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FLORIDA'S

ENHANCING EDUCATION THROUGH TECHNOLOGY

Leveraging Laptops: Effective Models for Enhancing Student Achievement

2007-2008 EVALUATION REPORT: Classroom Practices

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Leveraging Laptops: Effective Models for Enhancing Student Achievement

2007-2008 EVALUATION REPORT: Classroom Practices

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Florida's Enhancing Education Through Technology (FL EETT)
Leveraging Laptops: Effective Models for Enhancing Student Achievement

2007-2008 EVALUATION REPORT: Classroom Practices

ABSTRACT

This report summarizes the 2007-2008 evaluation that focused on investigating one primary question: What changes occur in tool-based, student-centered teaching as a result of the infusion of technology and professional development? The research methodology involved the use of trained external researchers from FL EETT schools conducting multi-class and targeted classroom observations in each participating school during two time periods: baseline (Fall 2007) and end of year one (Spring 2008). A total of 267 hours of direct classroom observations were conducted in 494 FL EETT classrooms in 61schools representing 11 districts. Observation data were collected with the School Observation Measure (SOM©) and the Observation of Computer Use (OCU©). The SOM was used to collect data regarding overall classroom activities, while the OCU was used to assess student use of computers. Both descriptive and inferential analyses were conducted. The Mantel-Haentzel procedure was used to infer statistical differences between the fall and spring classroom observations.

Positive trends were seen from both the multi-class and targeted SOM and OCU classroom observation results, yet there were only significant differences between fall 2007 and spring 2008 for two items. Specifically, SOM targeted results revealed a significant increase in teacher "Use of higher-level questioning strategies" and a significant decrease in the use of "Independent seatwork (self-paced worksheets, individual assignments)" for students. The most notable positive fall to spring increases were with student engagement in experiential, hands-on learning activities, teacher use of higher-level questioning strategies, use of project-based learning, cooperative learning, and classroom teachers acting as a coach or facilitator during student-centered learning activities. The changes most directly aligned with the Florida EETT goals were the increased frequency with which students were observed using the laptops as learning tools and with which "Meaningful use of computers" and "Very meaningful use of computers" were observed in the FL EETT classrooms.

These results reveal that the FL EETT program introduced positive changes in classroom practices, such as shifting from more traditional teacher-directed instruction to student-centered learning that engaged learners in higher-order thinking and use of computers as problem-solving tools. However, the data also reflected a couple of trends that reveal the need for continued professional development. First, there was a slight decrease in the frequency with which high academically-focused class time was seen during spring targeted observations. Second, although the use of student-centered practices increased between the fall and spring observations, the frequency with which they were observed was still fairly limited. An additional consideration when reviewing the evaluation results is the possible bias that may occur due to observer involvement in the Florida EETT program.

2007-2008 EVALUATION REPORT: CLASSROOM PRACTICES

This report summarizes the evaluation of the 2007-2008 classroom practices in the Florida EETT program. The overall purpose of the evaluation was twofold: (a) to provide evidence of EETT program implementation progress as demonstrated through classroom practices; and (b) to provide formative evaluation data of classroom practices as a basis for guiding improvement planning. The evaluation question, participants, instrumentation, procedures, and results are provided in the sections to follow.

EVALUATION QUESTION

This evaluation was focused toward investigating one primary question: What changes occur in tool-based, student-centered teaching as a result of the infusion of technology and professional development?

METHODOLOGY

The methodology chosen to address the evaluation question was to conduct direct classroom observations in each participating Florida EETT school during two time periods: baseline (fall 2007) and end of year one (spring 2008). Trained external researchers from Florida EETT schools conducted both multi-class and targeted observations. The two types of observations were used to more thoroughly investigate the program's impact on classroom practices. The intent of the multi-class observations was to identify laptop integration practices that routinely occur on a day-to-day basis. Conversely, targeted observations were prescheduled, which allowed teachers to demonstrate their best practices with regard to integrating the use of laptops into classroom instruction. Details of the participants, observation measures, and procedures are below.

Participants

A total of 230 Florida laptop teachers and approximately 6,000 students from 61 schools participated in the observation activities. The schools represented 11 districts from rural Florida as

well as major metropolitan areas distributed across the state. Of the 61 schools, 23 were elementary schools, 21 middle schools, and 17 were high schools.

Measures and Procedures

External researchers completed extensive training to conduct both multi-class and targeted classroom observations of Florida EETT classrooms with two data collection instruments: the School Observation Measure (SOM©), and the Survey of Computer Use (SCU©). The SOM was used to collect data regarding overall classroom activities, while the SCU was used to assess student use of computers.

The *multi-class* procedure involved an observer visiting 10-12 randomly selected laptop classrooms for 15 minutes each during a three-hour visitation period. At the conclusion of the three-hour visit, the observer summarized the frequency with which the SOM and SCU strategies were observed across all classes on a data summary form. *Targeted* observations involved observing laptop classrooms during prearranged 45- to 90-minute sessions in which randomly selected Florida EETT teachers were asked to implement a prepared lesson that integrated the use of laptops. Notes forms were completed by the observer every 15 minutes of the lesson, and then summarized on a data summary form at the end of the session.

SOM. The SOM was developed to determine the extent to which different common and alternative teaching practices are used throughout an entire school or program (Ross, Smith, & Alberg, 1999). The observer examines classroom events and activities descriptively, not judgmentally. Notes are taken relative to the use or nonuse of 24 target strategies. The notes form also contains two global items that use a three-point scale (low; moderate; high) to rate the degree of academically focused instructional time and degree of student attention and interest, respectively. The frequency is recorded via a 5-point rubric that ranges from (0) Not Observed to (4) Extensively. The same 5-point scale is used to summarize how frequently *high* academically-focused class time and *high* student interest/attention are observed.

To ensure the reliability of data, observers receive a manual with definitions of terms, examples and explanations of the target strategies, and a description of procedures for completing the instrument. The target strategies include traditional practices (e.g., direct instruction and

independent seatwork), and alternative, predominately student-centered methods associated with educational reforms (e.g., cooperative learning, project-based learning, inquiry, discussion, using technology as a learning tool). The strategies were identified through surveys and discussions involving policy makers, researchers, administrators, and teachers, as those most useful in providing indicators of schools' instructional philosophies and implementations of commonly used reform designs (Ross, Smith, Alberg, & Lowther, 2001).

In a 2004 reliability study reported by Sterbinsky and Burk, observer ratings were within one category for 96% of the multi-class observations, and for 91% of the targeted observations.

OCU. A companion instrument to the SOM is the Observation of Computer Use (OCU) (Lowther & Ross, 2007). The OCU was derived from the Survey of Computer Use, but extends the computer activities to include newer uses of technology that are described in the section below. The OCU was completed as part of the SOM observation sessions, during which OCU data were also recorded in 15-minute intervals by the observer, and then summarized on an overall data form.

The OCU was designed to capture exclusively *student* access to, ability with, and use of computers rather than teacher use of technology by recording four types of data: (a) computer capacity, currency, and configuration; (b) student computer ability; (c) digital devices used by students; and (d) student activities while using computers. *Computer Capacity and Currency* refers to the age, Internet connectivity, and type of computers available for student use. *Configuration* refers to the number of students working at each computer (e.g., alone, in pairs, in small groups). *Student Computer Ability* was assessed by recording the number of students who were computer literate (i.e., easily used software features/menus) and the number of students who easily used the keyboard. The *Digital Devices* section refers to desktop and laptop computers, portable devices such as a PDA or iPod, graphing calculators, information processors (e.g., Alphaboard), and any type of digital accessories (cameras, scanners, or science probes).

The next section of the OCU focuses on student use of computers with regard to: the types of activities, the subject areas of activities, and the software being used. The computer activities are divided into four categories based on the type of software tool: production tools,

Internet/research tools, educational software, and testing software. Within each category, primary types of software are identified. The software types for production tools and Internet/research were updated, as noted in the following descriptions. For example, under Production Tools, the software includes word processing, databases, spreadsheets, draw/paint/graphics, presentation (e.g., PowerPoint®), authoring (e.g., KidPix®), concept mapping (e.g., Inspiration), and planning (MS Project®). The OCU has the following added to the production tools: digital audio (e.g., Audacity, GarageBand, and Mixcraft), and digital video (e.g., iMovie, Movie Maker). The Internet/Research Tools include Information Search (formerly Internet browser), Web Posting (e.g., wiki, podcasting), Interactive Learning (e.g., live cams, virtual manipulatives), and CD reference (encyclopedias, etc.). This section also includes Communications, which has now been divided into two categories: Synchronous Communication (e.g., chats, video/audio conferencing), and Asynchronous Communication (e.g., email, discussion boards, lists). The Educational Software categories remained the same: drill/practice/tutorial, problem solving (e.g., Riverdeep™), and process tools (e.g., Author's Toolkit™); as did the testing Software, which included individualized/tracked (Accelerated Reader™), generic, and other.

With this type of recording system, several activities can be noted during the observation of one student working on a computer. For example, if a student gathered data from the Internet, created a graph from the data, and then imported the graph into a PowerPoint presentation, the observer would record three types of software tools as being observed: Internet browser, spreadsheet, and presentation. This section of the OCU ends by identifying the subject area of each computer activity. The categories include language arts, mathematics, science, social studies, other, and none. The computer activities and software being used are summarized and recorded using a five-point rubric that ranges from (0) Not Observed to (4) Extensively Observed.

The final section of the OCU is an "Overall Rubric", designed to assess the degree to which the activity reflects "meaningful use" of computers *as a tool* to enhance learning as defined by the National Educational Technology Standards for students (ISTE, 2007). The rubric has four levels: 1) Low-level use of computers; 2) Somewhat meaningful; 3) Meaningful; and 4) Very meaningful. Reliability data for the OCU (SCU) show that observer ratings were within one

category for 97% of the multi-class observations and for 91% of the targeted observations (Sterbinsky & Burke, 2004).

Data Collection

A data collection summary of the Florida EETT classroom observations is presented in Table 1. A total of 267 hours of direct classroom observations (multi-class = 147; targeted = 120) were conducted in 494 FL EETT classrooms.

TABLE 1

Data Collection Summary

Type	Instrument	Number Collected		Classrooms Observed		Schools Involved*		Procedure
		Fall	Spring	Fall	Spring	Fall	Spring	
Multi-Class Observations	SOM OCU	23 25	24 23	169	205	16	16	Multi-class observations were three- hour sessions in which external researchers observed about 10 randomly selected classes for 15 minutes each. The purpose was to obtain a program-wide perspective on common teaching practices and the use of technology in EETT laptop classrooms.
Targeted Classroom Observations	SOM OCU	67 66	53 53	67	53	34	26	Targeted observations were pre-arranged one-hour sessions in which EETT teachers were asked to demonstrate a prepared lesson using laptops. Note forms were completed every 15 minutes of the lesson.

*Numbers do not include Broward. Broward had 13 schools-all Multi class-spring and fall-but these were not included in the aggregate because they were on fall spring schedules-they will receive a school-level report.

Data Analysis

The majority of observation results for both SOM and SCU are in an ordinal scale of measurement, which usually fails to have a normal distribution. In addition, the observations in the 2007-08 school year were collected twice: once in fall 2007 (pre), then in spring 2008 (post). Thus, to account for data stratified in nature and with particular characteristics (i.e., ordinal response data and repeated measures), the Mantel-Haentzel procedure was used to infer statistical differences between the pre- and post-classroom observations.

Two statistics, Q_{SMH} and Q_{CSMH}, were reported. The statistic Q_{SMH} was used to measure the trend (e.g., increase or decrease) in the value of responses between observations, while

Q_{CSMH} was used to detect whether the mean responses were the same across the measurement time points (pre = fall and post = spring). As data from both SOM and OCU are complete (i.e., without missing values), the Q_{SMH} and Q_{CSMH} outcomes are identical in value (see Tables 3, 5, 7 and 9). For multiple comparisons, the Bonferroni adjustment was used on the alpha level to control the experimental-wise error. However, as the conservative nature of the analyses required raising the significance level (from 0.05 to 0.0019 for SOM and 0.0012 for OCU), *p*-values approaching the adjusted significance level (i.e., p<.01) are also discussed. Effect sizes were computed by dividing the mean difference by the pooled standard deviation. Except where noted, a positive sign before the effect size is indicative of outcomes favoring the spring (post) over the fall (pre) observation results, while a negative sign reveals that the fall had higher ratings than the spring.

RESULTS

The results of the study are presented below by data collection strategy: *multi-class* and *targeted* observations. Within these categories, data are presented by observation measure (SOM; OCU). In the Conclusion section, findings are synthesized across the two instruments to address the evaluation question.

Multi-Class Observation Results

A total of 49 multi-class observations (fall *n* = 25; spring *n* = 24) were conducted in 16 Florida schools, which yielded approximately 147 hours of direct observation. The SOM and OCU instruments were used to collect data from unannounced, random visits to 374 classrooms, 169 in the fall and 205 classrooms in the spring. Descriptive and inferential results from the multi-class visits are presented below by observation instrument.

Multi-Class SOM

When examining SOM observation data collected during random, unannounced visits during the fall and spring semesters, positive trends are revealed in routine teaching strategies as well as student activities (see Table 2 and Figure 1). Overall, the two most notable fall to spring changes, as represented by Cohen's *d* effect sizes, were increased student engagement in

experiential, hands-on learning activities (*d* = 0.854), and teacher use of higher-level questioning strategies (*d* = 0.851). Additional favorable changes included increased use of project-based learning (*d* = 0.586), students working in cooperative/collaborative learning groups (*d* = 0.553), and classroom teachers acting as a coach or facilitator during student-centered learning activities (*d* = 0.517). The change most directly aligned with the Florida EETT goals was the increased frequency with which students were observed using the laptops as learning tools (*d* = 0.496).

Further support suggesting a positive influence of the FL EETT program is seen when examining the spring results in comparison with CREP's normative data that reflects instructional practices from 2,970 control classrooms for a state-funded technology grant (see Table 2). Although this study did not include inferential analyses for a statistical comparison, the FL EETT mean scores were directionally more positive than the CREP Norms on SOM items associated with reformed classrooms that implement student-centered approaches. Of particular interest was the greater frequency with which students worked in cooperative groups (FL *M* = 1.58; Norm *M* = 0.87), worked on projects (FL *M* = 1.38; Norm *M* = 0.45), engaged in experiential hands-on learning (FL *M* = 1.83; Norm *M* = 0.91), and, most critically, student use of technology as a learning tool or resource (FL *M* = 2.14; Norm *M* = 0.67).

The FL EETT data also revealed decreases in some classroom activities that are associated with more traditional instructional practices. For example, teacher use of direct instruction, such as lecturing, was less frequently observed during spring observations as compared to fall observations (*d* = -0.161). This trend was also reflected in the normative data, as direct instruction was seen less frequently in FL EETT classes (FL *M* = 2.38; Norm *M* = 2.90). Additionally, there was a decline in the use of the computers as a means of delivering instruction, rather than as a tool used by students in a less traditional setting (*d* = -0.485). However, one fall to- spring decline does reflects a less positive change as high academically-focused class time was seen less frequently during spring observations (fall *n* = 2.96; spring *n* = 2.58; *d* = -0.418). The normative data also reflect this trend with a higher mean score than FL EETT (FL *M* = 2.58; Norm *M* = 3.17).

TABLE 2

Multi-Class School Observation Measure (SOM) 2007-2008

Fall (Baseline) *n* = 23 (169 Classrooms from multiple grades)
Spring *n* = 24 (205 Classrooms from multiple grades)
CREP Norm *n* = 26 (2,970 classrooms from multiple grades)

The extent to which each of the following was observed in the classroom.		Percent Observed			Florida EETT			CREP Norm	
		None or Rarely	Occasionally	Frequently or Extensively	Mean	Standard Deviation	Effect Size (*d*)	Mean	Standard Deviation
Instructional Orientation									
Direct instruction (lecture)	Baseline	17.4	21.7	60.8	2.57	1.20	-0.161	2.90	0.99
	Spring	33.4	8.3	58.4	2.38	1.21			
Team teaching	Baseline	86.9	13.0	0.0	0.48	0.73	-0.469	0.38	0.62
	Spring	100.0	0.0	0.0	0.21	0.41			
Cooperative/collaborative learning	Baseline	65.2	30.4	4.3	1.04	0.93	0.553	0.87	0.89
	Spring	50.0	25.0	25.0	1.58	1.06			
Individual tutoring (teacher, peer, aide, adult volunteer)	Baseline	82.6	17.4	0.0	0.43	0.79	0.238	0.35	0.67
	Spring	79.2	16.7	0.0	0.63	0.92			
Classroom Organization									
Ability groups	Baseline	87.0	13.0	0.0	0.35	0.71	0.226	0.47	0.90
	Spring	83.3	8.3	8.3	0.54	0.98			
Multi-age grouping	Baseline	82.6	8.7	8.7	0.65	1.23	0.213	0.45	1.06
	Spring	75.0	8.3	16.6	0.92	1.35			
Work centers (for individuals or groups)	Baseline	86.5	4.3	8.7	0.48	0.95	0.064	0.74	0.87
	Spring	87.5	8.3	4.2	0.54	0.98			
Instructional Strategies									
Higher level instructional feedback (written or verbal) to enhance student learning	Baseline	65.2	30.4	4.3	1.09	0.90	0.476	1.22	1.16
	Spring	50.0	25.0	25.0	1.58	1.18			
Integration of subject areas (interdisciplinary/thematic units)	Baseline	91.3	8.7	0.0	0.48	0.67	0.347	0.33	0.60
	Spring	79.2	16.7	4.2	0.75	0.90			
Project-based learning	Baseline	78.2	17.4	4.3	0.78	0.90	0.586	0.45	0.66
	Spring	58.4	16.7	25.0	1.38	1.17			
Use of higher-level questioning strategies	Baseline	60.9	26.1	13.0	1.09	1.12	0.851	1.73	1.19
	Spring	29.2	37.5	33.4	2.08	1.25			
Teacher acting as a coach/facilitator	Baseline	34.7	43.5	21.7	1.78	1.28	0.517	2.22	1.18
	Spring	25.0	20.8	54.1	2.42	1.25			
Parent/community involvement in learning activities	Baseline	100.0	0.0	0.0	0.04	0.21	-0.278	0.15	0.40
	Spring	100.0	0.0	0.0	0.00	0.00			
Student Activities									
Independent seatwork (self-paced worksheets, individual assignments)	Baseline	47.8	30.4	21.7	1.52	1.08	0.459	2.62	0.90
	Spring	37.5	16.7	45.8	2.00	1.06			
Experiential, hands-on learning	Baseline	80.1	17.4	4.3	0.83	0.89	0.854	0.91	0.86
	Spring	41.7	25.0	33.4	1.83	1.43			
Systematic individual instruction (differentiated assignments geared to individual needs)	Baseline	100.0	0.0	0.0	0.17	0.39	0.343	0.11	0.49
	Spring	83.3	8.3	8.3	0.42	0.97			

The extent to which each of the following was observed in the classroom.		Percent Observed			Florida EETT			CREP Norm	
		None or Rarely	Occasionally	Frequently or Extensively	Mean	Standard Deviation	Effect Size (*d*)	Mean	Standard Deviation
Sustained writing/composition (self-selected or teacher-generated topics)	Baseline	82.6	13.0	4.3	0.65	0.88	-0.283	0.37	0.55
	Spring	83.3	16.7	0.0	0.42	0.78			
Sustained reading	Baseline	86.9	13.0	0.0	0.39	0.72	0.386	0.97	0.89
	Spring	83.3	16.7	0.0	0.67	0.76			
Independent inquiry/research on the part of students	Baseline	78.3	13.0	8.7	0.78	1.00	0.184	0.34	0.58
	Spring	70.9	20.8	8.3	0.96	1.00			
Student discussion	Baseline	56.5	39.1	4.3	1.17	1.07	0.143	1.04	1.29
	Spring	58.3	16.7	25.0	1.33	1.20			
Technology Use									
Computer for instructional delivery (e.g. CAI, drill & practice)	Baseline	21.7	21.7	56.5	2.39	1.16	-0.485	0.75	0.80
	Spring	37.5	33.3	29.1	1.83	1.20			
Technology as a learning tool or resource (e.g. Internet research, spreadsheet or database creation)	Baseline	39.1	39.1	21.7	1.52	1.27	0.496	0.67	0.76
	Spring	37.5	20.8	41.7	2.14	1.40			
Assessment									
Performance assessment strategies	Baseline	86.9	13.0	0.0	0.48	0.73	0.402	0.30	0.75
	Spring	70.8	16.7	12.5	0.88	1.23			
Student self-assessment (portfolios, individual record books)	Baseline	82.6	17.4	0.0	0.48	0.79	0.462	0.16	0.57
	Spring	70.5	12.5	16.7	0.96	1.27			
Summary Items									
High academically focused class time	Baseline	0.0	21.7	78.3	2.96	0.64	-0.418	3.17	1.02
	Spring	16.6	16.7	66.7	2.58	1.14			
High level of student attention, interest, engagement	Baseline	0.0	47.8	52.2	2.61	0.66	-0.085	3.00	1.04
	Spring	8.3	29.2	62.5	2.54	0.98			

Scale: 0 = Not Observed; 1 = Rarely; 2 = Occasionally; 3 = Frequently; 4 = Extensively

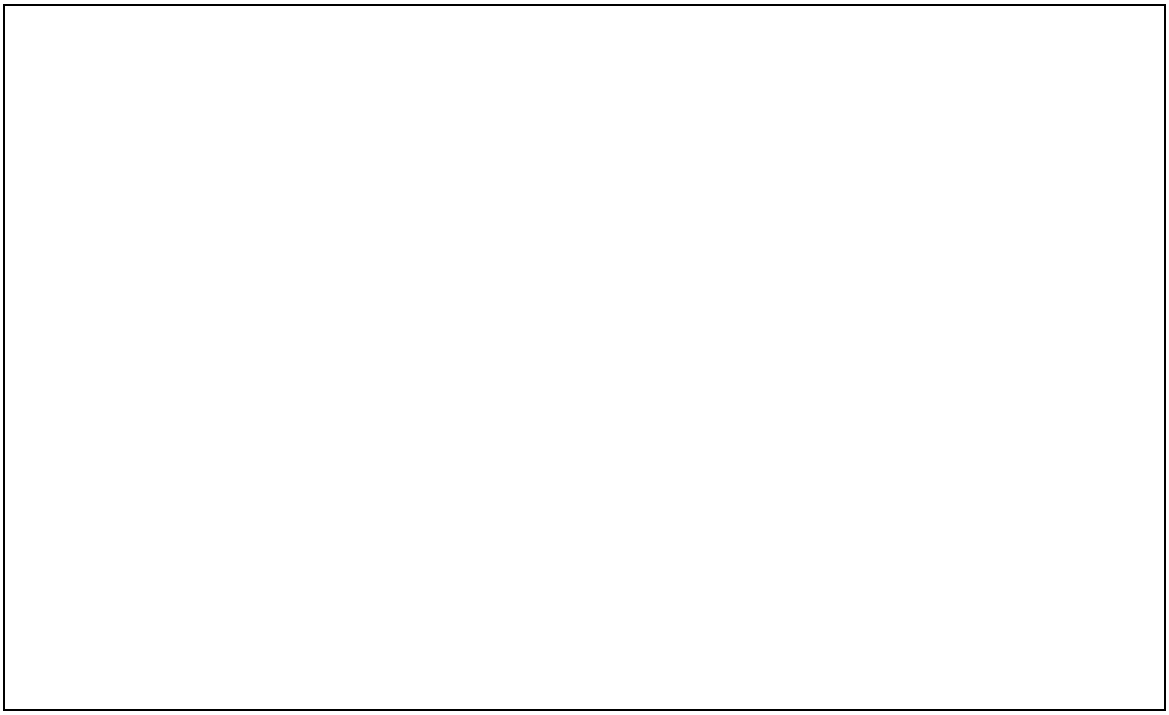

Figure 1. Multi-Class SOM: Fall vs. Spring Differences with Effect Sizes of *d* = 0.50 or higher

SOM Multi-Class Inferential Analyses

While not reaching statistical significance, there were notable increases ($p < .01$) from fall 2007 to spring 2008 (see Table 3) in "Use of higher-level questioning strategies" ($Q_{SMH} = Qc_{SMH} = 7.121$, $p = 0.0076$, $d = 0.851$) and "Experiential, hands-on learning" ($Q_{SMH} = Qc_{SMH} = 7.160$, $p = 0.0075$, $d = 0.854$). The corresponding effect sizes (0.851 and 0.854 respectively) were also very large (see Table 3). In addition, as seen in Table 3, the effect sizes between fall and spring for several items reached nearly a half standard deviation (i.e., nearly 0.500).

TABLE 3

SOM Multi-Class Means Comparison between Fall and Spring Using Mantel-Haenszel Test

Item	Q_{SMH}	p	Q_{CSMH}	p
Instructional Orientation				
Direct instruction (lecture)	0.298	0.5854	0.298	0.5854
Team teaching	2.378	0.1231	2.378	0.1231
Cooperative/collaborative learning	3.266	0.0707	3.266	0.0707
Individual tutoring (teacher, peer, aide, adult volunteer)	0.580	0.4463	0.580	0.4463
Classroom Organization				
Ability groups	0.604	0.4371	0.604	0.4371
Multi-age grouping	0.498	0.4803	0.498	0.4803
Work centers (for individuals or groups)	0.052	0.8196	0.052	0.8196
Instructional Strategies				
Higher-level instructional feedback (written or verbal) to enhance student learning	2.533	0.1115	2.533	0.1115
Integration of subject areas (interdisciplinary/thematic units)	1.371	0.2417	1.371	0.2417
Project-based learning	3.533	0.0602	3.533	0.0602
Use of higher-level questioning strategies	7.121	0.0076**	7.121	0.0076
Teacher acting as a coach/facilitator	2.840	0.0919	2.840	0.0919
Parent/community involvement in learning activities	1.044	0.3070	1.044	0.3070
Student Activities				
Independent seatwork (self-paced worksheets)	2.271	0.1319	2.271	0.1319
Experiential, hands-on learning	7.160	0.0075**	7.160	0.0075
Systematic individual instruction (differential assignments geared to individual needs)	1.233	0.2669	1.233	0.2669
Sustained writing/composition (self-selected or teacher-generated topics)	0.945	0.3309	0.945	0.3309
Sustained reading	1.594	0.2068	1.594	0.2068
Independent inquiry/research on the part of students	0.369	0.5437	0.369	0.5437
Student discussion	0.233	0.6293	0.233	0.6293
Technology Use				
Computer for instructional delivery (e.g., CAI, drill & practice)	2.531	0.1117	2.531	0.1117
Technology as a learning tool or resource (e.g., Internet research, spreadsheet creation)	2.614	0.1059	2.614	0.1059

Item	Q_{SMH}	*p*	Q_{CSMH}	*p*
Assessment				
Performance assessment strategies	1.764	0.1842	1.764	0.1842
Student self-assessment (portfolios, individual record books)	2.332	0.1268	2.332	0.1268
Summary Items				
High academically focused class time	1.861	0.1725	1.861	0.1725
High level of student attention/interest/engagement	0.077	0.7813	0.077	0.7813

** p<.0019; ** p<.01*

Multi-Class OCU

Random, unannounced fall and spring visits to FL EETT classrooms revealed that there was increased access to up-to-date, Internet-connected computers during the spring observations. Specifically, as seen in Table 4, the number of classrooms with "11 or more" computers available for student use increased from 48.0% in the fall to 56.5% in the spring, with 95.7% of the computers observed in the spring considered to be "Up-to-date", and 100% of them connected to the Internet. Understandably, with increased access to computers, there was also an increase in the percentage of classrooms in which the laptops were used by "nearly all" of the students observed during classroom visits (fall = 28.0%; spring = 43.5%). The results also showed an impressive increase in the percentage of students rated with "very good" computer literacy skills (Fall = 20.0%; Spring = 69.6%) and keyboarding skills (Fall = 20.0%; Spring = 60.9%). Although there was a slight increase in the percentage of classrooms in which student use of desktop computers was "Frequently" to "Extensively" observed (Fall = 20.0%; Spring = 30.4%), as would be expected there was a substantial increase in the frequency with which students were observed using laptop computers during the spring classroom visits (60.9%) as compared to the fall visits (36.0%).

TABLE 4

Multi-Class OCU Descriptive Data Summary of Computer Capacity, Currency, Configuration, Student Computer Ability, and Use of Digital Devices

Fall *n* = 25 (169 Classrooms)
Spring *n* = 23 (205 Classrooms)

Computer Capacity, Currency and Configuration	Florida EETT	Percent Observed
Percentages of classrooms with the following numbers of computers or digital tools:		
None; One, or 2 -4	Baseline	32.0
	Spring	17.3
5 – 10	Baseline	20.0
	Spring	26.1
11 or more	Baseline	48.0
	Spring	56.5
Percentages of classrooms in which the majority of computers were:		
Up-to-date	Baseline	76.0
	Spring	95.7
Aging, but adequate	Baseline	08.0
	Spring	04.3
Outdated/limited capacity	Baseline	04.0
	Spring	00.0
Percentages of classrooms in which the majority of computers were:		
Connected to the Internet	Baseline	84.0
	Spring	100.0
Percentage of classrooms in which computers or digital tools were used by:		
Few (less than 10%) to Some (about 10-50%) students	Baseline	20.0
	Spring	39.1
Most (about 51-90%) students	Baseline	28.0
	Spring	17.4
Nearly all (91-100%) students	Baseline	28.0
	Spring	43.5
Percentage of classrooms in which students worked with computers or digital tools:		
Alone	Baseline	64.0
	Spring	56.5
In pairs or small groups	Baseline	12.0
	Spring	34.8

Student Computer Ability	Florida EETT	Percent Observed
Percentage of classrooms in which student computer literacy skills were:		
Poor	Baseline	04.0
	Spring	00.0
Moderate	Baseline	36.0
	Spring	13.0
Very good	Baseline	20.0
	Spring	69.6
Not observed	Baseline	40.0
	Spring	17.4

Student Computer Ability	Florida EETT	Percent Observed
Percentage of classrooms in which student keyboarding skills were:		
Poor	Baseline	08.0
	Spring	00.0
Moderate	Baseline	32.0
	Spring	17.4

Student Computer Ability	Florida EETT	Percent Observed
Very good	Baseline	20.0
	Spring	60.9
Not observed	Baseline	40.0
	Spring	21.7

Digital Devices Used by Students		Not or Rarely Observed	Occasionally	Frequently or Extensively
Desktop Computers	Baseline	68.0	12.0	20.0
	Spring	52.1	17.4	30.4
Laptop Computers	Baseline	48.0	16.0	36.0
	Spring	21.7	17.4	60.9
Portable Digital Devices (PDA, iPod)	Baseline	96.0	00.0	04.0
	Spring	100.0	00.0	00.0
Graphing Calculator	Baseline	100.0	00.0	00.0
	Spring	100.0	00.0	00.0
Information Processor (e.g., Alphaboard)	Baseline	96.0	04.0	00.0
	Spring	95.6	04.3	00.0
Digital Accessories (e.g., camera, scanner, probes)	Baseline	76.0	08.0	16.0
	Spring	91.3	08.7	00.0

Note. Item percentages may not total 100% because of missing data

Student Computer Activities. Students were observed using all of the OCU computer applications during the multi-class visits, with the exception of "Synchronous Communication" (e.g., chats, video/audio conferences) and "Generic" test software (See Table 5). The most frequently observed computer activity during the fall (M = 1.20) and the spring (M = 1.22) classroom visits was student use of the Internet to conduct "Information Searches" with a browser such as Netscape Navigator or Internet Explorer. Notable fall to spring increases were seen for two production tool applications: "Draw, paint, and/or graphics" (Fall M = 0.44, Spring M = 0.96; d = +0.560), and "Presentation" (Fall M = 0.76, Spring M = 1.17; d = +0.403). Similarly, a fall to spring decrease also represents a trend aligned to the FL EETT goals, in that students were observed using "Drill and Practice", a traditional use of computers, less frequently in the spring (M = 0.57) than during the fall (M = 0.80). The frequency with which the remaining applications were observed during spring observations was fairly limited, as evidenced in mean scores that ranged from M = 0.04 for "Database" and "Spreadsheet" to M = 0.96 for "Word Processing", on a scale where 1.00 represents "Rarely Observed".

As seen with the SOM outcomes, when examining the spring OCU results in comparison with CREP's normative data representing 2,970 control classrooms for a state-funded technology

grant (see Table 5), positive trends are revealed. Specifically, the FL EETT mean scores were directionally higher than the CREP Norms on OCU items.

The spring data show that the most frequently observed subject area for three of the four types of computer activities was language arts: Production tools = 56.6%; Internet/Research tools = 34.8%; and Testing Software = 26.1%. Whereas, the focus of education software observed in use by the students was most frequently mathematics (43.5%).

Meaningfulness of Computer Activities. The observed activities in which students used computers demonstrated a positive shift from lower-level to more meaningful uses of computers (See Table 5). For example, "low-level uses of computers" (defined as "activities in general required no critical thinking, e.g., used computer applications for copying text or free-time drawing, or used educational software for drill & practice, tutorials, or games,") was observed occasionally to extensively during 32% of the fall classroom visits as compared to 17.3% during the spring observations. Conversely, a dramatic increase was seen in "Meaningful use of computers" (Fall *M* = 1.12, Spring *M* = 1.78, *d* = +0.508), in which "activities were problem-based, required some critical thinking skills, and some use of computer applications to locate and/or process information or some manipulation of educational software variables to reach solutions." Additionally, it should be noted that this category was observed Extensively to Occasionally in 60.9% of the spring multi-class visits. Also impressive was the increase in the frequency with which "Very meaningful use of computers" was observed in the FL EETT classrooms (Fall *M* = 0.68, Spring M = 1.39, *d* = +0.540).

TABLE 5

Multi-Class OCU Descriptive Data Summary of Student Computer Activities, Meaningfulness, and Subject Area of Computer Use

Fall *n* = 25 (169 Classrooms from multiple grades)
Spring *n* = 23 (205 Classrooms from multiple grades)
CREP Norm *n* = 26 (2,970 classrooms from multiple grades)

Student Computer Activities The extent to which each of the following was observed in the classroom.		**Percent Observed** None or Rarely	Occasionally	Frequently or Extensively	**Florida EETT** Mean	Standard Deviation	Effect Size (*d*)	**CREP Norm** Mean	Standard Deviation
Production Tools Used by Students									
Word Processing	Baseline	68.0	20.0	12.0	0.92	1.22	0.035	0.19	0.49
	Spring	69.5	17.4	13.0	0.96	1.11			
Database	Baseline	96.0	0.0	4.0	0.12	0.60	-0.179	0.01	0.14
	Spring	100.0	0.0	0.0	0.04	0.21			
Spreadsheet	Baseline	96.0	0.0	4.0	0.20	0.82	-0.268	0.02	0.15
	Spring	100.0	0.0	0.0	0.04	0.21			
Draw/Paint/Graphics	Baseline	88.0	8.0	4.0	0.44	0.82	0.560	0.04	0.22
	Spring	56.5	39.1	4.3	0.96	1.07			
Presentation (e.g., MS PowerPoint)	Baseline	72.0	24.0	4.0	0.76	0.97	0.403	0.11	0.43
	Spring	56.5	30.4	13.0	1.17	1.11			
Authoring (e.g., HyperStudio)	Baseline	96.0	4.0	0.0	0.08	0.40	0.119	0.01	0.10
	Spring	95.6	4.3	0.0	0.13	0.46			
Concept Mapping (e.g., Inspiration)	Baseline	96.0	4.0	0.0	0.28	0.54	0.031	0.00	0.00
	Spring	91.3	4.3	4.3	0.30	0.76			
Planning (e.g., MS Project)	Baseline	96.0	4.0	0.0	0.08	0.40	0.025	0.01	0.13
	Spring	95.7	4.3	0.0	0.09	0.42			
Digital Audio e.g., Audacity, GarageBand, Mixcraft)	Baseline	96.0	4.0	0.0	0.08	0.40	0.675	n/a	n/a
	Spring	78.2	4.3	17.3	0.70	1.29			
Digital Video (e.g., iMovie, Movie Maker)	Baseline	96.0	4.0	0.0	0.08	0.40	0.521	n/a	n/a
	Spring	82.6	13.0	4.3	0.43	0.90			
Other	Baseline	96.0	0.0	4.0	0.28	0.84	0.553	0.04	0.19
	Spring	82.6	13.0	4.3	0.74	0.86			
Internet/Research Tools Used by Students									
Information Search (e.g., Netscape Navigator, MS Internet Explorer)	Baseline	56.0	28.0	16.0	1.20	1.26	0.017	0.45	0.88
	Spring	47.8	39.1	13.0	1.22	1.17			
Web Posting (e.g., Wiki, Podcast)	Baseline	96.0	4.0	0.0	0.08	0.40	0.206	n/a	n/a
	Spring	95.7	4.3	0.0	0.17	0.49			
Interactive Learning (e.g., live cams, virtual manipulatives	Baseline	100.0	0.0	0.0	0.08	0.28	0.029	n/a	n/a
	Spring	95.7	4.3	0.0	0.09	0.42			
CD Reference (encyclopedias, etc.)	Baseline	100.0	0.0	0.0	0.08	0.28	0.029	0.05	0.27
	Spring	95.7	4.3	0.0	0.09	0.42			
Synchronous Communication (e.g., chats, video/audio conferencing)	Baseline	100.0	0.0	0.0	0.00	0.00	n/a	n/a	n/a
	Spring	100.0	0.0	0.0	0.00	0.00			
Asynchronous Communications (e.g., email, discussion boards, etc.	Baseline	96.0	4.0	0.0	0.08	0.40	0.119	n/a	n/a
	Spring	95.6	4.3	0.0	0.13	0.46			
Other	Baseline	100.0	0.0	0.0	0.04	0.20	0.000	0.02	0.14
	Spring	100.0	0.0	0.0	0.04	0.21			
Educational Software Used by Students									
Drill/Practice/Tutorial	Baseline	80.0	4.0	16.0	0.80	1.22	-0.223	0.58	0.89
	Spring	78.2	21.7	0.0	0.57	0.84			
Problem Solving (e.g., SimCity)	Baseline	96.0	0.0	4.0	0.16	0.62	0.217	0.04	0.21
	Spring	86.9	13.0	0.0	0.30	0.70			

Student Computer Activities The extent to which each of the following was observed in the classroom.		Percent Observed			Florida EETT			CREP Norm	
		None or Rarely	Occasionally	Frequently or Extensively	Mean	Standard Deviation	Effect Size (*d*)	Mean	Standard Deviation
Process Tools (e.g., Geometer's Sketchpad)	Baseline	100.0	0.0	0.0	0.04	0.20	0.465	0.01	0.10
	Spring	87.0	4.3	8.7	0.35	0.93			
Other	Baseline	96.0	4.0	0.0	0.12	0.44	0.213	0.05	0.29
	Spring	95.6	4.3	0.0	0.22	0.52			
Testing Software Used by Students									
Individualized/Tracked (e.g., Accelerated Reader)	Baseline	88.0	12.0	0.0	0.28	0.68	-0.031	0.53	0.92
	Spring	91.3	8.7	0.0	0.26	0.62			
Generic	Baseline	100.0	0.0	0.0	0.04	0.20	-0.283	0.01	0.10
	Spring	100.0	0.0	0.0	0.00	0.00			
Other	Baseline	100.0	0.0	0.0	0.00	0.00	0.512	0.01	0.10
	Spring	95.7	4.3	0.0	0.17	0.49			
Meaningfulness of Computer Activities**									
Low level use of computers	Baseline	68.0	20.0	12.0	1.00	1.19	-0.462	0.58	0.85
	Spring	82.6	13.0	4.3	0.52	0.90			
Somewhat meaningful use of computers	Baseline	80.0	12.0	8.0	0.72	0.98	0.023	0.50	0.81
	Spring	82.6	17.4	0.0	0.74	0.75			
Meaningful use of computers	Baseline	56.0	36.0	8.0	1.12	1.17	0.508	0.52	0.91
	Spring	39.1	17.4	43.5	1.78	1.48			
Very meaningful use of computers	Baseline	80.0	12.0	8.0	0.68	1.11	0.540	0.20	0.64
	Spring	52.2	13.0	34.8	1.39	1.56			

Scale: 0 = Not Observed; 1 = Rarely; 2 = Occasionally; 3 = Frequently; 4 = Extensively
Note. Item percentages may not total 100% because of missing data.

****Meaningfulness of Computer Activities Scale**

1. **Low-level use of computers:** activities in general required no critical thinking, e.g., used computer applications for copying text or free-time drawing, or used educational software for drill & practice, tutorials, or games.
2. **Somewhat meaningful use of computers**: activities in general required very little problem-solving or critical thinking and used computer applications or educational software in a limited manner.
3. **Somewhat meaningful use of computers**: activities in general required very little problem-solving or critical thinking and used computer applications or educational software in a limited manner.
4. **Very meaningful use of computers**: activities were based on meaningful problems, required critical thinking skills, and appropriate use of computer applications to locate and/or process information or manipulation of educational software variables to reach solutions.

Subject Areas of Computer Activities		Language	Mathematics	Science	S. Studies	Other	Percent Not Observed
Production Tools	Baseline	44.0	24.0	36.0	36.0	20.0	40.0
	Spring	56.5	34.8	34.8	43.5	26.1	8.7
Internet/Research Tools	Baseline	32.0	20.0	28.0	32.0	16.0	44.0
	Spring	34.8	13.0	26.1	30.4	30.4	30.4
Educational Software	Baseline	28.0	20.0	16.0	0.0	8.0	52.0
	Spring	17.4	43.5	8.7	4.3	13.0	30.4
Testing Software	Baseline	12.0	8.0	8.0	4.0	4.0	80.0
	Spring	26.1	8.7	4.3	0.0	8.7	65.2

Note. Item percentages may not total 100% because of missing data or activities involving more than one subject area.

OCU Multi-Class Inferential Statistics

The Observation of Computer Use (OCU) is organized into eight categories: "Computer Configuration", "Computer Use", "Frequency of Computer Type Use", "Production Tools Used", "Internet/Research Tools Used", "Educational Software Used", "Testing Software", and "Overall Meaningful Use of Computers". All rating categories, with the exception of items under "Computer Configuration" and "Computer Use", are measured using a 5-point Likert scale (0 = Not Observed, 1 = Rarely Observed, 2 = Occasionally Observed, 3 = Frequently Observed, and 4 = Extensively Observed). As a result, all OCU observation results except "Computer Configuration" and "Computer Use" were analyzed using an adjusted alpha with Bonferroni correction (p = 0.0012). The p-values approaching the adjusted significance level ($p < .01$) are also discussed.

As seen in Table 6, the OCU analyses outcomes are presented in Q_{SMH} and Q_{CSMH} statistics, except for items 4 and 5 under "Computer Configuration," which were not analyzed because their response levels were not ordinal or ranked. As a result, only the means and standard deviations are reported for these two items. Although not significant ($p < .01$), there was an improvement from fall 2007 to spring 2008 ($Q_{SMH} = Qc_{SMH} = 7.166$, $p = 0.0074$, $d = 0.852$) in the frequency with which the observed computer literacy skills of FL EETT students were rated as being "Very Good" (Fall = 20%; Spring = 69.6%' $p = 0.007$).

TABLE 6

OCU Multi-Class Means Comparison between Fall and Spring Using Mantel-Haenszel Test

Item	Q_{SMH}	*p*	Q_{CSMH}	*p*
Computer Configuration				
Classrooms most frequently had the following number of computers or digital tools • (1 = None, 2= One, 3= 2-4, and 4 = No computers were observed)	1.629	0.2018	1.629	0.2018
Classroom computers were most frequently • (1 = Up-to-date, 2= Aging but adequate, 3= Outdated/limited capacity, 4 = 5-10, and 5 = 11 or more)	4.273	0.0387	4.273	0.0387
In classrooms, computers were most frequently • (1 = Connected to the Internet, 2 = Not connected to the Internet, and 3 = No computers were observed)	3.931	0.0474	3.931	0.0474
Total number of classrooms visited	na	na	na	na
Total number of classrooms without students using computers	na	na	na	na
Student Computer Use				
Classroom computers or digital tools were most frequently used by • (1 = few, 2 = most, 3 = nearly all)	1.974	0.1601	1.974	0.1601
Students most frequently worked with computers/digital tools • (1 = alone, 2 = pairs, 3 = groups)	4.341	0.0372	4.341	0.0372
Student computer literacy skills were most frequently: • (1 = poor, 2 = moderate, 3 = very good)	7.166	0.0074**	7.166	0.0074
Student keyboarding skills were most frequently: • (1 = poor, 2 = moderate, 3 = very good)	5.299	0.0213	5.299	0.0213
Digital Tools used by students: • (0 = not observed, 1 = rarely, 2 = occasionally, 3 = frequently, 4 = extensively)				
Desktop computers	0.209	0.6475	0.209	0.6475
Laptop computers	2.798	0.0944	2.798	0.0944
Portable Digital Devices (e.g. PDA, iPod)	0.780	0.3712	0.780	0.3712
Graphing calculators	3.406	0.0650	3.406	0.0650
Information Processors (e.g. Alphaboard)	0.169	0.6811	0.169	0.6811
Digital Accessories (e.g. camera, scanner, probes)	2.807	0.0939	2.807	0.0939
Production Tools Used by Students				
Word Processor	0.012	0.9129	0.012	0.9129
Database	0.341	0.5592	0.341	0.5592
Spreadsheet	0.800	0.3712	0.800	0.3712
Draw/Paint/Graphics/Photo-imaging	3.390	0.0656	3.390	0.0656
Presentation	1.858	0.1729	1.858	0.1729
Authoring	0.169	0.6811	0.169	0.6811
Concept Mapping	0.017	0.8970	0.017	0.8970
Planning (e.g. MS Project)	0.004	0.9525	0.004	0.9525
Digital Audio (e.g., Audacity, GarageBand, Mixcraft)	4.716	0.0299	4.716	0.0299
Digital Video (e.g., iMovie, Movie Maker)	3.081	0.0792	3.081	0.0792
Other production tools	3.297	0.0694	3.297	0.0694
Internet/Research Tools Used by Students				
Internet Browser	0.003	0.9601	0.003	0.9601
Web Posting (e.g., Wiki, Podcast)	0.537	0.4638	0.537	0.4638
Interactive Learning (e.g., live cams, virtual manipulatives)	0.005	0.9447	0.005	0.9447
CD Reference	0.005	0.9447	0.005	0.9447
Synchronous Communication (e.g., chats, video/audio conferencing)	-	-	-	-
Asynchronous Communication (e.g., email, discussion boards, lists)	0.169	0.6811	0.169	0.6811
Other Internet/Research Tools	0.004	0.9525	0.004	0.9525

Item	Q_{SMH}	*p*	Q_{CSMH}	*p*
Educational Software Used by Students				
Drill/Practice/Tutorial	0.593	0.4412	0.593	0.4412
Problem-Solving	0.573	0.4491	0.573	0.4491
Process Tools	2.503	0.1136	2.503	0.1136
Other educational software	0.501	0.4792	0.501	0.4792
Testing Software Used by Students				
Individualized/Tracked	0.011	0.9181	0.011	0.9181
Generic	0.920	0.3375	0.920	0.3375
Other testing software	3.005	0.0830	3.005	0.0830
Overall Meaningful Use of Computers				
Low level use of computers	2.364	0.1242	2.364	0.1242
Somewhat meaningful use of computers	0.006	0.9393	0.006	0.9393
Meaningful use of computers	2.881	0.0897	2.881	0.0897
Very meaningful use of computers	3.202	0.0736	3.202	0.0736

** p<.01
"na" = The item was excluded from the Mantel-Haenszel test because the response levels are not ordinal.
"-" = No statistics are computed since the response to the item has less than 2 nonmissing levels.

Targeted Classroom Observation Results

Targeted observations were conducted in 67 classrooms in the fall and 53 classrooms in the late spring. The data were collected with SOMs and OCUs during prearranged one-hour sessions in which teachers were asked to implement a prepared lesson using the laptops. The targeted observation results are presented by data collection instrument.

Targeted SOM

The SOM fall and spring targeted observation data revealed fewer positive trends than what was seen during the random, unannounced multi-class observations (see Table 7). The most notable fall to spring changes, as represented by Cohen's *d* effect sizes, were increased teacher use of higher-level questioning strategies (*d* = 0.626), as well as increased teacher provision of higher-level instructional feedback to enhance student learning groups (*d* = 0.282). Additional favorable changes included increased frequency of students working in cooperative/collaborative learning groups (*d* = 0.266), and in the use of systematic individual instruction, or instruction that has been modified to meet specific student needs groups (*d* = 0.520). The frequency with which students were observed using the laptops as learning tools remained fairly consistent for both

observation periods (fall *M* = 1.69; spring *M* = 1.64; *d* = -0.029). The targeted data also revealed a positive fall to spring decrease in the frequency with which students were observed completing independent seatwork, such as worksheets (*d* = -0.652).

In contrast to the multi-class findings, somewhat mixed results were revealed when examining the FL EETT spring targeted results in comparison with CREP's normative data that reflects instructional practices from 182 control classrooms for a state-funded technology grant (see Table 7). Although inferential analyses to compare FL EETT with the CREP Norms were not conducted, several SOM items associated with student-centered approaches revealed promising patterns. For instance, FL EETT students more frequently worked in cooperative groups (FL *M* = 1.66; Norm *M* = 0.97), received higher-level feedback (FL *M* = 1.42; Norm *M* = 1.15), engaged in project-based learning (FL *M* = 1.34; Norm *M* = 0.62), and used technology as a learning tool or resource (FL *M* = 1.64; Norm *M* = 1.18). In addition, direct instruction (FL *M* = 1.89; Norm *M* = 2.63), independent seatwork (FL *M* = 0.68; Norm *M* = 1.37), and use of computers for instructional delivery (FL *M* = 1.13; Norm *M* = 1.60) were seen less frequently in FL EETT as compared to CREP Normative data. Conversely, teachers represented by the CREP Norms were more frequently observed acting as a coach facilitator (FL *M* = 1.66; Norm *M* = 0.97) and more frequently engaged students in experiential, hands-on learning (FL *M* = 0.94; Norm *M* = 1.04). Further, data from the normative group revealed a greater frequency with which high academically focused class time (FL *M* = 2.57; Norm *M* = 3.48) and high student attention, interest and engagement (FL *M* = 2.66; Norm *M* = 3.39) were observed.

TABLE 7

Targeted School Observation Measure (SOM) Results 2007-2008

Fall *n* = 67 classrooms from multiple grades
Spring *n* = 53 classrooms from multiple grades
CREP Norm *n* = 182 classrooms from multiple grades

		Percent Observed			Florida EETT			CREP Norm	
The extent to which each of the following was observed in the classroom.		None or Rarely	Occasionally	Frequently or Extensively	Mean	Standard Deviation	Effect Size (*d*)	Mean	Standard Deviation
Instructional Orientation									
Direct instruction (lecture)	Baseline	41.1	9.0	49.3	2.04	1.63	-0.097	2.63	1.45
	Spring	45.2	18.9	35.9	1.89	1.46			
Team teaching	Baseline	89.6	3.0	7.5	0.33	1.01	-0.300	0.51	1.21
	Spring	98.1	0.0	1.9	0.08	0.55			
Cooperative/collaborative learning	Baseline	62.6	10.4	26.8	1.24	1.48	0.266	0.97	1.48
	Spring	52.9	3.8	43.4	1.66	1.73			
Individual tutoring (teacher, peer, aide, adult volunteer)	Baseline	82.1	9.0	9.0	0.49	1.08	-0.116	0.26	0.80
	Spring	90.6	5.7	3.8	0.38	0.77			
Classroom Organization									
Ability groups	Baseline	86.6	0.0	13.5	0.48	1.20	-0.143	0.48	1.21
	Spring	90.6	1.9	7.6	0.32	1.03			
Multi-age grouping	Baseline	88.1	0.0	12.0	0.45	1.20	0.032	0.52	1.35
	Spring	86.8	1.9	11.3	0.49	1.30			
Work centers (for individuals or groups)	Baseline	86.6	3.0	10.5	0.46	1.15	-0.130	0.89	1.50
	Spring	90.6	3.8	5.7	0.32	1.00			
Instructional Strategies									
Higher level instructional feedback (written or verbal) to enhance student learning	Baseline	62.6	23.9	13.5	1.04	1.24	0.282	1.15	1.40
	Spring	56.6	15.1	28.3	1.42	1.50			
Integration of subject areas (interdisciplinary/thematic units)	Baseline	85.1	3.0	12.0	0.46	1.11	0.082	0.38	1.04
	Spring	84.9	1.9	13.2	0.55	1.10			
Project-based learning	Baseline	64.2	7.5	27.4	1.13	1.57	0.130	0.62	1.36
	Spring	60.4	7.5	32.1	1.34	1.71			
Use of higher-level questioning strategies	Baseline	71.6	17.9	10.5	0.85	1.14	0.626	1.69	11.59
	Spring	41.5	22.6	35.8	1.66	1.49			
Teacher acting as a coach/facilitator	Baseline	35.0	19.4	44.8	1.96	1.55	-0.057	2.45	1.57
	Spring	47.2	5.7	47.2	1.87	1.62			
Parent/community involvement in learning activities	Baseline	92.5	3.0	4.5	0.24	0.89	-0.204	0.09	0.56
	Spring	96.2	1.9	0.0	0.09	0.49			
Student Activities									
Independent seatwork (self-paced worksheets, individual assignments)	Baseline	49.3	9.0	41.8	1.60	1.61	-0.652	1.37	1.47
	Spring	79.2	13.2	7.6	0.68	1.14			
Experiential, hands-on learning	Baseline	73.2	11.9	13.0	0.84	1.36	0.072	1.04	1.50
	Spring	69.8	13.2	17.0	0.94	1.47			
Systematic individual instruction	Baseline	97.0	3.0	0.0	0.07	0.36	0.520	0.09	0.59
	Spring	80.7	9.4	3.8	0.38	0.81			
Sustained writing/composition (self-selected or teacher-generated topics)	Baseline	92.6	1.5	6.0	0.27	0.83	-0.116	0.25	0.76
	Spring	96.2	3.8	0.0	0.19	0.48			
Sustained reading	Baseline	89.6	3.0	7.5	0.37	0.92	-0.232	0.26	0.80
	Spring	96.2	1.9	1.9	0.19	0.56			

The extent to which each of the following was observed in the classroom.		Percent Observed			Florida EETT			CREP Norm	
		None or Rarely	Occasionally	Frequently or Extensively	Mean	Standard Deviation	Effect Size (*d*)	Mean	Standard Deviation
Independent inquiry/research on the part of students	Baseline	67.2	10.4	22.4	0.99	1.46	-0.185	0.60	1.28
	Spring	73.6	13.2	13.2	0.74	1.23			
Student discussion	Baseline	56.7	22.4	20.9	1.30	1.37	-0.249	0.95	1.44
	Spring	71.7	7.5	20.7	0.96	1.39			
Technology Use									
Computer for instructional delivery (e.g. CAI, drill & practice)	Baseline	65.6	6.0	28.3	1.27	1.55	-0.094	1.60	1.70
	Spring	66.0	9.4	24.5	1.13	1.45			
Technology as a learning tool or resource (e.g. Internet research, spreadsheet or database creation)	Baseline	52.3	7.5	40.3	1.69	1.78	-0.029	1.18	1.62
	Spring	51.7	9.4	39.6	1.64	1.71			
Assessment									
Performance assessment strategies	Baseline	83.6	4.5	12.0	0.54	1.20	0.281	0.48	1.16
	Spring	71.7	5.7	22.6	0.91	1.47			
Student self-assessment (portfolios, individual record books)	Baseline	73.1	10.4	16.4	0.82	1.41	-0.295	0.19	0.82
	Spring	84.9	7.5	7.6	0.45	1.05			
Summary Items									
High academically focused class time	Baseline	6.0	34.3	59.7	2.88	1.01	-0.263	3.48	0.83
	Spring	20.8	17.0	62.3	2.57	1.38			
High level of student attention, interest, engagement	Baseline	7.5	31.3	61.2	2.87	1.01	-0.176	3.39	0.87
	Spring	22.6	13.2	64.1	2.66	1.41			

Scale: 0 = Not Observed; 1 = Rarely; 2 = Occasionally; 3 = Frequently; 4 = Extensively

SOM Targeted Inferential Statistics

As indicated in Table 8 and Figure 2, there was a significant increase from fall 2007 to spring 2008 in the area of "Use of higher-level questioning strategies" (*QSMH* =*QcSMH* = 10.408, $p = 0.0013$), and a significant decrease in the use of "Independent seatwork (self-paced worksheets, individual assignments)" (*QSMH* = *QcSMH* = 11.295, $p = 0.0008$). The associated effect sizes for these two items were very large ($d = 0.626$ and $d = -0.652$, respectively).

While not statistically significant, the increase ($p < .01$) for "Systematic individual instruction (differential assignments geared to individual needs)" between fall 2007 and spring 2008 was also notable (*QSMH* = *QcSMH* = 7.048, $p = 0.0079$), with the associated effect size ($d = 0.520$) reinforcing the magnitude of the difference.

TABLE 8

SOM Targeted Means Comparison between Fall and Spring Using Mantel-Haenszel Test

Item	Q_{SMH}	*p*	Q_{CSMH}	*p*
Instructional Orientation				
Direct instruction (lecture)	0.306	0.5799	0.306	0.5799
Team teaching	2.669	0.1023	2.669	0.1023
Cooperative/collaborative learning	2.050	0.1522	2.050	0.1522
Individual tutoring (teacher, peer, aide, adult volunteer)	0.434	0.5099	0.434	0.5099
Classroom Organization				
Ability groups	0.574	0.4487	0.574	0.4487
Multi-age grouping	0.036	0.8506	0.036	0.8506
Work centers (for individuals or groups)	0.511	0.4747	0.511	0.4747
Instructional Strategies				
Higher-level instructional feedback (written or verbal) to enhance student learning	2.177	0.1401	2.177	0.1401
Integration of subject areas (interdisciplinary/thematic units)	0.175	0.6761	0.175	0.6761
Project-based learning	0.471	0.4924	0.471	0.4924
Use of higher-level questioning strategies	10.408	0.0013*	10.408	0.0013
Teacher acting as a coach/facilitator	0.091	0.7630	0.091	0.7630
Parent/community involvement in learning activities	1.125	0.2888	1.125	0.2888
Student Activities				
Independent seatwork (self-paced worksheets)	11.295	0.0008*	11.295	0.0008
Experiential, hands-on learning	0.174	0.6767	0.174	0.6767
Systematic individual instruction (differential assignments geared to individual needs)	7.048	0.0079**	7.048	0.0079
Sustained writing/composition	0.392	0.5313	0.392	0.5313
Sustained reading	1.646	0.1995	1.646	0.1995
Independent inquiry/research on the part of students	0.989	0.3199	0.989	0.3199
Student discussion	1.752	0.1857	1.752	0.1857
Technology Use				
Computer for instructional delivery (e.g., CAI, drill & practice)	0.244	0.6217	0.244	0.6217
Technology as a learning tool or resource (e.g., Internet research, spreadsheet creation)	0.020	0.8880	0.020	0.8880
Assessment				
Performance assessment strategies	2.262	0.1326	2.262	0.1326
Student self-assessment (portfolios, individual record books)	2.472	0.1159	2.472	0.1159
Summary Items				
High academically focused class time	2.062	0.1510	2.062	0.1510
High level of student attention/interest/engagement	0.858	0.3542	0.858	0.3542

* p<.0019; ** p<.01

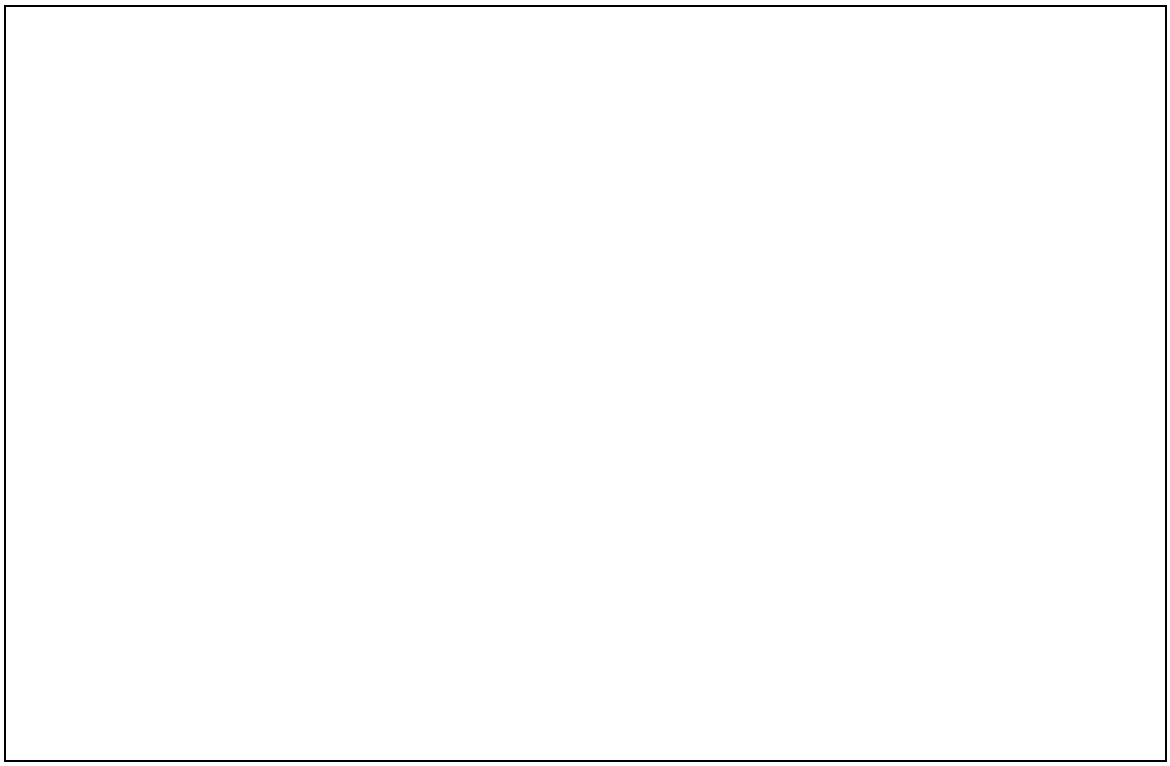

Figure 2. Targeted SOM: Significant Fall vs. Spring Differences

Targeted OCU

Data from targeted visits to FL EETT classrooms revealed that there was increased access to up-to-date, Internet-connected computers during the spring observations. Specifically, as seen in Table 9, the number of classrooms with "11 or more" computers available for student use showed a slight increase from 45.5% in the fall to 47.2% in the spring. Of those, 64.2% were considered to be "Up-to-date" and three-quarters (75.5%) were connected to the Internet. The frequency with which the laptops were used by "nearly all" of the students remained fairly consistent; however, there was a increase in the percentage of students rated with "very good" computer literacy skills (Fall = 28.8%; spring = 39.8%) and keyboarding skills (Fall = 21.2%; Spring = 30.2%). There was an almost equal decrease in the percentage of classrooms in which student use of desktop computers was "Occasionally" to "Extensively" observed (Fall = 25.8%; Spring = 17.0%), as compared to the increase in the frequency with which students were observed using laptop computers during the spring classroom visits (33.3%) as compared to the fall visits (43.4%).

TABLE 9

Targeted OCU Descriptive Data Summary of Computer Capacity, Currency, Configuration, Student Computer Ability, and Use of Digital Devices

Fall *n* = 66 classrooms from multiple grades
Spring *n* = 53 classrooms from multiple grades

Computer Configuration	Florida EETT	Percent Observed
Percentages of classrooms with the following numbers of computers or digital tools:		
None; One, or 2 -4	Baseline	40.9
	Spring	47.2
5 – 10	Baseline	13.6
	Spring	05.7
11 or more	Baseline	45.5
	Spring	47.2
Percentages of classrooms in which the majority of computers were:		
Up-to-date	Baseline	54.5
	Spring	64.2
Aging, but adequate	Baseline	18.2
	Spring	11.3
Outdated/limited capacity	Baseline	18.2
	Spring	07.5
Percentages of classrooms in which the majority of computers were:		
Connected to the Internet	Baseline	86.4
	Spring	75.5
Student Computer Use		
Percentage of classrooms in which computers or digital tools were used by:		
Few (less than 10%) to Some (about 10-50%) students	Baseline	18.2
	Spring	24.6
Most (about 51-90%) students	Baseline	03.0
	Spring	03.8
Nearly all (91-100%) students	Baseline	45.5
	Spring	43.4
Percentage of classrooms in which students worked with computers or digital tools:		
Alone	Baseline	43.9
	Spring	41.5
In pairs or small groups	Baseline	22.8
	Spring	22.7
Percentage of classrooms in which student computer literacy skills were:		
Poor	Baseline	01.5
	Spring	00.0
Moderate	Baseline	24.2
	Spring	15.1
Very good	Baseline	28.8
	Spring	39.6
Not observed	Baseline	45.5
	Spring	45.3
Percentage of classrooms in which student keyboarding skills were:		
Poor	Baseline	01.5
	Spring	00.0
Moderate	Baseline	22.7
	Spring	11.3
Very good	Baseline	21.2
	Spring	30.2
Not observed	Baseline	54.5
	Spring	58.5

Digital Devices Used by Students		Not or Rarely Observed	Occasionally	Frequently or Extensively
Desktop Computers	Baseline	74.3	1.5	24.3
	Spring	83.0	5.7	11.3
Laptop Computers	Baseline	66.7	3.0	30.3
	Spring	56.6	9.4	34.0
Portable Digital Devices (PDA, iPod)	Baseline	95.5	0.0	04.5
	Spring	100.0	0.0	00.0
Graphing Calculator	Baseline	100.0	0.0	00.0
	Spring	98.1	0.0	01.9
Information Processor (e.g., Alphaboard)	Baseline	100.0	0.0	00.0
	Spring	94.4	3.8	01.9
Digital Accessories (e.g., camera, scanner, probes)	Baseline	90.9	3.0	06.0
	Spring	88.6	3.8	07.6

Note. Item percentages may not total 100% because of missing data.

Student Computer Activities. As seen in Table 10, the fall targeted classroom visits revealed that students used all but the following four OCU computer applications: "Databases", "Web Posting", "Problem Solving", and "Generic" tests. Whereas during the spring observations, students used all but six of the listed applications: "Databases", "Planning", "CD References", "Synchronous Communication" (e.g., chats, video/audio conferences), "Individualized/Tracked" and "Generic" test software. Similar to the multi-class results, the most frequently observed computer activity was student use of the Internet to conduct "Information Searches" with a browser. However, the frequency of occurrence during targeted observations was markedly lower than the multi-class for both the fall (Multi-class M = 1.20; Targeted M = 0.76) and the spring observations (Multi-class M = 1.22; Targeted M = 0.64).

There were four fall to spring increases in student use of production tools that suggest promising trends: "Draw, paint, and/or graphics" (Fall M = 0.20, Spring M = 0.70; d = +0.517), "Presentation" (Fall M = 0.47, Spring M = 0.64; d = +0.146), "Digital Audio" (Fall M = 0.18, Spring M = 0.34; d = +0.187), and "Digital Video" (Fall M = 0.14, Spring M = 0.30; d = +0.194). Similarly, there was a slight a fall to spring decrease in student use of drill and practice applications (Fall M = 0.32, Spring M = 0.13; d = -0.238). It should be noted that the frequency with which the above-mentioned applications were observed during spring observations was fairly limited, as evidenced in mean scores that ranged from M = 0.00 for the six applications listed previously to M = 0.70 for "Draw/Paint/Graphics" on a scale, where 1.00 represents "Rarely Observed" (see Table 5). The

subject area of computer activities observed during spring visits was most frequently language arts for Production tools (24.5%) and Internet/Research tools (17.0%), whereas the subject area of education software was most frequently language arts (11.3%) or areas other than the listed core content.

As seen with the targeted SOM outcomes, descriptive analyses revealed that the spring OCU results, in comparison with CREP's normative data representing 182 control classrooms for a state-funded technology grant (see Table 10), were somewhat mixed. As might be expected, the normative data reflected more student use of drill and practice software (FL *M* = 0.13; Norm *M* = 0.84) and more use of low-level computer activities (FL *M* = 0.15; Norm *M* = 0.54). In contrast, Students in FL EETT classes, as compared to those represented in the CREP norms, more frequently used presentation (FL *M* = 0.64; Norm *M* = 0.13) and draw/Paint/Graphics software (FL *M* = 0.70; Norm *M* = 0.07). FL EETT students were also more frequently engaged in very meaningful use of computers (FL *M* = 1.00; Norm *M* = 0.38). However, unexpectedly, students in the norm group used the Internet more frequently than students in FL EETT classes (FL *M* = 0.64; Norm *M* = 0.75).

Meaningfulness of Computer Activities. As seen in the multi-class results, there was once again a positive shift from student engagement in lower-level computer activities to more meaningful uses of computers (see Table 10). For example, "low-level uses of computers" was observed occasionally to extensively during 7.5% of the fall classroom visits, as compared to only 1.9% during the spring observations (*d* = -0.258). On the other hand, a noteworthy increase was seen in the frequency with which "Very meaningful use of computers" was occasionally to extensively observed during the fall (18.1%) and spring (26.5%) (*d* = +0.211) classroom visits.

TABLE 10

Targeted OCU Descriptive Data Summary of Student Computer Activities, Meaningfulness, and Subject Area of Computer Use

Fall *n* = 66 classrooms from multiple grades
Spring *n* = 53 classrooms from multiple grades
CREP Norm *n* = 182 classrooms from multiple grades

Student Computer Activities The extent to which each of the following was observed in the classroom.		**Percent Observed** None or Rarely	Occasionally	Frequently or Extensively	**Florida EETT** Mean	Standard Deviation	Effect Size (*d*)	**National Norm** Mean	Standard Deviation
Production Tools Used by Students									
Word Processing	Baseline	81.8	6.1	12.2	0.59	1.21	-0.197	0.21	0.80
	Spring	86.8	9.4	3.8	0.38	0.88			
Database	Baseline	100.0	0.0	0.0	0.00	0.00	n/a	0.02	0.23
	Spring	100.0	0.0	0.0	0.00	0.00			
Spreadsheet	Baseline	98.5	0.0	1.5	0.06	0.49	-0.050	0.07	0.49
	Spring	98.1	1.9	0.0	0.04	0.27			
Draw/Paint/Graphics	Baseline	93.9	1.5	4.5	0.20	0.75	0.517	0.07	0.49
	Spring	77.3	9.4	13.2	0.70	1.20			
Presentation (e.g., MS PowerPoint)	Baseline	86.3	3.0	10.6	0.47	1.15	0.146	0.13	0.60
	Spring	79.3	9.4	11.4	0.64	1.21			
Authoring (e.g., HyperStudio)	Baseline	98.5	0.0	1.5	0.05	0.37	0.152	0.00	0.00
	Spring	96.2	0.0	3.8	0.13	0.68			
Concept Mapping (e.g., Inspiration)	Baseline	93.9	0.0	6.0	0.23	0.86	0.000	0.04	0.29
	Spring	92.5	1.9	5.7	0.23	0.82			
Planning (e.g., MS Project)	Baseline	98.5	1.5	0.0	0.03	0.25	-0.162	0.01	0.15
	Spring	100.0	0.0	0.0	0.00	0.00			
Digital audio e.g., Audacity, GarageBand, Mixcraft)	Baseline	93.9	3.0	3.0	0.18	0.76	0.187	n/a	n/a
	Spring	88.7	1.9	9.4	0.34	0.98			
Digital Video (e.g., iMovie, Movie Maker)	Baseline	97.0	0.0	3.0	0.14	0.70	0.194	n/a	n/a
	Spring	90.6	1.9	7.6	0.30	0.97			
Other	Baseline	97.0	0.0	3.0	0.14	0.70	0.182	0.07	0.47
	Spring	90.6	3.8	5.7	0.28	0.86			
Internet/Research Tools Used by Students									
Information Search (e.g., Netscape Navigator, MS Internet Explorer)	Baseline	74.2	6.1	19.7	0.76	1.30	-0.095	0.75	1.40
	Spring	79.3	7.5	13.2	0.64	1.24			
Web Posting (e.g., Wiki, Podcast)	Baseline	100.0	0.0	0.0	0.00	0.00	0.221	n/a	n/a
	Spring	98.1	0.0	1.9	0.06	0.41			
Interactive Learning (e.g., live cams, virtual manipulatives	Baseline	97.0	1.5	1.5	0.08	0.44	-0.053	n/a	n/a
	Spring	98.1	1.9	0.0	0.06	0.30			
CD Reference (encyclopedias, etc.)	Baseline	98.5	1.5	0.0	0.05	0.27	-0.251	0.04	0.29
	Spring	100.0	0.0	0.0	0.00	0.00			
Synchronous Communication (e.g. chats, video/audio conferencing)	Baseline	98.5	1.5	0.0	0.03	0.25	-0.162	n/a	n/a
	Spring	100.0	0.0	0.0	0.00	0.00			
Asynchronous Communications (e.g., email, discussion boards, etc.	Baseline	98.5	1.5	0.0	0.03	0.25	0.277	n/a	n/a
	Spring	96.2	1.9	1.9	0.09	0.49			
Other	Baseline	97.0	1.5	1.5	0.09	0.55	-0.168	0.04	0.38
	Spring	100.0	0.0	0.0	0.02	0.14			

Student Computer Activities The extent to which each of the following was observed in the classroom.		Percent Observed			Florida EETT			National Norm	
		None or Rarely	Occasionally	Frequently or Extensively	Mean	Standard Deviation	Effect Size (*d*)	Mean	Standard Deviation
Educational Software Used by Students									
Drill/Practice/Tutorial	Baseline	92.4	1.5	6.1	0.32	0.99	-0.238	0.84	1.48
	Spring	94.4	5.7	0.0	0.13	0.48			
Problem Solving (e.g., SimCity)	Baseline	100.0	0.0	0.0	0.00	0.00	0.330	0.03	0.25
	Spring	96.2	0.0	3.8	0.17	0.78			
Process Tools (e.g., Geometer's Sketchpad)	Baseline	97.0	0.0	3.0	0.11	0.61	0.000	0.04	0.34
	Spring	96.2	1.9	1.9	0.11	0.61			
Other	Baseline	97.0	0.0	1.5	0.08	0.51	0.097	0.04	0.32
	Spring	94.4	1.9	1.9	0.13	0.53			
Testing Software Used by Students									
Individualized/Tracked (e.g., Accelerated Reader)	Baseline	92.4	0.0	7.5	0.29	0.92	0.00	0.10	0.48
	Spring	100.0	0.0	0.0	0.00	0.00			
Generic	Baseline	100.0	0.0	0.0	0.00	0.00	0.00	0.00	0.00
	Spring	100.0	0.0	0.0	0.00	0.00			
Other	Baseline	98.5	0.0	1.5	0.05	0.37	0.27	0.02	0.31
	Spring	98.1	1.9	0.0	0.04	0.27			
Meaningfulness of Computer Activities*									
Low level use of computers	Baseline	92.4	4.5	3.0	0.33	0.83	-0.258	0.54	1.19
	Spring	98.1	0.0	1.9	0.15	0.5			
Somewhat meaningful use of computers	Baseline	72.7	10.6	16.6	0.79	1.3	-0.169	0.65	1.33
	Spring	81.2	7.5	11.4	0.58	1.2			
Meaningful use of computers	Baseline	72.7	4.5	19.7	0.80	1.34	-0.038	0.66	1.31
	Spring	73.6	9.4	17.0	0.75	1.28			
Very meaningful use of computers	Baseline	80.3	4.5	13.6	0.68	1.42	0.211	0.38	1.08
	Spring	73.6	3.8	22.7	1.00	1.65			

Scale: 0 = Not Observed; 1 = Rarely; 2 = Occasionally; 3 = Frequently; 4 = Extensively
Note. Item percentages may not total 100% because of missing data.

Meaningfulness of Computer Activities Scale

5. **Low-level use of computers:** activities in general required no critical thinking, e.g., used computer applications for copying text or free-time drawing, or used educational software for drill & practice, tutorials, or games.
6. **Somewhat meaningful use of computers**: activities in general required very little problem-solving or critical thinking and used computer applications or educational software in a limited manner.
7. **Somewhat meaningful use of computers**: activities in general required very little problem-solving or critical thinking and used computer applications or educational software in a limited manner.
8. **Very meaningful use of computers**: activities were based on meaningful problems, required critical thinking skills, and appropriate use of computer applications to locate and/or process information or manipulation of educational software variables to reach solutions.

Subject Areas of Computer Activities		Language	Mathematics	Science	S. Studies	Other	Percent Not Observed
Production Tools	Baseline	28.8	4.5	10.6	10.6	6.1	51.5
	Spring	24.5	9.4	20.8	13.2	13.2	35.8
Internet/Research Tools	Baseline	13.6	3.0	6.1	7.6	0.0	72.7
	Spring	17.0	5.7	13.2	11.3	11.3	58.5
Educational Software	Baseline	12.1	3.0	0.0	1.5	3.0	75.8
	Spring	11.3	7.5	5.7	5.7	11.3	66.0
Testing Software	Baseline	6.1	1.5	0.0	1.5	0.0	86.4
	Spring	9.4	0.0	1.9	1.9	11.3	73.6

Note. Item percentages may not total 100% because of missing data or activities involving more than one subject area.

OCU Targeted Inferential Statistics

As summarized in Table 11, there was an increase from fall 2007 to spring 2008 in "Draw/Paint/Graphics/Photo-imaging" ($QSMH = QcSMH = 7.321$, $p = 0.0068$, $d = 0.517$) that approached statistical significance ($p < .01$). There were no other differences found.

TABLE 11

OCU Targeted Means Comparison between Fall and Spring Using Mantel-Haenszel Test

Item	Q_{SMH}	p	Q_{CSMH}	p
Computer Configuration				
Classrooms most frequently had the following number of computers or digital tools • (1 = None, 2= One, 3= 2-4, and 4 = No computers were observed)	0.658	0.4174	0.658	0.4174
Classroom computers were most frequently • (1 = Up-to-date, 2= Aging but adequate, 3= Outdated/limited capacity, 4 = 5-10, and 5 = 11 or more)	0.049	0.8250	0.049	0.8250
In classrooms, computers were most frequently • (1 = Connected to the Internet, 2 = Not connected to the Internet, and 3 = No computers were observed)	2.360	0.1245	2.360	0.1245
Total number of classrooms visited	na	na	na	na
Total number of classrooms without students using computers	na	na	na	na
Student Computer Use				
Classroom computers or digital tools were most frequently used by • (1 = few, 2 = most, 3 = nearly all)	0.020	0.8887	0.020	0.8887
Students most frequently worked with computers/digital tools • (1 = alone, 2 = pairs, 3 = groups)	0.035	0.8510	0.035	0.8510
Student computer literacy skills were most frequently: • (1 = poor, 2 = moderate, 3 = very good)	0.258	0.6118	0.258	0.6118
Student keyboarding skills were most frequently: • (1 = poor, 2 = moderate, 3 = very good)	0.011	0.9150	0.011	0.9150
Digital Tools used by students: • (0 = not observed, 1 = rarely, 2 = occasionally, 3 = frequently, 4 = extensively)				
Desktop computers.	2.330	0.1269	2.330	0.1269
Laptop computers.	1.182	0.2771	1.182	0.2771
Portable Digital Devices (e.g. PDA, iPod)	2.410	0.1206	2.410	0.1206
Graphing calculators.	1.245	0.2645	1.245	0.2645
Information Processors (e.g. Alphaboard).	5.460	0.0195	5.460	0.0195
Digital Accessories (e.g. camera, scanner, probes).	0.282	0.5955	0.282	0.5955
Production Tools Used by Students				
Word Processor	1.148	0.2839	1.148	0.2839
Database	-	-	-	-
Spreadsheet	0.092	0.7615	0.092	0.7615
Draw/Paint/Graphics/Photo-imaging	7.321	0.0068**	7.321	0.0068
Presentation	0.626	0.4287	0.626	0.4287
Authoring	0.785	0.3757	0.785	0.3757
Concept Mapping	0.000	0.9956	0.000	0.9956
Planning (e.g. MS Project)	0.803	0.3702	0.803	0.3702
Digital Audio (e.g., Audacity, GarageBand, Mixcraft)	0.977	0.3230	0.977	0.3230
Digital Video (e.g., iMovie, Movie Maker)	1.163	0.2809	1.163	0.2809
Other production tools	1.048	0.3059	1.048	0.3059
Internet/Research Tools Used by Students				

Item	Q_{SMH}	*p*	Q_{CSMH}	*p*
Internet Browser	0.245	0.6206	0.245	0.6206
Web Posting (e.g., Wiki, Podcast)	1.245	0.2645	1.245	0.2645
Interactive Learning (e.g., live cams, virtual manipulatives)	0.073	0.7872	0.073	0.7872
CD Reference	1.455	0.2277	1.455	0.2277
Synchronous Communication (e.g., chats, video/audio conferencing)	0.803	0.3702	0.803	0.3702
Asynchronous Communication (e.g., email, discussion boards, lists)	2.377	0.1231	2.377	0.1231
Other Internet/Research Tools	0.874	0.3497	0.874	0.3497
Educational Software Used by Students				
Drill/Practice/Tutorial	1.552	0.2129	1.552	0.2129
Problem-Solving	3.095	0.0785	3.095	0.0785
Process Tools	0.004	0.9492	0.004	0.9492
Other educational software	0.363	0.5471	0.363	0.5471
Testing Software Used by Students				
Individualized/Tracked	4.959	0.0260	4.959	0.0260
Generic	-	-	-	-
Other testing software	0.016	0.8989	0.016	0.8989
Overall Meaningful Use of Computers				
Low level use of computers	1.975	0.1600	1.975	0.1600
Somewhat meaningful use of computers	0.772	0.3796	0.772	0.3796
Meaningful use of computers	0.030	0.8621	0.030	0.8621
Very meaningful use of computers	1.305	0.2533	1.305	0.2533

** p<.01
"na" = The item was excluded from the Mantel-Haenszel test because the response levels are not ordinal.
"-" = No statistics are computed since the response to the item has less than 2 nonmissing levels.

SUMMARY

This study conducted two types of classroom observations as a means of addressing the key research question stated below. The first type of observation involved collecting data from random visits to multiple classrooms during unannounced visits to reflect routine teacher practices. The second type of observations occurred during prescheduled visits to classrooms in which the teacher was asked to implement a technology integration lesson. The purpose of the targeted visits is to observe best practices in order to refine professional development strategies.

Research Question

What changes occur in tool-based, student-centered teaching as a result of the infusion of technology and professional development?

Positive trends were seen from both the multi-class and targeted SOM and OCU classroom observation results, yet there were only significant differences between fall 2007 and spring 2008 for two items. Specifically, SOM targeted results revealed a significant increase in teacher "Use of higher-level questioning strategies" and a significant decrease in the use of student "Independent seatwork (self-paced worksheets, individual assignments)". The most notable positive fall to spring increases were in student engagement in experiential, hands-on learning activities, teacher use of higher-level questioning strategies, use of project-based learning, cooperative learning, and classroom teachers acting as a coach or facilitator during student-centered learning activities. The changes most directly aligned with the Florida EETT goals were the increased frequency with which students were observed using the laptops as learning tools, and with which "Meaningful use of computers" and "Very meaningful use of computers" was observed in the FL EETT classrooms.

These results reveal that the FL EETT program is introduced positive changes in classroom practices, such as shifting from more traditional teacher-directed instruction to student-centered learning that engaged learners in higher-order thinking and use of computers as problem-solving tools. However, the data also reflected a couple of trends that reveal the need for continued professional development. First, there was a slight decrease in the frequency with which high academically focused class time was seen during spring targeted observations.

Second, although use of student-centered practices increased between the fall and spring observations, the frequency with which they were observed was fairly limited. An additional consideration when reviewing the evaluation results is the possible bias that may occur due to observer involvement in the Florida EETT program.

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