Teachers' perception of their classroom technological resources and the perceived feasibility of implementation of their Connecticut Teacher Technology Competencies: Level II proposals

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Abstract

This study investigates the possible relationship between teachers' perception of their classroom technological resources and the perceived feasibility of implementation of their Connecticut Teacher Technology Competencies (2001) Level II (LII) proposals. The impact of gender, years of teaching experience, and level of education were evaluated using a two-way contingency table analysis. Incomplete survey responses were excluded from the analysis. A greater percentage of individuals with graduate degrees felt that their technology equipment was insufficient when compared to those with non-graduate degrees. Also, a greater percentage of individuals with non-graduate degrees felt that they could use the equipment they had when compared to those with graduate degrees. Years of teaching experience did not appear to have a directional impact on self-perception of ability to implement technology, although the two are related. The lack of findings related to gender are perhaps reflective of a skewed self-reported sample with a disproportionately high number of females (n=88) compared to males (n=25). Limitations of this study are the nature of self-reported multiple choice questions that ask the participant to predict their future technology implementation. Further research is needed to observe the actual implementation of the LII technology proposals as they are implemented in classrooms.

Introduction

Substantial progress has been made in terms of student access to technology in schools. From 1994 to 2002, the percentage of public schools with access to the Internet increased from 35% to 99% (NCES, 2003). Further, according to the National Center for Educational Statistics (NCES), by the fall of 2003, nearly 100 percent of public schools in the United States had access to the Internet (NCES, 2005). As computers have become more prevalent in schools, educators are increasingly encouraged to integrate technology into all aspects of learning. Research has indicated that the use of technology in the classroom can aid and improve the delivery of curriculum content while also providing training in the skills students need to enter the workforce (Holcomb, 2005; O'Dwyer, Russell, & Damain, 2004). Technology has also been found to play a key role in non-instructional activities, which include data management, lesson preparation, and communication (Holcomb, 2005; O'Dwyer, Russell, & Damain, 2004). Much like the rest of the nation, the state of Connecticut realized the growing importance of educational technology in both learning and teaching. As a result, Connecticut developed the Connecticut Teacher Technology Competencies in 2001 (Holcomb, 2005; Holcomb, Brown, Kulikowich, & Jordan, 2004).

The Husky Educational Technology Assessment Program

The Husky Educational Technology Assessment Program (HETAP) is a three-tier assessment battery built upon the International Society for Technology in Education (ISTE) standards and the Connecticut Teacher Technology Competencies (CTTC) (2001) (Archambault, Kulikowich, Brown, & Rezendes, 2002; Kulikowich, Brown, & Holcomb, 2001). Its content focuses on the four main stands of the CTTC. These include: a)

Educational Technology Concepts and Operations — Awareness and Use; b) Creating Environments for Learning; c) Productivity and Professional Practice; and, d) Social, Legal, Ethical and Human Issues. Further, HETAP is a hierarchically organized assessment that specifies three levels of competence whereby educators in the State of Connecticut demonstrate ability and skill in effective technology integration within academic settings. The first level (LI) focuses on educators' use for technology for personal productivity and the implication of technology in the classroom to enhance student learning. The second level (LII) requires educators to come together through an asynchronous discussion system to learn and demonstrate their technology and planning skills in order to develop a curriculum appropriate for their specific learning environments designed to facilitate student learning. The third level (LIII) requires the educator to provide a portfolio of student products that demonstrate student learning resulting from specific approaches and assignments implemented by the teacher. Additionally, the educator must provide a clear link between pedagogy, student products and a systematic approach to enhancing student learning (Archambault, Kulikowich, Brown, & Rezendes, 2002; Kulikowich & Holcomb, 2002a; 2002b; Kulikowich, Brown, & Holcomb, 2001).

Level II Assessment

In an effort to improve educational technology access and competency, Connecticut issued Blue Chip School technology grants to sixteen schools across the state. As part of the Blue Chip initiative, educators within each school must demonstrate their technology literacy. All of the Level II participants (n=117) in this study were affiliated with a Blue Chip school. The Level II Educational Technology Assessment is

the sequential assessment to the Level I Educational Technology Assessment. Unlike its predecessor, Level II is not designed to measure specific technology skills. Instead, educators are to develop a plan for integrating technology in the classroom. Level II Assessment focuses on the developing stages of the skills identified in each of the four competency strands. To successfully complete Level II, educators must submit a plan outlining how the plan to integrate technology into their classroom. Additionally, educators must be able to identify the specific skills from Level I that will be used as part of their integration plan. Level II is also fundamentally different from the Level I, in that the Level II assessment requires a one-month commitment by the participants (see Table 1). Once the participants for Level II have registered and completed the pre-assessment surveys, participants spend the first five days of the LII engaged in a series of discussions on an asynchronous discussion board that are aligned with the CTTC (2001). During weeks two and three, all participants must complete a series of on-line surveys. The on-line surveys are designed to facilitate participants thinking about their plans for integrating technology in their own classrooms. The on-line surveys require educators to consider their content and what resources are available to them in their school and classroom. Proposals are submitted during the final week of the LII for final evaluation according to a set of rubrics (Holcomb, Brown, & Kulikowich, 2003; Holcomb, Brown, Kulikowich, & Zheng, 2003; Kulikowich & Holcomb, 2002a; 2002b; Kulikowich, Brown, & Holcomb, 2001). For a timeframe of the Level II Assessment, see Table 1.

Table 1

Level II Assessment Timeframe

Assessment Period	**Assessment Activities/Deadlines**
Day 1	• Begin online asynchronous discussion • Meet colleagues
Days 1-5	Threaded Discussion: • Day 1: Idea Generation and Sharing • Day 2: Standard One: Educational Technology Concepts and Operations • Day 3: Standard Two: Creating Learning Environments and Experiences • Day 4: Standard Three: Productivity and Professional Practice • Day 5: Standard Four: Social, Legal, Ethical, and Human Issues • *Participants are encouraged to continue dialogue beyond Day 5
Day 12 (Can submit any day during Week Two)	My Context Survey (Appendix C)
Day 19 (Can Submit any day during Week Three)	My Content Survey (Appendix B)
Days 26-28	• Submitting My Project Survey • My Exit Survey (Appendix D) • Suggestions and Recommendations for the Level II Assessment Team Survey • Where Would you Like Us to Send Your Evaluation Report Survey
Day 28	Proposals Submitted

Technology implementation

With the increased focus and expenditure on educational technology, the question then arises as to why some Connecticut teachers are not implementing technology in their classrooms. Through the study of teachers and technology, factors such as years of teaching experience, highest degree earned, and gender have been shown to impact the implementation of technology (Limon, 2004). These results confirm the findings of Lam (2000) that age, gender, attitudes toward technology, and teaching experience impact the

use of technology in the classroom. However, the results are varied as to what extent these variables are related to teacher use of technology (Lam, 2000). The perception of available resources, both in the form of computer availability and technical support, have also been shown to impact a teacher's use of technology in the classroom (Becker, Ravitz & Wong, 1999; Becker & Ravitz, 1999; Mathews, 2000). Further, explorations of the factors that influence the implementation of technology in the classroom are imperative in refining teacher professional development and supporting the acquisition of the required teacher technology competencies (Holcomb, 2005).

Technology and Gender

Until recently, vast amounts of research indicated that a technology gender gap exists between males and females, with males using technology more frequently than females (see AAUW, 1992; Crombie & Armstrong, 1999; Fiore, 1999; Kadijevich, 2000). In addition to using technology more frequently than females, research has also found that males have a higher exposure to technology, both in school and at home (Kirkpatrick & Cuban, 1998). Further, research has found that as new technologies emerge, initial users tend to be young, male, educated, affluent, urban, and not members of a racial or ethnic minority group (Norris, 2001; Rogers, 1995). Furthermore, according to Van Braak, Tondeur, and Valcke (2004), male teachers reported that they integrate computers in their classrooms more often than female teachers self-reported. However, more recent research has indicated that the gender gap is closing and in some areas it is reversing (Ono & Zavodny, 2003). A study conducted by Graphic Visualization, & Usability (as cited in Dholakia, Dholakia, & Kshetri, 2003), found that in the United States and Canada the number of women who use the Internet is parallel for

the number of females in the population. The study further suggested that in 2000 the gender gap disappeared in the United States and Canada (Dholakia et al., 2003). Although more recent research indicates that the technology gender gap is closing, there are still studies arguing whether or not the gender gap does still in fact exist.

Technology, Teaching Experience and Teacher Education Level

Over the years, research has examined how the use of educational technology has been impacted by the number of years of teaching experience as well as the highest degree earned (Mathews, 2000; O'Dwyer, Russell, & Damain, 2003). Due to recent induction of state and federal standards related to educational technology**,** discrepancies in technology use have been found to exist between pre-service and in-service educators (Yildirim, 2000). Given that college students are heavy users of the Internet (Pew 2002), it would be expected that pre-service educators utilize the Internet on a regular basis. As noted in the study conducted by Pew (2002), college students use the Internet to communicate with professors and classmates, to conduct research, and to access resources. Therefore, it would be estimated that teachers who recently graduated from a teacher preparation program would use technology more frequently than those teachers who have been teaching for fifteen or more years. Similarly, Coombs (2000) found that degree earned by teachers did not predict observed teacher technology implementation.

Barriers

Aside from not being technologically literate, barriers have been identified as to why educators are unable to integrate technology into learning. Hoffman (1997) reported such barriers to technology implementation as: not having enough computers to in the classroom; no reward for the teachers making the extra effort to integrate technology; and

no training to support their effort. In a study of teacher-education students, Wentworth (1996) found that the students could not later use the technology projects they developed in their teaching because their schools did not have the appropriate technology resources. The perception of available resources has also been found to impact a teacher's classroom technology use (Becker, Ravitz & Wong, 1999; Becker & Ravitz, 1999; Mathews, 2000). More specifically, classroom dynamics, and factors such as classroom size, have been identified in the literature (e.g. Brandt, 2000; Mandinach & Cline, 1994; Sweet, 2004) as being barriers to the implementation of technology. Correspondingly, Gipson and Hart (1997) reported the main reasons for teachers not using technology. These reasons include: lack of preparation and training; the failure of computer materials to closely match the required curriculum; and inconsistent levels of success achieved by students and teachers.

Research Questions

This study investigates the relationship between teachers' perception of classroom technology resources and of the perceived feasibility of implementing an educational technology intervention. The technology assessment was designed to facilitate learning and pupil academic achievement according to the developing stage of the CTTC. Specific research questions were:

- Is there a relationship between the gender of the teacher and the perceived feasibility of implementation of Level II proposals?
- Is there a relationship between level of education of the teachers and perceived feasibility of implementation of their Level II proposals?

- Is there a relationship between years of teaching experience and the perceived feasibility of implementation of their Level II proposals?
- Is there a relationship between a teacher's perception of their classroom size the perceived feasibility of implementation of their Level II proposals?

Methodology

Participants

A total of 117 educators completed the Level II during the Fall of 2003 and Spring of 2005. As each analysis was conducted, only complete datasets were used resulting in slight variations in the small sizes across different sets of analyses. An unbalanced representation of males and females was present in the sample, with females comprising 75% (n=88) of the sample. More than half of the participants taught at the elementary level (53%), while 34% taught at the middle school level and 4% taught at the high school level. The remaining 9% reported that they did not hold a traditional classroom position (e.g. technology facilitator, media specialist). Nearly half (49%) of the participants had sixteen years or more of teaching experience, while remaining 51% of the participants had between one to fifteen years of teaching experience. Of those completing Level II, half of the participants had earned a master's degree. Twenty-eight percent had a bachelor's degree, 12% has a sixth year degree, and only 1% had earned a doctoral degree. See Table 2 for participants' demographics.

Table 2

Level II Participant Demographics (n=117)

		n	*Percentage*
Gender	*Male*	*25*	*21%*
	Female	*88*	*75%*
	Missing cases	*4*	*4%*
Grade Level	*Elementary*	*62*	*53%*
	Middle School	*40*	*34%*
	High School	*5*	*4%*
	Non-traditional Classroom Position	*10*	*9%*
Years Teaching Experience	*Internship*	*2*	*2%*
	1-2	*12*	*10%*
	3-5	*12*	*10%*
	6-10	*20*	*17%*
	11-15	*13*	*11%*
	16-20	*26*	*22%*
	20+	*32*	*28%*
Degree	*Some College*	*7*	*6%*
	Bachelor's	*32*	*28%*
	Master's	*59*	*50%*
	6th Year Degree	*14*	*12%*
	Doctorate	*1*	*1%*
	Other	*4*	*3%*

Procedures

For the purpose of this study, the relationship between teachers' perception of the technology resources they have in their classroom and their perceptions of the feasibility of implementing their Level II proposals were examined with respect to gender, years

teaching experience, and level of education. This study specifically utilized the on-line Context Survey (see Appendix C) which was developed to help educators understand their available resources. The Context Survey consists of four questions aimed at technology integration, resources, and strategies. Of particular interest were two the multiple choice questions that prompted the participants to think about their Level II technology integration proposal, class room space (Q1) and technology equipment (Q3).

Results

A two-way contingency table analysis was carried out to evaluate the data on this study. Pearson's chi-square test for independence was used to test the null hypothesis that the row classification factor (technology equipment: Q3) and the column classification factors (class room space: Q1, years teaching, gender & level of Education) are independent.

Is there a relationship between gender and the perceived feasibility of implementation of Level II proposals?

There was not a significant relationship between gender and teachers' perception of the technology resources they have in their classroom to implement their LII proposals (Q3) (Pearson $\chi^2 = 4.1$, df $=3$, $p = 0.25$). The pattern of responses for Q3 and Gender are shown in Table 3.

Table 3
Pattern of Responses Between Technology Equipment (Question 3) and Gender

		Gender		
		Male	Female	Total
Technology Equipment (Q3)	Outdated_no	2	1	3
	Outdated_yes	4	10	14
	Sufficient	5	19	24
	Just right	14	58	72
Total		25	88	113

Is there a relationship between level of education and perceived feasibility of implementation of their Level II proposals?

When comparing level of education (graduate vs. undergraduate) to teachers' perception of the technology resources they have in their classroom to implement their LII proposals (Q3) responses, there was a significant pattern of responses (Pearson χ^2= 22.0, df =6, p= 0.001). The pattern of responses for Q3 and level of education are shown in Table 4.

Table 4
Pattern of Responses Between Technology Equipment (Question 3) and Level of Education

	Degree						Total
Technology Equipment (Q3)	College	BA/BS	MA/MS	Sixth year	Doctorate	Other	
Outdated_no	1	1	1	0	0	0	3
Outdated_yes	0	4	4	2	0	3	13
Sufficient	1	4	18	3	0	0	26
Just right	5	23	33	9	1	0	71
Total	7	32	56	14	1	3	113

Approximately 30% of those with a graduate degree and 12.5% of those with only an undergraduate degree reported that their technology equipment was insufficient. However, 59.4% of those with a graduate degree and 72.5% of those with an undergraduate degree reported that their technology equipment was "just right." Thus, a greater percentage of individuals with a graduate degree indicated that their technology equipment was not sufficient, while a greater percentage of those with non-graduate degrees reported they could use the equipment they had.

Is there a relationship between years of teaching experience and the perceived feasibility of implementation of their Level II proposals?

When comparing years of teaching experience (internship, 1-2, 3-5, 6-10, 11-15, 16-20 & 20+) to teachers' perception of the technology resources they have in their classroom to implement their LII proposals (Q3) responses, there was a significant pattern of responses (Pearson χ^2= 32.7, df =18, p= 0.02). The pattern of responses for Q3 and years of teaching are shown in Table 5.

Table 5

Pattern of Responses Between Technology Equipment (Question 3) and Years Of Teaching Experience

	Years Teaching							Total
Technology Equipment (Q3)	Intern	1-2	3-5	6-10	11-15	16-20	20+	
Outdated_no	0	2	0	0	0	0	0	2
Outdated_yes	0	3	3	1	0	5	2	14
Sufficient	1	0	3	4	3	4	11	26
Just right	1	6	5	13	9	14	16	64
Total	2	11	11	18	12	23	29	106

For all years of teaching groupings, approximately 25% of the teachers felt that their technology was not sufficient.

Is there a relationship between teacher's perception of the size of their classroom and their perception of the feasibility of implementation of their Level II proposals?

Finally, there was a significant pattern of responses between teacher's perception of the size of their classroom (Q1) and their perception of the feasibility of implementation of their Level II proposals (Q3) (Pearson χ^2= 14.2, df =6, p= 0.03). The pattern of responses for Q3 and Q1 are shown in Table 6.

Table 6
Pattern of Responses Between Technology Equipment (Question 3) and Class Room Space (*Question 1).*

	Class Room Space (Q1)			Total
Technology Equipment (Q3)	Too large	Rearrange	Just right	
Outdated_no	0	0	3	3
Outdated_yes	1	4	9	14
Sufficient	0	13	11	24
Just right	0	20	51	71
Total	1	37	74	112

Interestingly, 64.9% of individuals who wanted to rearrange their classroom space reported that their technology equipment was "just right," while 81% of those who felt their space was acceptable reported that their technology equipment was "just right."

Discussion

Over the course of time, education has been redefined as progress has been made in the field. More specifically, the impact of technology has reshaped education, both from a teaching and learning perspective (NCES, 2000a; 2000b; 2002). Each year, technology has become more and more prevalent in schools, with virtually every public school in the United States having access to the Internet (NCES, 2003). Despite the strong presence of technology, issues and concerns have arisen centered on the implementation of technology into teaching and learning. This study examined what factors influence the perceived feasibility of being able to implement a technology enriched learning project.

Graduate Education

Graduate level education was found to have an impact on teachers' technology implementation in the classroom. A greater percentage of individuals with graduate degrees indicated that their technology equipment was not sufficient, while a greater

percentage of those with non-graduate degrees reported they could use the equipment they had. Findings from this study contradict prior research (see Coombs, 2000). One explanation for this may be due in fact to the unbalanced representation of participants with a graduate degree. As a nation, nearly half (45%) of all teachers have a master's degree (Lewis, Parsad, Carey, Bartfai, Farris, & Smerdon, 1999). However, 66% of the participants in this study had earned a master's degree or higher.

Also, as shown by our finding and supported by the literature, contextual and/or physical variables such as classroom size can impact technology implementation (Brandt, 2000; Mandinach and Cline, 1994; Sweet, 2004). These types of variables need to be controlled for in future studies.

Teaching Experience

Years of teaching experience did not appear to have a directional impact on self-perception of ability to implement technology, although the two are correlated. These findings also are contradictory to prior research. As noted by Pew (2002), college students are heavy users of the Internet. Similarly, due to state and national standards, recent graduates of teacher preparation programs received extensive training in educational technology. Therefore, it was expected that teachers who had less than ten years teaching experience would have both view and use technology differently than teachers who have been in the field more than ten years.

Gender

The lack of significant findings related to gender are perhaps reflective of a skewed sample with a disproportionately high number of females (n=88) compared to males (n=25), that generally reflects the gender distribution of teachers. This finding is

supportive of recent literature that indicates that the technology gender gap is disappearing (Dholakia et al., 2003). To evaluate if there is relationship between gender and the perceived feasibility of implementation of Level II proposals, a less skewed sample is needed is needed in future studies. Furthermore, a more thorough examination of the types of technology uses and the manner in which they were utilized would help to provide a more sound understanding of technology use by gender.

Limitations and Future Research

Limitations of this study are the nature of self-reported questionnaires and concerns over the validity of causal conclusions (Razavi, 2001). Another limitation is that the participants choose to take the Level II assessment. Furthermore, Level II is tied to Connecticut and national ISTE standards.

Further research is needed to observe the actual implementation of the LII technology proposals, rather than the self-reported prediction of implementation. In order to make real world training decisions, it is more informative to observe actual implementation rather than the perceived feasibility of implementation of Level II proposals.

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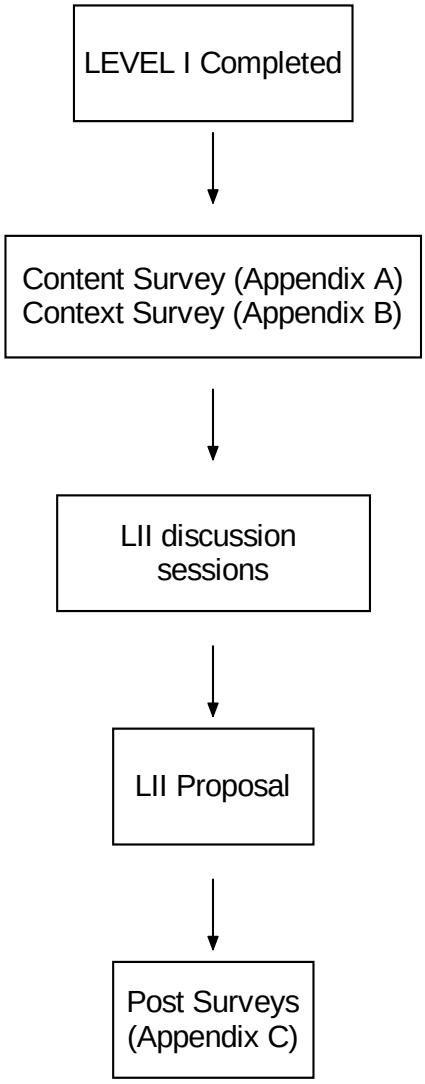
Appendix A – Level II procedure



Appendix B – Content Survey

My Content Survey

First Name: **Last Name:**

1. As I think about my technology integration proposal, I realize that I can:

☐ Implement my plan throughout the year.

☐ Implement my plan best during my unit on:

☐ Implement my plan best during my lesson on:

2. Please list some reasons why you think your plan is best implemented given your response to the above item:

3. As I think about my technology integration proposal, I wish that:

Please feel free to provide responses for more than one option.

☐ I had more time to teach my students about the topic of:

☐ I could teach with a in instructor who knows a lot about the topic of:

☐ I knew more about the topic of , for I find it interesting and I think my students would find it interesting too.

Thank you for sharing your ideas!

Submit Reset

Appendix C – Context Survey

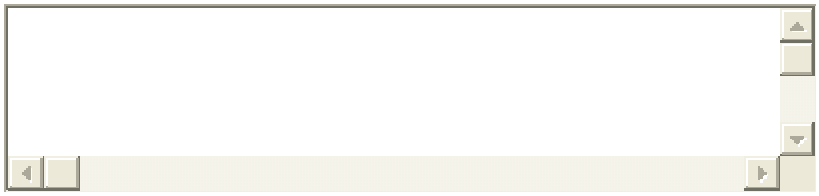
My Context Survey

First Name: **Last Name:**

1. As I think about my technology integration proposal, I realize that my class room may be:

- ☐ Too small for the proposed project.
- ☐ Too large for the proposed project.
- ☐ I think I have enough space, but I may have to rearrange my room.
- ☐ Just right. I have enough space and the room arrangement is fine.

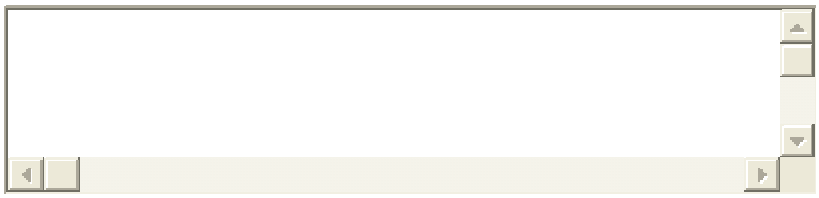
2. Please list some strategies that may help you revise your plan so that it may work more effectively in your classroom.



3. As I think about my technology integration proposal, I realize that my technology equipment is:

- ☐ Too outdated for that I would really like to do.
- ☐ Outdated, but I think I can still work with it.
- ☐ Not sufficient to realize all my students' needs.
- ☐ Just right. I think I have the technology required to implement my plan so that all my students can succeed.

4. Please list some strategies that would improve your plan by either the acquisition of new technology or more technology given your students' needs.



Thank you for sharing your ideas!

Submit Reset

Appendix D – Exit Survey

My Exit Survey

First Name:

Last Name:

1. In thinking about my proposal, I believe that I have demonstrated my developing skills in using technology:

- ☐ Well
- ☐ Very Well
- ☐ I am satisfied

2. While I was completing my Level II Assessment Proposal, I realized that:

Please check all that may apply.

- ☐ I was learning a lot about technology while completing the proposal.
- ☐ I really enjoyed sharing ideas with other colleagues.
- ☐ I would have never given much consideration into my classroom context has it not been for this experience.
- ☐ I would never have given much consideration to the content that I must cover had it not been for this experience.

Thank you for sharing your ideas!