if respondents' frame of reference (or understanding of what the survey is asking) changes over time. In other words, it can be hard to distinguish the extent to which changes in ratings from pre-test to post-test are the result of a true change in the outcome versus a change in the frame of reference. Despite

this limitation, the pre-post design also has its advantages. The major advantage is that collecting the pre-test and post-test ratings at separate points in time helps prevent respondents from exaggerating the pre-post change due to social desirability, since respondents are unlikely to remember what their pre-test ratings were by the time they take the post-test survey.

In contrast to the traditional pre-post design, which uses two data collection periods (before and after the intervention), the retrospective pre-test questions are asked at the same time as the post-test and the respondent is asked to think back to before the intervention. The major advantage of asking respondents for their post and pre ratings at the same time ensures that the same frame of reference is used for both sets of ratings, avoiding the response shift bias effect (Howard, 1980). One concern with this design is that respondents might exaggerate (in a downward direction) their retrospective pre-test rating to produce a socially desirable difference in their responses from pre to post. In our survey, we attempted to minimize social desirability by having the retrospective ratings in a separate section at the end of the survey, rather than asking them adjacent to the corresponding post measure (Nimon et al., 2011).

To be clear, all teachers who were asked to participate in the Technology Integration Survey for Teachers (TIS-T) have three points of data available: baseline data gathered at pre-test, retrospective status at baseline gathered at the time of post-test (this is the retrospective pre-test), and outcome data gathered at post-test.

Testing for statistical significance

In this pre-post study, we used a number of statistical tests to determine significance based on the type of data measured. The *Wilcoxin* test is a non-parametric test used to assess the difference between dependent samples (e.g., pre and post responses) when ordinal variables are used. This test was performed to determine the significance of pre-post change on study measures that used rating scales to measure such things as technology skill levels or the frequency of technology use. The *McNemar* test is a non-parametric test used to assess the significance of difference between dependent samples (e.g., pre and post responses) when dichotomous nominal variables are analyzed. This test was performed to determine the significance of differences in objectives for technology use selected at pre-test and post-test. *Fisher's exact test* was used to determine whether the percentage of teachers who increased (yes or no) from pre-test to post-test significantly differed between low and high dosage participants (note that *Fisher's exact test* was used instead of *Pearson's chi square* test due to the small sample size, i.e., expected counts of less than five in individual cells). Finally, scale data (e.g., number of technologies used, number of minutes spent using technology) were tested for

significance using paired sample *t*-tests, a statistical technique used to compare the means (averages) of two dependent samples (e.g., pre and post responses).

Estimating dosage

We used Moodle logs data to estimate dosage levels. These data, which were exported directly out of the Moodle platform, included a timestamp for each time the participant clicked a link on the webpage. We counted the time elapsed between any two clicks as continuous use of Moodle as long as they were within 30 minutes of each (because 30 minutes was the time-out length). After summing up the time that each participant spent on Moodle, we then looked at the distribution of average hours on Moodle per course, excluding those people from the distribution who had spent less than one hour total on Moodle cumulatively across all the courses they participated in. Based on the distribution, we determined the following cutoffs for the dosage categories: less than one hour for "no dosage," between one hour and less than five hours for "low dosage," and five or more hours for "high dosage."

Technology Integration Survey for Teachers (TIS-T)

Minneapolis Public Schools has contracted with Wilder Research to evaluate the Professional Development through Technology (PDT2) program. As part of the study, we are asking participating teachers to take a survey. The survey asks about your teaching approach; your technology knowledge, skills, and abilities; your use of technology in the classroom; and your students' use of technology. The survey is estimated to take about 10-20 minutes to complete. You will be asked to take a similar survey later in the school year. The survey results will be used to track changes in technology integration over time.

This survey is completely voluntary and your decision whether or not to participate will not affect your relationship with Minneapolis Public Schools. While participation is voluntary, your feedback is critical to ensure the results are comprehensive and accurate. For the survey to be most useful, it is important that you respond as honestly as you can. No one outside of the Wilder Research team will see your individual responses or feedback; all the information you share will be kept confidential and private.

If you agree to take this survey, please sign this form by typing your employee number below. This "signature" is needed to fulfill our informed consent requirement and to link your current and future surveys. Please rest assured that we will not identify you personally when we report the results of the survey.

If you agree to take this survey, please type your employee ID number below.

1. Employee ID number: _____

Thank you in advance for your help!

About You

2. *What grade level(s) do you currently teach? (Select all that apply)*
   - ❒ Kindergarten
   - ❒ 1
   - ❒ 2
   - ❒ 3
   - ❒ 4
   - ❒ 5
   - ❒ 6
   - ❒ 7
   - ❒ 8
   - ❒ 9
   - ❒ 10
   - ❒ 11
   - ❒ 12

3. Including this school year, how many years have you taught?
   - ❒ 0-5 years
   - ❒ 6-10 years
   - ❒ 11-15 years
   - ❒ 16 or more years

4. What subject area(s) do you teach? (Select all that apply)
   - ❒ General Elementary (all subjects)
   - ❒ Art/Music
   - ❒ AVID
   - ❒ Computers or Technology
   - ❒ English as a Second Language
   - ❒ Foreign/World Languages
   - ❒ Health/Physical Education
   - ❒ History/Social Studies
   - ❒ Language Arts/English
   - ❒ Mathematics
   - ❒ Reading
   - ❒ Science
   - ❒ Special Education
   - ❒ Vocational Field
   - ❒ Other (*Please specify*:_____)

5. In what setting did you first become reasonably comfortable with using computers? (Select one)

- ❒ While I was a student in high school or earlier
- ❒ While in college or getting first teaching credential
- ❒ While working in another job, outside of teaching
- ❒ Several years ago during my teaching career
- ❒ More recently during my teaching career
- ❒ Other (*Please specify*:_____)
- ❒ I am still not "reasonably familiar and comfortable with using computers"

6. Which of the following professional development opportunities did you participate in last school year or summer? (Select all that apply)

- ❒ Online professional development course(s)
- ❒ Middle Years Laptop Pilot
- ❒ June Tech Academy (*Please specify the classes you participated in*:_____)
- ❒ Other professional development related to technology integration (*Please specify*:_____)
- ❒ None

7. Which of the following professional development opportunities are you currently participating in? (Select all that apply)

- ❒ Online professional development course(s)
- ❒ Middle Years Laptop Pilot
- ❒ Other professional development related to technology integration (*Please specify*:_____)

Your Teaching Approach

8. How often do you…

	Never	Once in a while	Regularly	Very frequently
a. Use principles of direct instruction (review, teach, guided practice, individual practice) when planning lessons	❒	❒	❒	❒
b. Have many activities going on in the room at the same time	❒	❒	❒	❒
c. Use the textbook as your primary guide through units	❒	❒	❒	❒
d. Let student interest partly influence the topics in the lesson	❒	❒	❒	❒
e. Closely monitor and supervise students while they work	❒	❒	❒	❒
f. Evaluate students through their products instead of tests	❒	❒	❒	❒
g. Allow yourself to be taught by students	❒	❒	❒	❒

9. How often do you give the following types of assignments…

	Never	Once in a while	Regularly	Very frequently
a. Have students teach or help other students	❒	❒	❒	❒
b. Have students explore a topic on their own, without direction	❒	❒	❒	❒
c. Have students review and revise their own work	❒	❒	❒	❒
d. Have students make predictions and investigate them	❒	❒	❒	❒

Your Technology Knowledge, Skills, and Abilities

Definition: For the purposes of this survey, "technology" refers to information technology such as computers (including iPods and "Smartphones"), devices that can be attached to computers (e.g., video-data projector, interactive whiteboard, digital camera), networks (e.g., Internet, local networks), and computer software. Please do not consider non-computer technologies such as overhead projectors and VCRs.

10. How would you rate your…

	Poor	Fair	Good	Excellent
a. Skills in using technology	❒	❒	❒	❒
b. Knowledge about the variety of different technologies that can be used in the classroom	❒	❒	❒	❒
c. Ability to learn technology for classroom use	❒	❒	❒	❒

11. How would you rate your…

	Poor	Fair	Good	Excellent
a. Knowledge about technologies that students can use for learning about your content area	❒	❒	❒	❒
b. Comfort level with planning for class sessions that involve students using technology during instruction	❒	❒	❒	❒
c. Ability to organize and manage your classroom during activities that integrate technology	❒	❒	❒	❒
d. Comfort level with using technology to help you gather, analyze, and interpret data on student progress	❒	❒	❒	❒

Your Technology Use

Teachers vary in knowledge, skills, and use of technology. The following questions cover a wide range of technology skills and uses. We don't expect any one teacher to engage in all or even most of these. The questions are intended to track progress as technology resources and professional development change over time. Please respond to the statements in terms of your present uses of technology in the classroom.

12. How often do you **use technology to**…

	Never	Once in a while	Regularly	Very frequently
a. Adapt instructional activities to students' individual needs	❒	❒	❒	❒
b. Facilitate cooperative learning experiences	❒	❒	❒	❒
c. Manage or interpret student assessment data	❒	❒	❒	❒

13. How often do you…

	Never	Once in a while	Regularly	Very frequently
a. Learn new technologies to use in your classroom	❒	❒	❒	❒
b. Adapt the use of the technologies you are learning about to different teaching activities	❒	❒	❒	❒
c. Do Internet research when planning lessons	❒	❒	❒	❒
d. Choose technologies that enhance the **content** for a lesson	❒	❒	❒	❒
e. Choose technologies that enhance **how you teach** a lesson	❒	❒	❒	❒

14. How often do you…

	Never	Once in a while	Regularly	Very frequently
a. Use online tools or clicker software to create and give tests or quizzes	❒	❒	❒	❒
b. Provide alternative assessment opportunities that encourage students to "showcase" their content understanding in nontraditional ways	❒	❒	❒	❒
c. Create and maintain Web pages or Moodle sites for your class	❒	❒	❒	❒
d. Post homework assignments or schedule information on web pages or Moodle sites	❒	❒	❒	❒

15. How often do you…

	Never	Once in a while	Regularly	Very frequently
a. Use technology to communicate and collaborate with peers (e.g., email, threaded discussion boards, listserv, chat)	❒	❒	❒	❒
b. Use technology to support your own professional growth (through activities such as online learning, research, and collaborative projects)	❒	❒	❒	❒
c. Seek professional development to maximize the use of technology available to your students	❒	❒	❒	❒
e. Participate in professional online communities	❒	❒	❒	❒
f. Provide leadership in helping others to coordinate the use of content, technologies, and teaching approaches at your school and/or district	❒	❒	❒	❒

16. How often do you teach **technology-related lessons** that are designed to…

	Never	Once in a while	Regularly	Very frequently
a. Improve your students' basic skills (e.g., reading, writing, math computation)	❒	❒	❒	❒
b. Promote increased problem solving and critical thinking	❒	❒	❒	❒
c. Build students' familiarity with basic computer functions	❒	❒	❒	❒
d. Build students' understanding of ethical and legal issues related to technology use	❒	❒	❒	❒
e. Cater to students' interests and experiences	❒	❒	❒	❒

17. How often do you…

	Never	Once in a while	Regularly	Very frequently
a. Teach lessons that appropriately combine content, technologies, and teaching approaches	❒	❒	❒	❒
b. Use technological representations (i.e., multimedia, visual demonstrations, video, etc.) to demonstrate specific concepts in your content area	❒	❒	❒	❒
c. Assign students projects using technology and internet resources beyond the school to solve authentic problems	❒	❒	❒	❒
d. Use student response systems (clickers) to assess student learning	❒	❒	❒	❒

18a. To what extent has technology influenced the way you organize space in your classroom?

❒ Not at all (SKIP TO QUESTION 19a)

❒ To a small extent

❒ To a large extent

18b. How has technology influenced the way you organize space in your classroom?

_____

_____

_____

19a. To what extent has technology influenced the way you break up your class time into activities?

- ❒ Not at all (SKIP TO QUESTION 20a)
- ❒ To a small extent
- ❒ To a large extent

19b. How has technology influenced the way you break up your class time into activities?

_____

_____

_____

20. Think about times when you or your students have used technology in class over the past month. Please indicate how frequently the following statements would have applied to your lessons that included technology use.

	None of the time	Little of the time	Some of the time	Most of the time	All of the time
a. An outside observer would have seen the technology activity as a seamless part of the lesson	❒	❒	❒	❒	❒
b. You saw the technology as more trouble than it was worth	❒	❒	❒	❒	❒
c. The reason for using technology was obvious to you, the students, and others	❒	❒	❒	❒	❒
d. The students were focused on learning, not on the technology	❒	❒	❒	❒	❒
e. You could describe how technology was helping a particular student	❒	❒	❒	❒	❒
f. You would have had a hard time accomplishing lesson objectives without utilizing technology	❒	❒	❒	❒	❒
g. All students were participating with the technology and benefiting from it	❒	❒	❒	❒	❒

Your Students' Technology Use

For the following set of questions, please respond with regard to the students you currently teach in your class(es) this school year.

21. Teachers have a variety of objectives for student computer use. Which <u>three</u> objectives are your most important ones? (Select 3 from the list below)

- ❒ Mastering skills just taught
- ❒ Remediation of skills not learned well
- ❒ Expressing themselves in writing
- ❒ Communicating electronically with other people
- ❒ Finding out about ideas and information
- ❒ Analyzing information
- ❒ Presenting information to an audience
- ❒ Improving computer skills
- ❒ Learning to work collaboratively
- ❒ Learning to work independently
- ❒ Other (*Describe*:_____)

22. In general, how often do your students **use technology to**…

	Never	Once in a while	Regularly	Very frequently
a. Practice or review topics	❒	❒	❒	❒
b. Visually represent or investigate concepts (e.g., through concept mapping, graphing, reading charts)	❒	❒	❒	❒
c. Solve real-world problems (i.e., involving situations, issues, and tasks that people actually tackle in the outside world)	❒	❒	❒	❒
d. Improve their technology literacy	❒	❒	❒	❒

23. In general, how often do your students use…

	Never	Once in a while	Regularly	Very frequently
a. Drill and practice or tutorial software	❒	❒	❒	❒
b. Digital tools and peripheral devices (e.g., clickers, digital cameras, scanners) to enhance their learning or their school work	❒	❒	❒	❒
c. Authentic technology tools (i.e., the tools that professionals use in their fields)	❒	❒	❒	❒
d. Inquiry-based strategies (i.e., asking and answering questions using multiple sources)	❒	❒	❒	❒

24. In general, how often do your students…

	Never	Once in a while	Regularly	Very frequently
a. Work individually using computers	❒	❒	❒	❒
b. Work in groups using computers	❒	❒	❒	❒
c. Present information to the class using computers	❒	❒	❒	❒
d. Conduct online research	❒	❒	❒	❒
e. Use the Internet to communicate and collaborate with experts or peers in or beyond your school	❒	❒	❒	❒
f. Participate in formal distance learning via the Internet or other interactive media	❒	❒	❒	❒

25. In general, how often do your students use technology to **produce**…

	Never	Once in a while	Regularly	Very frequently
a. Print products	❒	❒	❒	❒
b. Pictures/artwork	❒	❒	❒	❒
c. Graphs/charts	❒	❒	❒	❒
d. Videos/movies	❒	❒	❒	❒
e. Web pages/sites	❒	❒	❒	❒
f. Multimedia projects	❒	❒	❒	❒
g. Products that have real-world audiences	❒	❒	❒	❒

Thank you!

Technology Integration Survey for Students (TIS-S)

Minneapolis Public Schools is interested in learning about how technology is used in classrooms and has asked Wilder Research to do a study. As part of the study, we are asking students to take a survey. The survey asks how you, your class, and your teacher use technology at school.

You get to decide whether or not you would like to take the survey. You will not get in any trouble if you decide not to participate. We hope that you will decide to participate because your thoughts and opinions are very important and will help us learn about how technology is used at school.

If you prefer not to answer any of the questions in the survey, it is okay. You decide how much you want to share. There are no right or wrong answers. Your responses are private, so your teacher and other school staff will not know how you answered. Only Wilder Research staff will know what you said. Wilder Research staff will summarize everyone's responses together into a report for school staff.

If you would like to take this survey, please sign this form by typing your student login username below. We will not share your name when we report the results of the survey.

If you agree to take this survey, please type your student login username below.

1. Student login username: _____

Thank you for your help!

2. What class period are you in right now?
   - ❒ 1
   - ❒ 2
   - ❒ 3
   - ❒ 4
   - ❒ 5
   - ❒ 6
   - ❒ 7
   - ❒ 8

This survey asks about technology.
Technology includes such things as computers, laptops, software, iPods, interactive whiteboards, digital cameras, document cameras, video cameras, the Internet, clickers, etc.

Your Teacher's Use of Technology

The following questions ask about your teacher's use of technology. We want to know your opinion about the teacher of the class you are in right now.

3. How good is your teacher at using technology?
   - ❒ Very good
   - ❒ Pretty good
   - ❒ Not so good
   - ❒ Very bad

4. In the past month, how often did your teacher use technology when teaching your class?
   - ❒ Never
   - ❒ Less than once a week
   - ❒ Once or twice a week
   - ❒ Three or more times a week

5. How much does your teacher use computers and other technology in this class?
   - ❒ Too much
   - ❒ About the right amount
   - ❒ Not enough

6. The way your teacher uses computers and technology makes class _____.
   - ❒ More interesting.
   - ❒ Less interesting.
   - ❒ Neither more nor less interesting.

7. The way your teacher uses computers and technology makes it _____.
   - ❒ Easier to learn in this class.
   - ❒ Harder to learn in this class.
   - ❒ Neither easier nor harder to learn in this class.

Your Use of Technology

The following questions ask about how you use technology in this class.

8. In the last month, how often did you work **by yourself** using computers in this class?
   - ❒ Never
   - ❒ Less than once a week
   - ❒ Once or twice a week
   - ❒ Three or more times a week

9 In the last month, how often did you work together **with a small group of other students** using computers in this class?

- ❒ Never
- ❒ Less than once a week
- ❒ Once or twice a week
- ❒ Three or more times a week

In the last month, how often did you use technology in this class to do the following things…	Never	Once or twice	Three or more times
10. Practice or review things you've learned	❒	❒	❒
11. Online research	❒	❒	❒
12. Send or receive e-mails or instant messages related to class	❒	❒	❒
13. Write stories or reports on the computer	❒	❒	❒
14. Analyze information	❒	❒	❒

In the last month, how often did you use technology in this class to do the following things…	Never	Once or twice	Three or more times
15. Present information using graphs, charts, or maps	❒	❒	❒
16. Work on real-life situations or problems	❒	❒	❒
17. Give a presentation to the class	❒	❒	❒
18. Improve your technology skills and knowledge	❒	❒	❒
19. Work on projects with students in other schools	❒	❒	❒

In the last month, how often did you use technology in this class to do the following things…	Never	Once or twice	Three or more times
20. Learn basic computer skills (keyboarding, word processing, etc.)	❒	❒	❒
21. Learn advanced computer skills (programming, web page development, etc.)	❒	❒	❒
22. Practice for tests or take tests online	❒	❒	❒
23. Complete assignments online (Moodle)	❒	❒	❒
24. Use online textbooks	❒	❒	❒
25. View a video online	❒	❒	❒

In the last month, how often did you use technology in this class to make the following things…	Never	Once or twice	Three or more times
26. Printed paper projects	❒	❒	❒
27. Pictures or artwork	❒	❒	❒
28. Videos or movies	❒	❒	❒
29. Web pages or web sites	❒	❒	❒
30. PowerPoints	❒	❒	❒
31. Interactive presentations	❒	❒	❒

32. How well do students behave in this class when computers and technology are being used?

- ❒ Worse than normal
- ❒ About the same as normal
- ❒ Better than normal

Thank you!

Technology Integration Observation Protocol (TIOP)

Background information

1. Observer name:_____
2. Date of observation:_____
3. School name:_____
4. Teacher name:_____
5. Observation start time:_____ 6. End time: _____
7. Observation type:
   - ❒[1] Inter-rater reliability practice observation
   - ❒[2] Inter-rater reliability practice observation
   - ❒[3] Inter-rater reliability practice observation
   - ❒[1] Pre-test
   - ❒[2] Pre-test
   - ❒[1] Post-test
   - ❒[2] Post-test

Classroom information

8. Subject:_____ 9. Grade level: _____ 10. Class period: _____
11. Total number of students in the class :_____
12. Were any instructional collaborators present?
    Includes for example: co-teacher, paraprofessional, teaching assistant, curriculum specialist, special education teacher, media coordinator, technology facilitator, administrator, outside expert or consultant, volunteer
    - ❒ Yes (*Describe*:_____)
    - ❒ No

13. Learning environment:
    - ❒ Classroom
    - ❒ Multi-purpose room
    - ❒ Computer lab
    - ❒ Library
    - ❒ Media center
    - ❒ Other (*Describe:*_____*)*

14. Classroom arrangement (*Check all that apply*):
    - ❒ Rows
    - ❒ Small clusters (tables, centers, pods)
    - ❒ Whole class circle or semi-circle
    - ❒ Other (*Describe:*_____*)*

15. Student groupings (*Check all that apply*):
    - ❒ Independent
    - ❒ Pairs
    - ❒ Small groups (3 or more students)
    - ❒ Whole class
    - ❒ Other (*Describe:*_____*)*

16. Access to technology (*Check all that apply*):
    - ❒ Teacher access only
    - ❒ One presentation station
    - ❒ 1 student per device
    - ❒ 2 students per device
    - ❒ 3-5 students per device
    - ❒ More than 5 students per device
    - ❒ Other (*Describe:*_____*)*

Objectives of technology use

17. The teacher used technology for the following purposes (*Check all that apply*):
    - ❒ For grading, attendance, or material preparation
    - ❒ To present information
    - ❒ To demonstrate or model a skill
    - ❒ To facilitate interactive learning
    - ❒ To assess student learning or check for understanding
    - ❒ Other (*Describe*:_____)
    - ❒ Not applicable (the teacher did not actively use technology)

18. The students used technology for the following purposes (*Check all that apply*):
    - ❒ For free time, leisure, or reward
    - ❒ To develop technology skills
    - ❒ To view information
    - ❒ To learn content-related skills, facts, or concepts
    - ❒ To practice or reinforce a skill or concept
    - ❒ To communicate with resource person or peer
    - ❒ To organize or manage information
    - ❒ To develop a project
    - ❒ To conduct research
    - ❒ To analyze information
    - ❒ To solve a problem (higher order)
    - ❒ To construct knowledge (synthesize, generate, invent)
    - ❒ To demonstrate learning (assessment)
    - ❒ Other (*Describe*:_____)
    - ❒ Not applicable (the students did not actively use technology)

Summary information

19. Which of the use categories from the RAT framework describe(s) how technology was used in this classroom? (*Check all that apply*)
    - ❒ Technology as Replacement
    - ❒ Technology as Amplification
    - ❒ Technology as Transformation

20. Overall rating of **student engagement** during technology use:
    - ❒ Low engagement, 80% or more of the students off-task
    - ❒ Mixed engagement
    - ❒ High engagement, 80% or more of the students engaged
    - ❒ Not applicable (technology was not used during the lesson)

21. Overall rating of **students' level of technical skills**:

- ❒ Need lots of help
- ❒ Somewhat skilled, but need help of teacher
- ❒ Independent
- ❒ Not applicable (the students did not actively use technology)
- ❒ Don't know

22. Overall rating of **classroom management** during technology use:
(specifically, behavior management issues or conflicts on the part of students)

- ❒ No problems
- ❒ Minor problems
- ❒ Significant problems (*Describe*:_____)
- ❒ Not applicable (technology was not used during the lesson)

INSTRUCTIONS: For the following items, circle a number of the continuum that best represents what you observed.

23. Overall, the primary nature of student activity was:

0----------1----------2----------3----------4

Passive/Receiving — Active/Producing

❒ Don't know

24. Overall, the students' level of ownership/independence over their interaction with technology was best described as:

0----------1----------2----------3----------4

Teacher controls students' interaction with technology — Students work independently

❒ Don't know

❒ Not applicable (no student use of technology)

25. How would you rate the integration of technology as it relates to the lesson objectives?

0----------1----------2----------3----------4

Not related to lesson objectives — Somewhat related to lesson objectives — Integral to lesson objectives

❒ Don't know

❒ Not applicable (no integration of technology)

26. Overall, the use of technology was a seamless part of the lesson:

0----------1----------2----------3----------4

Not at all true — Somewhat true — Completely true

❒ Don't know

If no use of technology, circle 0.

27. **Additional comments** (use backside if needed):

Technology uses

Instructions: Use a checkmark (∟) to indicate all observed uses of technology, indicating by whom (teachers and/or all students or some students).

HARDWARE / PERIPHERALS / RESOURCES (28a-c)				SOFTWARE / PRODUCTION TOOLS (29a-c)				WEB APPLICATIONS (30a-c)			
Teacher	Students		Hardware/Peripherals/Resources	Teacher	Students		Software/Production tools	Teacher	Students		Web applications
	All	Some			All	Some			All	Some	
			Art/Music (e.g., tablet, keyboard)				Administrative (grading, records)				Blog
			Assistive technology				Assessment/Testing				Class web site (Moodle)
			Audio (e.g., speakers, microphone)				Assistive				Database
			External storage device				Interactive white board software				Internet research or browsing
			Student Response System (clickers)				GIS				Libraries, e-publications, e-books
			Computer				*Computer-assisted instruction*				Podcast
			Desktop				Drill/Practice/Tutorial				Web authoring or programming
			Handheld				Geometer's Sketchpad				WebQuest
			Laptop				Integrated Learning System				Wiki
			Tablet				Other subject specific (*specify*)				*Computer-assisted instruction*
			Display				Simulation/Modeling/ProbSolve				Drill/Practice/Tutorial
			Digital projector				*Productivity software*				Simulation/Modeling/ProbSolve
			DVD/Blueray				Concept mapping				*Google Suite of Tools*
			Interactive whiteboard				Data analysis (Tinkerplots)				Google Docs
			Printer				Database (Access, FileMaker Pro)				Google Earth
			Television				Graphics/Publishing				Google Forms
			VCR				Presentation (MS PowerPoint)				Google Presentations
			Imaging				Spreadsheet (MS Excel)				Google Spreadsheets
			Camcorder or video camera				Video/sound editing/production				*Interactive communication tools*
			Document camera				Word processing (MS Word)				Chat/Instant messenger
			Digital camera				*Other software (Describe)*				Discussion board, listserv, forum
			Film camera								E-mail
			Scanner								Video or voice conferencing
			Math/Science/Technical								*Other web application (Describe)*
			GPS								
			Calculator								
			Probeware								
			Digital microscope								
			Other hardware (Describe)								

Time spent actively using technology

TEACHERS		**STUDENTS** (Indicate whether *all* or *some* where noted as A/S. Whole class activities count as All.)	
For teaching	**For other purpose** (e.g., recreation, routine tasks, tech problems)	**For learning**	**For other purpose** (e.g., recreation, routine tasks, tech problems)
Start time – End time (mins)	Start time – End time (mins)	(A/S) Start time – End time (mins)	(A/S) Start time – End time (mins)
Subtotal minutes teacher used technology for teaching:	Subtotal minutes teacher used technology for other purpose:	Subtotal minutes students used technology for learning: All:_____ Some:_____	Subtotal minutes students used technology for other purpose: All:_____ Some:_____

Report grand totals on Page 6

Time spent actively using technology, continued

TEACHERS		**STUDENTS** (Indicate whether *all* or *some* where noted as A/S. Whole class activities count as All.)	
For teaching	**For other purpose** (e.g., recreation, routine tasks, tech problems)	**For learning**	**For other purpose** (e.g., recreation, routine tasks, tech problems)
Start time – End time (mins)	Start time – End time (mins)	(A/S) Start time – End time (mins)	(A/S) Start time – End time (mins)
Subtotal minutes teacher used technology for teaching:	Subtotal minutes teacher used technology for other purpose:	Subtotal minutes students used technology for learning: All:_____ Some:_____	Subtotal minutes students used technology for other purpose: All:_____ Some:_____
31a. Total minutes teacher used technology for teaching:	31b. Total minutes teacher used technology for other purpose:	Total minutes students used technology for learning: 32a. All:_____ 33a. Some:_____	Total minutes students used technology for other purpose 32b. All:_____ 33b. Some:_____
31c. Total minutes teacher used technology:		Total minutes students used technology: 32c. All:_____ 33c. Some:_____	

Teacher Experience Survey for Completers (TES)

Minneapolis Public Schools has contracted with Wilder Research to evaluate the Professional Development through Technology (PDT2) program. PDT2 is focusing on online professional development. As part of the Wilder study, we are asking participating teachers to take a survey about their experience in PDT2. The survey is estimated to take about 10 minutes to complete.

This survey is completely voluntary and your decision whether or not to participate will not affect your relationship with Minneapolis Public Schools. While participation is voluntary, your feedback is critical to ensure the results are comprehensive and accurate. For the survey to be most useful, it is important that you respond as honestly as you can. No one outside of the Wilder Research team will see your individual responses or feedback; all the information you share will be kept confidential and private.

If you agree to take this survey, please sign this form by typing your employee number below. This "signature" is needed to fulfill our informed consent requirement and to link this survey with other survey data. Please rest assured that we will not identify you personally when we report the results of the survey.

If you agree to take this survey, please type your employee ID number below.

1. Employee ID number: _____

Thank you in advance for your help!

2. *In which online professional development course did you participate? (Select all that apply)*

- ❒ Leading Schools in a Web 2.0 World
- ❒ Solving Systems of Equations
- ❒ Improving Reading and Writing in the Content Areas
- ❒ Instructional Approaches for Teachers of English Language Learners
- ❒ Using Digital Portfolios to Foster Student Learning
- ❒ Transforming the Classroom with Project-Based Learning
- ❒ Supporting Student-Centered Learning with WebQuests 2.0
- ❒ Using Technology to Help Students Become Better Researchers
- ❒ MPLS ActiveInspire Level One Skills

3. *Based on your expectations for this course, which statement best describes your experience?*

- ❒ This course **did not meet** my expectations.
- ❒ This course **met** my expectations.
- ❒ This course **exceeded** my expectations.

4. What did you find most valuable about this course?

5. How could this course be improved?

6. Using the scale below, please indicate your level of agreement or disagreement with each of the statements listed by checking the appropriate box.

	Strongly disagree	Disagree	Agree	Strongly agree
a. Overall, this course was of high quality.	❒	❒	❒	❒
b. The language used in the course was clear and easy to understand.	❒	❒	❒	❒
c. The course was the right length.	❒	❒	❒	❒
d. The facilitator was effective.	❒	❒	❒	❒
e. The information I learned in this course will improve my teaching.	❒	❒	❒	❒
f. I would recommend this course to other teachers.	❒	❒	❒	❒

7. *Please rate your capacity to integrate technology in your classes before taking this course.*
   - ❒ Not at all capable
   - ❒ Somewhat capable
   - ❒ Capable
   - ❒ Very capable

8. *Please rate your capacity to integrate technology in your classes after taking this course.*
   - ❒ Not at all capable
   - ❒ Somewhat capable
   - ❒ Capable
   - ❒ Very capable

9. *Has this course affected the way that you teach your class(es)?*
   - ❒ No
   - ❒ Yes (If yes, how?_____)

10. How did the online course format compare to a traditional face-to-face workshop in the following respects…

	Better	About the same	Worse
a. Convenience of timing	❒	❒	❒
b. Convenience of location	❒	❒	❒
c. Expense	❒	❒	❒
d. Ongoing connections to own classroom practice	❒	❒	❒
e. Interactions with colleagues and mentors not available at my site	❒	❒	❒
f. Exposure to diverse perspectives	❒	❒	❒
g. Opportunity to collaborate with peers	❒	❒	❒
h. Opportunity to review discussion archives and summaries	❒	❒	❒
i. Time to be reflective	❒	❒	❒
j. Ability to work at your own pace	❒	❒	❒
k. Opportunity to experience using technology as a learner	❒	❒	❒
l. Resources for future use	❒	❒	❒

11. *Apart from the issues mentioned above, are there any other strengths or benefits of the online course format for professional development?*

12. *Apart from the issues mentioned above, are there any other weaknesses or drawbacks of the online course format for professional development?*

13. *Based on your experience in this course, what uses and opportunities do you see for online professional development in your school or in the district at large?*

Thank you!

Teacher Feedback Survey for Non-completers (TFS)

This survey is for teachers who expressed interest in taking an online professional development course offered through the Professional Development through Technology (PDT2) program, but
a) decided not to participate, or b) initially participated but decided to discontinue the course.

Minneapolis Public Schools has contracted with Wilder Research to evaluate the Professional Development through Technology (PDT2) program. As part of the evaluation, we are asking teachers to take a short survey. The survey will help us better understand how effective the PDT2 online course model is at meeting the professional development needs of teachers.

This survey is completely voluntary and your decision whether or not to participate will not affect your relationship with Minneapolis Public Schools. All the information you share will be kept confidential and private.

If you agree to take this survey, please sign this form by typing your employee number below. This "signature" is needed to fulfill our informed consent requirement. Please rest assured that we will not identify you personally when we report the results of the survey.

If you agree to take this survey, please type your employee ID number below.

Employee ID number: _____

Thank you in advance for your help!

1. *I expressed interest in taking an online professional development course through the Professional Development through Technology program, but…*
   - ❒ I changed my mind and never started the course.
   - ❒ I started the course but decided to discontinue it.

2. *Why did you decide to discontinue (or never start) the course? (CHECK ALL THAT APPLY)*
   - ❒ I became too busy
   - ❒ I wasn't interested enough in the topics
   - ❒ They did not provide a large enough incentive
   - ❒ My internet access was inadequate
   - ❒ I was worried about my technology skill level being too low
   - ❒ I would rather attend a face-to-face workshop (Please explain why:_____)
   - ❒ Other reason (Please explain:_____)

3. *Do you have any suggestions for how MPS can improve the online course model so that it better meets teachers' professional development needs?*
   - ❒ No
   - ❒ Yes (Please share:_____)

4. *How would you rate your capacity to integrate technology in your classes?*
   - ❒ Not at all capable
   - ❒ Somewhat capable
   - ❒ Capable
   - ❒ Very capable

Thank you!

Interview Protocol

Evaluation of the Professional Development through Technology (PDT2) program
Interview Protocol

Interviewer:

Teacher:

School:

Date:

INTRODUCTION

Thank you for taking the time to do this interview with me today.

Before we begin the interview, let me start by providing some background information about this project. The Minneapolis Public Schools have contracted with Wilder Research to evaluate the Professional Development through Technology (or PDT2) program. This program consisted of online professional development courses and virtual learning communities that took place this school year. To be clear, the PDT2 program does not include other experiences you may have had with professional development in technology, such as the Middle Years Laptop Pilot that provided training last spring and laptops for your students. For the purposes of this interview, I would like you to focus specifically on your experience in PDT2.

As you know, our evaluation has included classroom observations and surveys of participating teachers and their students. The final component of the evaluation is interviews with some of the participating teachers. The purpose of the interview is to learn about your experience in PDT2 and any impact it may have had on your integration of technology in the classroom. The results from these interviews, along with the surveys and observations, will help Minneapolis Public Schools make important programmatic decisions to improve the professional development of teachers and enhance technology use in the classroom.

Everything you share with me in this interview will be kept confidential, and your name will not appear in any reporting of the evaluation results. If we pull any quotes from this interview, your name will not be attached to them. This interview will take about 45 to 60 minutes of your time. I would like to record this interview to be sure that I am capturing your thoughts accurately – would that be okay? The recording will only be used to write up my notes.

EXPERIENCE

Let's begin by talking about your experience in the Virtual Learning Community this school year.
ONLY FOR TEACHERS WHO PARTICIPATED IN THE ONLINE COURSES: After we talk about that, then I'd like to talk about your experience in the ____ online course.

1. To begin, could you describe your experience in the Virtual Learning Community?
   [*PROBE for a detailed description*]
   a. When did you participate? (Approximate start and end dates)
   b. What was the topic or focus of the VLC?
   c. How did the VLC work? What did your participation consist of?
   d. How would you rate your level of involvement and engagement? How often were you expected to log in, and how often did you?
   e. *[Anything else noted by the teacher can go here]*

2a. What was your favorite part about participating?

   2b. Were there other aspects of the VLC that worked particularly well?

3a. What was your least favorite part about participating?

   3b. Were there other aspects of the VLC that did not work out so well?

[If not mentioned in 2 or 3, PROBE for: facilitation, content, involvement of and interaction with peers, activities/homework, resources]

4a. How did the VLC format compare to other formats of professional development, such as the traditional face-to-face workshop?

4b. What were the strengths or benefits of the VLC format for professional development?

4c. What were the weaknesses or drawbacks of the VLC format for professional development?

5. Overall, how well would you say the VLC experience met your professional development needs? Why? *(PROBE: Time, place, learning style)*

6. Are there any ways the VLC could be improved that you haven't already mentioned?
ONLY FOR TEACHERS WHO PARTICIPATED IN THE ONLINE COURSES: Now let's talk about your experience in _____ online course(s) this school year. *[Run through questions 1-6 again, this time about the online course(s)]*

IMPACT

[Note to interviewer: Teachers may want to talk about the impacts they perceive the technology has had on their students. However, we do not want to spend time on that topic because it is outside the scope of our evaluation. If needed, redirect the teacher by telling them that the district is responsible for evaluating the impact of the technology on student learning, but that Wilder's evaluation has a more limited scope, focusing on the impact of professional development on increasing the level of technology integration.]

The next set of questions has to do with ways that your experience in PDT2 may have impacted your teaching. Once again, let's begin by talking about your experience in the Virtual Learning Community.

ONLY FOR TEACHERS WHO PARTICIPATED IN THE ONLINE COURSES: Then we'll talk about your experience in the ____ online course.

7a. Has your experience in the VLC had an impact on the way that you integrate technology in your classes?

7b. *IF YES*, how?
[*PROBE for specific examples*]

7bi. What are some of the ways that you and your students have used technology in your classes this school year?

7bii. How, if at all, is this different from how you and your students would have used (or not used) technology before you participated in the VLC?

7c. *IF NO*, why not?
[PROBE: How did the professional development fall short?]

8. Has your experience in the VLC impacted your teaching in any other ways besides how you use technology? *IF YES*, how?
[PROBE: Content, pedagogy, classroom organization, etc.]

9a. Are there any aspects of integrating technology that are still a challenge for you?
IF YES:

9b. Which aspects?

9c. [*IF UNSURE*] Were these aspects addressed in your VLC?

9d. What kinds of resources or support would help you improve in those areas?

10. What could the VLCs do, if anything, to have a greater impact on teachers' integration of technology in the classroom?

ONLY FOR TEACHERS WHO PARTICIPATED IN THE ONLINE COURSES: Let's also talk about the impact, if any, of your experience in the ___ online course(s). *[Run through questions 7-10 again, this time about the online course(s)]*

FINAL THOUGHTS

11. Do you have any additional thoughts or recommendations that you would like to share about the PDT2 program or online professional development in general?

Thank you!

Additional figures

Technology Integration Observation Protocol (TIOP) Tables

A1. Rubrics

Measure	Scale	Average rating Pre (N=10)	Average rating Post (N=10)	Pre-to-post change	Significance (Paired samples *t*)
Primary nature of student activity	0 = Passive/Receiving 4 = Active/Producing	2.06	1.94	-0.11	ns
Students' level of ownership/independence over their interaction with technology	0 = Teacher controls 4 = Students work independently	1.94	2.13	+0.19	ns
Integration of technology as it relates to the lesson objectives	0 = Not related 4 = Integral	3.94	3.63	-0.31	ns
Overall, the use of technology was a seamless part of the lesson	0 = Not at all true 4 = Completely true	3.75	3.25	-0.50	ns

Averaged the two ratings, and then averaged among the teachers

ns not statistically significant

A2. Ratings

Measure	Category	Pre (N=10)	Post (N=10)
Student engagement during technology use	Mixed/Mixed	2	3
	Mixed/High	2	2
	High/High	6	5
		(N=6)	**(N=8)**
Students' level of technical skills	Somewhat skilled/Somewhat skilled	1	1
	Needs lots of help/ independent Somewhat skilled/Independent	1	4
	Independent/Independent	4	3
		(N=10)	**(N=10)**
Classroom management during technology use	None/None None/Minor	7	5
	None/Significant Minor/Minor	1	2
	Minor/Significant Significant/Significant	2	3

Note. *The sample size of 10 classrooms is too small to test for statistical significance.*

A3. Observed objectives of technology use

	Observed in classroom (N=10)	
	At pre-test	At post-test
Teacher's purpose		
For grading, attendance, or material preparation	6	3
To present information	10	10
To demonstrate or model a skill	6	9
To facilitate interactive learning	4	4
To assess student learning or check for understanding	5	3
Other	4	3
Average number of purposes in one class period	*3.5*	*3.2*
Students' purpose		
For free time, leisure, or reward	1	2
To develop technology skills	4	6
To view information	10	10
To learn content-related skills, facts, or concepts	10	8
To practice or reinforce a skill or concept	3	7
To communicate with resource person or peer	-	2
To organize or manage information	4	4
To develop a project	2	3
To conduct research	2	3
To analyze information	1	3
To solve a problem (higher order)	-	-
To construct knowledge (synthesize, generate, invent)	-	-
To demonstrate learning (assessment)	2	4
Other	3	1
Higher order purpose[a]	4	5
Average number of purposes in one class period	*4.2*	*5.3*

Source. *Technology Integration Observation Protocol*

Note. *The sample size of 10 classrooms is too small to test for statistical significance of each purpose. The average number of purposes in one class period did not significantly differ from pre- to post-test for either teachers or students.*

[a] *Unduplicated count if any higher order purpose was observed. Higher order purposes include the following: organizing or managing information, developing a project, conducting research, analyzing information, solving a problem, and constructing knowledge.*

A4. Satisfaction with aspects of the course

Statement	Dosage	n (Percentage indicating agreement[a])	Significance (Pearson X^2)
Overall, this course was of high quality.	High	17 (100%)	ns
	Low	22 (88%)	
The language used in the course was clear and easy to understand.	High	16 (94%)	
	Low	22 (88%)	ns
The course was the right length.	High	15 (88%)	
	Low	23 (92%)	ns
The facilitator was effective.	High	17 (100%)	
	Low	22 (88%)	ns
The information I learned in this course will improve my teaching.	High	17 (100%)	
	Low	23 (92%)	ns
I would recommend this course to other teachers.	High	16 (94%)	
	Low	22 (88%)	ns

[a] *Percentage indicating that they "strongly agree" or "agree" with the statement*

ns not statistically significant

* *p<.05*

Note. *High dosage subgroup N=17, low dosage subgroup N=25.*

A5. Comparison to traditional face-to-face workshop

How did the online course format compare to a traditional face-to-face workshop in the following respects:	Dosage	n (Percentage indicating improvement[a])	Significance (Pearson X^2)
Convenience of timing	High	14 (82%)	ns
	Low	20 (80%)	
Convenience of location	High	17 (100%)	
	Low	25 (100%)	ns
Expense	High	15 (94%)	
	Low	21 (84%)	ns
Ongoing connections to own classroom practice	High	13 (81%)	
	Low	12 (48%)	*
Interactions with colleagues and mentors not available at my site	High	8 (47%)	
	Low	9 (36%)	*
Exposure to diverse perspectives	High	5 (29%)	
	Low	10 (40%)	ns
Opportunity to collaborate with peers	High	6 (35%)	
	Low	10 (40%)	ns
Opportunity to review discussion archives and summaries	High	12 (70%)	
	Low	15 (60%)	ns
Time to be reflective	High	13 (77%)	
	Low	19 (76%)	ns
Ability to work at your own pace	High	13 (81%)	
	Low	21 (88%)	ns
Opportunity to experience using technology as a learner	High	13 (77%)	
	Low	16 (67%)	ns
Resources for future use	High	12 (71%)	
	Low	17 (71%)	ns

[a] *Percentage indicating that the online format is "better" than the traditional format*

ns not statistically significant

* *p<.05*

A6. Capacity to integrate technology in your classes

Statement	Before or After course	N	Not at all capable	Somewhat capable	Capable	Very capable	Significance (Wilcoxon)
Capacity to integrate technology in your classes	Before	42	5%	36%	36%	24%	***
	After	42	-	14%	45%	40%	

*** *p<.001*

A7. Increase in capacity to integrate technology

Group	Total N[a]	Percentage reporting increase in capacity
Total	32	56%
Low dosage	19	47%
High dosage	13	69%

[a] *Excludes teachers who rated themselves as "very capable" at pre-test since these teachers would not have remove for improvement.*

Note. *The difference between low dosage and high dosage is notable, but not statistically significant.*

A8. Students' rating of teacher's technology skill

Question	Survey	N	Very good	Pretty good	Not so good	Very bad	Significance (Wilcoxon)
How good is your teacher at using technology?	Pre-test	158	26%	68%	6%	-	ns
	Post-test	158	30%	65%	4%	1%	

ns Not significant

A9. Students' report of interest level

Statement	Survey	N	More interesting	Less interesting	Neither more nor less interesting	Significance (Wilcoxon)
The way your teacher uses computers and technology makes class…	Pre-test	158	68%	4%	28%	ns
	Post-test	157	73%	6%	21%	

ns Not significant

A10. Students' report of ease of learning

Statement	Survey	N	Easier to learn in this class	Harder to learn in this class	Neither easier nor harder to learn in this class	Significance (Wilcoxon)
The way your teacher uses computers and technology makes it…	Pre-test	158	65%	4%	32%	ns
	Post-test	157	69%	3%	28%	

ns Not significant

A11. Students' rating of student behavior during technology use

Question	Survey	N	Worse than normal	About the same as normal	Better than normal	Significance (Wilcoxon)
How well do students behave in this class when computers and technology are being used?	Pre-test	154	7%	60%	33%	ns
	Post-test	154	5%	62%	34%	

ns Not significant

A12. Students' report: Frequency of using technology in class

In the last month, how often did you use technology in this class to do the following things	Survey	N	Never	Once or twice	Three or more times	Significance (Wilcoxon)
Practice or review things you've learned	Pre-test	149	35%	46%	20%	*
	Post-test	154	22%	60%	18%	
Online research	Pre-test	150	47%	31%	22%	***
	Post-test	153	18%	39%	44%	
Send or receive e-mails or instant messages related to class	Pre-test	149	58%	35%	7%	***
	Post-test	153	40%	48%	12%	
Write stories or reports on the computer	Pre-test	149	48%	38%	14%	***
	Post-test	152	25%	55%	20%	
Analyze information	Pre-test	150	41%	43%	16%	***
	Post-test	152	24%	52%	24%	
Present information using graphs, charts, or maps	Pre-test	151	62%	28%	11%	ns
	Post-test	154	49%	44%	7%	
Work on real-life situations or problems	Pre-test	151	64%	31%	5%	***
	Post-test	154	45%	42%	12%	
Give a presentation to the class	Pre-test	150	63%	27%	10%	ns
	Post-test	154	54%	39%	7%	
Improve your technology skills and knowledge	Pre-test	150	47%	40%	13%	ns
	Post-test	153	41%	47%	12%	
Work on projects with students in other schools	Pre-test	149	81%	14%	5%	ns
	Post-test	154	75%	16%	8%	
Learn basic computer skills (keyboarding, word processing, etc.)	Pre-test	152	72%	20%	7%	ns
	Post-test	150	63%	29%	8%	
Learn advanced computer skills (programming, web page development, etc.)	Pre-test	152	76%	18%	6%	**
	Post-test	150	67%	21%	13%	
Practice for tests or take tests online	Pre-test	152	59%	32%	9%	***
	Post-test	149	32%	54%	14%	
Complete assignments online (Moodle)	Pre-test	154	58%	24%	17%	***
	Post-test	151	34%	38%	28%	
Use online textbooks	Pre-test	151	87%	9%	5%	***
	Post-test	148	68%	26%	6%	
View a video online	Pre-test	151	61%	29%	10%	*
	Post-test	150	52%	37%	11%	

ns *Not significant*

* *p<.05*

** *p<.01*

*** *p<.001*

A13. Most important objectives for student computer use

Objective	Percentage indicating choice At pre-test (N=45) First choice	Second choice	Third choice	Chosen[a]	Percentage indicating choice At post-test (N=45) First choice	Second choice	Third choice	Chosen[a]
Finding out about ideas and information	12 (27%)	13 (29%)	1 (2%)	26 (58%)	21 (47%)	5 (11%)	7 (16%)	33 (73%)
Presenting information to an audience	4 (9%)	4 (9%)	11 (24%)	19 (42%)	3 (7%)	10 (22%)	5 (11%)	18 (40%)
Mastering skills just taught	10 (22%)	3 (7%)	4 (9%)	17 (38%)	7 (16%)	3 (7%)	3 (7%)	13 (29%)
Analyzing information	4 (9%)	3 (7%)	8 (18%)	15 (33%)	4 (9%)	5 (11%)	3 (7%)	12 (27%)
Learning to work collaboratively	1 (2%)	6 (13%)	5 (11%)	12 (27%)	1 (2%)	1 (2%)	7 (16%)	9 (20%)
Expressing themselves in writing	4 (9%)	3 (7%)	3 (7%)	10 (22%)	4 (9%)	7 (16%)	4 (9%)	15 (33%)
Remediation of skills not learned well	2 (4%)	6 (13%)	2 (4%)	10 (22%)	2 (4%)	5 (11%)	1 (2%)	8 (18%)
Improving computer skills	4 (9%)	1 (2%)	3 (7%)	8 (18%)	1 (2%)	6 (13%)	7 (16%)	14 (31%)
Communicating electronically with other people	2 (4%)	1 (2%)	3 (7%)	6 (13%)	1 (2%)	2 (4%)	1 (2%)	4 (9%)
Learning to work independently	-	3 (7%)	2 (4%)	5 (11%)	-	-	6 (13%)	6 (13%)
Other	1 (2%)	1 (2%)	1 (2%)	3 (7%)	-	1 (2%)	-	1 (2%)

Note. *Teachers were asked to select their top three objectives from the list.*

[a] *Percentage of teachers that selected the objective as either their first, second, or third choice.*

A14. Frequency with which teachers do various aspects of teaching

Aspect of teaching approach	Survey	N	Never	Once in a while	Regularly	Very frequently	Significance (Wilcoxon)
Use principles of direct instruction (review, teach, guided practice, individual practice) when planning lessons	Pre-test	45	2%	18%	47%	33%	ns
	Post-test	45	-	14%	48%	39%	
Have many activities going on in the room at the same time	Pre-test	45	-	36%	47%	18%	ns
	Post-test	45	-	38%	42%	20%	
Use the textbook as your primary guide through units	Pre-test	45	40%	24%	36%	-	ns
	Post-test	45	33%	36%	27%	4%	
Let student interest partly influence topics in the lesson	Pre-test	45	2%	40%	51%	7%	ns
	Post-test	45	-	40%	56%	4%	
Closely monitor and supervise students while they work	Pre-test	45	-	-	51%	49%	ns
	Post-test	45	-	-	49%	51%	
Evaluate students through their products instead of tests	Pre-test	45	-	18%	40%	42%	ns
	Post-test	45	-	4%	58%	38%	
Allow yourself to be taught by students	Pre-test	45	-	9%	73%	18%	ns
	Post-test	45	-	18%	62%	20%	

ns Not significant

A15. Frequency with which teachers give certain types of assignments

Type of assignment	Survey	N	Never	Once in a while	Regularly	Very frequently	Significance (Wilcoxon)
Have students teach or help other students	Pre-test	45	-	27%	62%	11%	ns
	Post-test	45	-	27%	56%	18%	
Have students explore a topic on their own, without direction	Pre-test	45	11%	69%	18%	2%	ns
	Post-test	45	4%	76%	18%	2%	
Have students review and revise their own work	Pre-test	45	-	36%	53%	11%	ns
	Post-test	45	-	20%	69%	11%	
Have students make predictions and investigate them	Pre-test	45	2%	38%	42%	18%	ns
	Post-test	45	2%	36%	48%	13%	

ns Not significant

A16. Teachers' self-ratings of knowledge, skills, abilities, and comfort levels

How would you rate your…	Survey	N	Poor	Fair	Good	Excellent	Significance (Wilcoxon)
Skills in using technology	Pre-test	45	2%	18%	60%	20%	**
	Post-test	45	2%	7%	58%	33%	
	Retrospective pre	55	4%	33%	46%	18%	***
	Post-test	56	2%	5%	61%	32%	
Knowledge about the variety of different technologies that can be used in the classroom	Pre-test	45	2%	18%	64%	16%	*
	Post-test	45	2%	9%	64%	24%	
	Retrospective pre	54	6%	48%	32%	15%	***
	Post-test	55	2%	11%	62%	25%	
Ability to learn technology for classroom use	Pre-test	45	-	18%	42%	40%	ns
	Post-test	45	-	13%	48%	38%	
Knowledge about technologies that students can use for learning about your content area	Pre-test	45	4%	27%	58%	11%	ns
	Post-test	45	2%	33%	47%	18%	
Comfort level with planning for class sessions that involve students using technology during instruction	Pre-test	45	2%	36%	36%	27%	ns
	Post-test	45	2%	20%	49%	29%	
Ability to organize and manage your classroom during activities that integrate technology	Pre-test	45	-	24%	49%	27%	ns
	Post-test	45	2%	22%	40%	36%	
Comfort level with using technology to help you gather, analyze, and interpret data on student progress	Pre-test	45	7%	13%	62%	18%	ns
	Post-test	45	2%	22%	42%	33%	

ns Not significant

* *p<.05*

** *p<.01*

*** *p<.001*

A17. Frequency of teachers' use of technology

How often do you use technology to…	Survey	N	Poor	Fair	Good	Excellent	Significance (Wilcoxon)
Adapt instructional activities to students' individual needs	Pre-test	45	4%	31%	44%	20%	ns
	Post-test	45	-	36%	49%	16%	
	Retrospective pre	55	9%	49%	27%	15%	**
	Post-test	56	-	38%	45%	18%	
Facilitate cooperative learning experiences	Pre-test	45	4%	31%	40%	24%	ns
	Post-test	45	4%	27%	56%	13%	
	Retrospective pre	55	13%	47%	31%	9%	**
	Post-test	56	4%	25%	61%	11%	

ns Not significant

** *p<.01*

A18. Frequency of teacher's use of technology for classroom preparation

How often do you…	Survey	N	Never	Once in a while	Regularly	Very frequently	Significance (Wilcoxon)
Learn new technologies to use in your classroom	Pre-test	45	2%	22%	53%	22%	ns
	Post-test	45	-	22%	64%	13%	
Adapt the use of the technologies you are learning about to different teaching activities	Pre-test	45	-	38%	38%	24%	ns
	Post-test	45	-	22%	60%	18%	
Do internet research when planning lessons	Pre-test	45	-	13%	31%	56%	ns
	Post-test	44	-	18%	36%	46%	
Choose technologies that enhance the content for a lesson	Pre-test	45	-	27%	47%	27%	ns
	Post-test	45	-	16%	58%	27%	
	Retrospective pre	55	4%	44%	36%	14%	***
	Post-test	56	-	16%	55%	29%	
Choose technologies that enhance how you teach a lesson	Pre-test	45	2%	31%	38%	29%	*
	Post-test	45	-	16%	54%	30%	
	Retrospective pre	55	2%	42%	38%	18%	***
	Post-test	55	-	18%	53%	29%	

ns Not significant

* *p<.05*

*** *p<.001*

A19. Frequency of teachers' use of technology for assessment

How often do you…	Survey	N	Never	Once in a while	Regularly	Very frequently	Significance (Wilcoxon)
Use online tools or clicker software to create and give tests or quizzes	Pre-test	45	40%	29%	20%	11%	ns
	Post-test	45	33%	38%	18%	11%	
Use student response systems (clickers) to assess student learning	Pre-test	44	43%	25%	21%	11%	ns
	Post-test	45	39%	34%	18%	9%	
Provide alternative assessment opportunities that encourage students to "showcase" their content understanding in nontraditional ways	Pre-test	44	9%	39%	36%	16%	ns
	Post-test	45	7%	36%	47%	11%	
Use technology to manage or interpret student assessment data	Pre-test	45	4%	20%	58%	18%	ns
	Post-test	45	-	22%	56%	22%	
	Retrospective pre	55	9%	46%	29%	16%	***
	Post-test	56	-	21%	57%	21%	

ns Not significant

*** *p<.001*

A20. Frequency of teachers' use of classroom web pages

How often do you…	Survey	N	Never	Once in a while	Regularly	Very frequently	Significance (Wilcoxon)
Create and maintain web pages or Moodle sites for your class	Pre-test	45	27%	20%	38%	16%	*
	Post-test	45	13%	29%	36%	22%	
Post homework assignments or schedule information on web pages or Moodle sites	Pre-test	45	27%	31%	29%	13%	ns
	Post-test	45	27%	38%	24%	11%	

ns Not significant

* *p<.05*

A21. Frequency of teaching technology-related lessons

How often do you teach technology-related lessons that are designed to…	Survey	N	Never	Once in a while	Regularly	Very frequently	Significance (Wilcoxon)
Improve your students' basic skills (e.g., reading, writing, math, computation)	Pre-test	44	5%	48%	41%	7%	ns
	Post-test	45	7%	44%	40%	9%	
Promote increased problem solving and critical thinking	Pre-test	44	5%	48%	36%	11%	ns
	Post-test	45	2%	33%	56%	9%	
	Retrospective pre	55	4%	55%	29%	13%	**
	Post-test	56	2%	32%	57%	9%	
Build students' familiarity with basic computer functions	Pre-test	44	14%	41%	36%	9%	**
	Post-test	45	4%	29%	58%	9%	
Build students' understanding of ethical and legal issues related to technology use	Pre-test	44	25%	50%	23%	2%	**
	Post-test	45	18%	47%	31%	4%	
Cater to students' interests and experiences	Pre-test	44	2%	61%	25%	11%	ns
	Post-test	45	2%	49%	38%	11%	

ns Not significant

** *p<.01*

A22. Characteristics of lessons that included technology use

Statement	Survey	N	None of the time	Little of the time	Some of the time	Most of the time	All of the time	Significance (Wilcoxon)
An outside observer would have seen the technology activity as a seamless part of the lesson	Pre-test	44	-	11%	25%	50%	14%	ns
	Post-test	45	2%	7%	27%	51%	13%	
	Retrospective	55	4%	29%	31%	31%	6%	***
	Post-test	56	2%	5%	30%	48%	14%	
You saw the technology as more trouble than it was worth	Pre-test	44	27%	46%	23%	5%	-	ns
	Post-test	45	36%	38%	24%	-	2%	
The reason for using technology was obvious to you, the students, and others	Pre-test	44	-	2%	11%	68%	18%	ns
	Post-test	45	-	2%	16%	62%	20%	
The students were focused on learning, not on the technology	Pre-test	43	5%	-	28%	63%	5%	ns
	Post-test	45	4%	2%	24%	56%	13%	
	Retrospective	55	2%	18%	33%	42%	6%	***
	Post-test	55	4%	2%	24%	51%	20%	
You could describe how technology was helping a particular student	Pre-test	44	-	11%	27%	43%	18%	ns
	Post-test	45	2%	7%	20%	62%	9%	
You would have had a hard time accomplishing lesson objectives without utilizing technology	Pre-test	44	7%	7%	41%	30%	16%	ns
	Post-test	45	2%	16%	38%	31%	13%	
All students were participating with the technology and benefitting from it	Pre-test	44	2%	9%	14%	57%	18%	ns
	Post-test	45	2%	2%	16%	62%	18%	
	Retrospective	55	2%	11%	44%	38%	6%	***
	Post-test	56	2%	2%	16%	61%	20%	

ns Not significant

*** *p<.001*

A23. Frequency of students' use of technology to accomplish objectives

How often do your students use technology to…	Survey	N	Never	Once in a while	Regularly	Very frequently	Significance (Wilcoxon)
Practice or review topics	Pre-test	43	2%	53%	28%	16%	ns
	Post-test	44	5%	39%	48%	9%	
Visually represent or investigate concepts (e.g., through concept mapping, graphing, reading charts)	Pre-test	43	23%	40%	30%	7%	*
	Post-test	43	7%	56%	26%	12%	
Solve real-world problems (i.e., involving situations, issues, and tasks that people actually tackle in the outside world)	Pre-test	43	21%	58%	19%	2%	**
	Post-test	43	9%	53%	23%	14%	
Improve their technology literacy	Pre-test	44	5%	41%	52%	2%	*
	Post-test	43	2%	35%	56%	7%	

ns Not significant

* *p<.05*

** *p<.01*

A24. Pre-to-post change in students' use of technology to accomplish objectives

How often do your students use technology to…	N	Change in rating from pre to post: Decreased	Maintained low	Maintained high	Increased
Visually represent or investigate concepts (e.g., through concept mapping, graphing, reading charts)	41	15%	29%	20%	37%
Solve real-world problems (i.e., involving situations, issues, and tasks that people actually tackle in the outside world)	41	10%	39%	7%	44%
Improve their technology literacy	42	7%	26%	43%	24%

A25. Frequency of students' use

How often do your students use…	Survey	N	Never	Once in a while	Regularly	Very frequently	Significance (Wilcoxon)
Drill and practice or tutorial software	Pre-test	44	41%	43%	16%	-	ns
	Post-test	45	38%	53%	9%	-	
Digital tools and peripheral devices (e.g., clickers, digital cameras, scanners) to enhance their learning or their school work	Pre-test	44	20%	36%	30%	14%	ns
	Post-test	44	18%	41%	34%	7%	
Authentic technology tools (i.e., the tools that professionals use in their fields)	Pre-test	44	23%	57%	18%	2%	ns
	Post-test	44	25%	50%	23%	2%	
Inquiry-based strategies (i.e., asking and answering questions using multiple sources)	Pre-test	44	11%	52%	30%	7%	**
	Post-test	45	2%	44%	42%	11%	

ns Not significant

** *p<.01*

A26. Pre-to-post change in students' use

		Change in rating from pre to post			
How often do your students use…	N	Decreased	Maintained low	Maintained high	Increased
Inquiry-based strategies (i.e., asking and answering questions using multiple sources)	44	9%	30%	23%	39%

A27. Frequency of students' use of technology

How often do your students…	Survey	N	Never	Once in a while	Regularly	Very frequently	Significance (Wilcoxon)
Work individually using computers	Pre-test	44	-	45%	39%	16%	ns
	Post-test	45	2%	33%	47%	18%	
Work in groups using computers	Pre-test	44	14%	52%	32%	2%	*
	Post-test	45	7%	49%	42%	2%	
Present information to the class using computers	Pre-test	44	32%	43%	16%	9%	*
	Post-test	45	22%	38%	31%	9%	
Conduct online research	Pre-test	44	18%	45%	25%	11%	*
	Post-test	45	13%	42%	29%	16%	
Use the Internet to communicate and collaborate with experts or peers in or beyond your school	Pre-test	44	57%	36%	5%	2%	**
	Post-test	45	36%	38%	24%	2%	
Participate in formal distance learning via the Internet or other interactive media	Pre-test	44	66%	32%	2%	-	ns
	Post-test	45	64%	22%	11%	2%	

ns *Not significant*

* *p<.05*

** *p<.01*

A28. Pre-to-post change in students' use of technology

How often do your students…	N	Change in rating from pre to post: Decreased	Maintained low	Maintained high	Increased
Work in groups using computers	44	14%	32%	20%	34%
Present information to the class using computers	44	14%	36%	11%	39%
Conduct online research	44	11%	39%	20%	30%
Use the Internet to communicate and collaborate with experts or peers in or beyond your school	44	11%	45%	2%	41%

A29. Frequency of students' use of technology to make products

How often do your students use technology to produce…	Survey	N	Never	Once in a while	Regularly	Very frequently	Significance (Wilcoxon)
Print products	Pre-test	44	9%	59%	25%	7%	ns
	Post-test	45	7%	56%	33%	4%	
Pictures/artwork	Pre-test	44	18%	66%	16%	-	*
	Post-test	45	16%	53%	31%	-	
Graphs/charts	Pre-test	44	30%	57%	11%	2%	*
	Post-test	44	25%	45%	30%	-	
Videos/movies	Pre-test	44	59%	36%	5%	-	ns
	Post-test	45	53%	33%	13%	-	
Web pages/sites	Pre-test	44	66%	27%	5%	2%	*
	Post-test	45	49%	33%	18%	-	
Multimedia projects	Pre-test	44	43%	36%	16%	5%	*
	Post-test	44	32%	43%	25%	-	
Products that have real-world audiences	Pre-test	44	48%	41%	11%	-	ns
	Post-test	45	42%	42%	11%	4%	

ns Not significant

** p<.05*

A30. Pre-to-post change in students' use of technology to make products

How often do your students use technology to produce…	N	Change in rating from pre to post: Decreased	Maintained low	Maintained high	Increased
Pictures/artwork	44	16%	48%	7%	30%
Graphs/charts	43	9%	58%	7%	26%
Web pages/sites	44	9%	59%	-	32%
Multimedia projects	43	9%	51%	12%	28%