5-9-2016

INTRODUCING CLASSROOM LABELING AS AN INNOVATIVE METHOD TO INFORM EDUCATIONAL PRACTICE

Roberta Lynn Crawford
University of Missouri-St. Louis, msrobbiedobber@gmail.com

INTRODUCING CLASSROOM LABELING AS AN INNOVATIVE METHOD TO INFORM EDUCATIONAL PRACTICE

by

ROBERTA CRAWFORD

M.Ed., Elementary Education, University of Missouri-St. Louis, 2003
B.S., Elementary Education, University of Missouri-Columbia, 1993

A DISSERTATION

Submitted to The Graduate School at the

UNIVERSITY OF MISSOURI - ST. LOUIS

in partial fulfillment of the requirements for the degree

DOCTOR OF PHILOSOPHY

in

EDUCATION
with an emphasis in TEACHING AND LEARNING PROCESSES

May, 2016

Advisory Committee

Charles Granger, Ph.D.
Chairperson

Natalie Bolton, Ph.D.

Marlene Levine, Ed.D.

Gayle Wilkinson, Ed.D.

Abstract

In-service seminars and one-shot workshops are the primary methods used for the on-going professional development of instructors, but these methods have been shown to be ineffective and an inadequate way to provide teacher training (Winton & McCollum, 2008). Classroom labeling is proposed as a way of providing knowledge utilization and an alternative to in-service education for preschool teachers by intentionally applying layers of information directly to the learning environment through visual displays, usually in the form of posters. Instructional exhibits typically have only been used to enhance the learning experience of the children. Through the use of classroom labeling, adult educators can become aware of new research as well as textbook knowledge through words and pictures attractively displayed around the classroom where they are working every day. Participating teachers were asked to complete a pre-assessment before their early childhood classrooms were labeled with posters, which are educational signs, placed strategically around the room in places where they would be seen by adults, read and directly applied. After the classrooms were labeled for two weeks, the teachers completed a post-assessment to ascertain whether this method increased their knowledge base as evidenced by their ability to retain and recall the information from the classroom labeling. Results showed that classroom labeling was effective in disseminating knowledge to the teachers in the classroom and that some prefer this method of professional development.

Keywords: classroom, labeling, early childhood, knowledge implementation, teacher preparation, preschool, professional development

Acknowledgements

I am very appreciative to my advisor and committee chair, Dr. Granger. He has been encouraging of my many ideas, tempered them at times but has always given thoughtful feedback and important wisdom. Dr. Bolton has met with me personally on several occasions and offered advice and instruction. She is a person that I look to as a mentor. Dr. Levine was one of the most rigorous instructors in my early childhood classes. She takes her job as an instructor seriously and she highly values early childhood education. Dr. Wilkinson is like a breath of fresh air, always smiling, laughing, spurring me on and giving very important guidance on clarifying my thoughts.

I am thankful for my family. My husband, James, has often taken up the slack throughout these past few years with laundry, meals and housekeeping when I was overwhelmed with work. My oldest daughter, Jessie, has been my trusty and brilliant "research assistant" and constant companion. I am thankful that her husband, Jordan, allowed her to work late into the night with me cleaning, categorizing and crunching data. She has helped me through each phase of this process, all while she is completing her own MBA. My two youngest daughters, Jene and Jia have believed in me and cheered me on through it all but will never let me forget what is most important-my family.

My administrator, Anthony Braswell, has been wonderful and without his flexibility, I would not have been able to finish this dissertation. My co-workers are the best in the world and have also assisted me greatly in my endeavors. I am thankful for my parents and sisters who gave me a secure foundation on which to build my life. I am thankful for my lifelong friends and church family who have been a network of love, resources and a deep well of enthusiasm.

Table of Contents

List of Tables

Introducing Classroom Labeling as an Innovative Method to Inform Educational Practice

Chapter One: Introduction

Early childhood professional teacher preparation in the United States is not an organized, systematic approach and consists of many credentialing agencies and authorities (Winton & McCollum, 2006). Currently only fifty-seven percent of states require a college degree for lead teachers in state-funded, early childhood education settings (Barnett, Carolan, Squires & Clarke Brown, 2013). When taking into consideration all of the faith-based and private settings, the percentage of preschool classroom teachers with a college diploma is much lower with only forty-six percent that have obtained a bachelors degree or higher. It is estimated that one in four early childhood centers in the United States is operated in a religious facility (Neugebauer, 2005). This information leads to two potential issues. First, because bachelors degrees for lead teachers is one of the standards of quality, most centers in the United States would be considered below that benchmark. Even more dismal, over five hundred thousand children, or forty-one percent of nationwide preschool enrollees in 2013, attended programs that met fewer than fifty percent of the quality standards benchmarks (Barnett, et al., 2013). However, this benchmark has recently come under some scrutiny because of a comprehensive review by Early, Maxwell, Burchinal, Bender, Ebanks & Henry (2007). Seven large scale studies that found little relationship between the level of teacher education and overall classroom quality or pre-academic outcomes for young students. This may mean that a trend toward hiring non-degreed staff will increase. It may also indicate that in the future, experience and specific qualities in a person will be

valued more highly when interviewing for employment, rather than a reliance on background education. Secondly, if programs hire teachers who do not have a bachelors degree, it becomes imperative for the administration to assume the responsibility of providing additional targeted training and support in order to ensure a quality education, professionalism and a common core knowledge base of all teaching staff on the team. This will allow for a continuity of positive outcomes for children. It is important that innovative methods are created to facilitate on-the-job training and professional development for this potentially undereducated workforce.

Three familiar differentiated types of professional development interventions are (a) pre-service education: degree or credentialing from a higher education institute; (b) in-service training: the trade model for on-the-job training and seminars; and (c) knowledge implementation: systematic strategies to facilitate the dissemination of research and to promote the adaptation and implementation of practices based on new or updated research (Estabrooks, 2001). Winton & McCollum (2008) have shown that in-service seminars and one-shot workshops are the primary methods used for the continuing education of early childhood teachers but are ineffective and an inadequate way to affect educational practice.

Classroom labeling (CL) is a form of knowledge utilization and an alternative to in-service education for preschool teachers. Classroom labeling impacts educational practices by bringing research and knowledge into the classroom through visual displays in the form of posters. CL informs all participants in the learning community by creating

an atmosphere that encourages curiosity, logic and critical thinking through intentionally applying layers of information directly to the learning environment.

Purpose of the Study

The purpose of this quasi-experimental study was to determine the effectiveness of classroom labeling as a knowledge implementation strategy for the professional development of early childhood teachers in the Midwest. Because on-the-job training is crucial in this field and typical forms of information delivery have been shown to be ineffective (Winton & McCollum, 2008), this innovative approach has been developed as an alternative method to the trade model of in-service training sessions and seminars that are currently widely used in preschool and daycare centers.

The classroom environment has been emphasized by the National Association for the Education of Young Children as being of utmost importance (Ritchie & Willer, 2008). In the popular Reggio Emilio philosophy, the environment is referred to as the "third teacher" (Sassalos, 1999). Dodge and Kittredge (2003) asserted that a well-designed classroom instructs and conveys multiple messages to its students. The concept of classroom layering (R. Crawford, original work, August 30, 2013) takes these concepts a step further and shows how the environment can also be used to teach adults who are in the learning community of that class.

Significance of the Study and Research Question

Classroom labeling has the potential to benefit the early childhood field by exposing concepts to adult learners who are unaware of their existence and disseminating

the concepts within a context in which to understand and experience them fully. Visual examples are readily available to reinforce the ideas that are being taught. If CL was a common practice and refreshed often, parents and teachers would enter the preschool expecting it to be an information rich source and would potentially seek out the material that is displayed for them within the classroom. Policymakers could use the results of this study to determine how much pre-service education should be required and if alternative methods could be used effectively to prepare a qualified, professional early childhood workforce.

Although many topics can be taught via CL, for this research, the subject matter was narrowed down to "The Benefits of the Use of Technology for Young Children." This topic was chosen because many preschools use technology but there are some scholars and parents who oppose its use (Alliance for Childhood, 2000). It would be beneficial and relevant thus intrinsically motivating for early childhood teachers to learn about what the research says concerning appropriateness and efficacy of technology in the preschool classroom (Penuel, Pasnik, Bates, Townsend, Gallagher, Llorente, & Hupert, 2009).

Research Question

The research question is “Does classroom labeling increase preschool teachers’ awareness of the benefits of the use of technology for young children as evidenced by the teachers' recall of them?” The purpose of the study is to put the idea of CL to the test to see if it is an effective knowledge implementation strategy for professional development in the early childhood classroom setting. The topic of technology was utilized in this

instance because it is a current and relevant interest of many teachers, but other topics could have been used effectively also. The importance of the research question was on CL as a professional development strategy. The focus of the analysis was not on the importance of the participants' knowledge of technology but whether or not CL was an effective delivery model.

Theoretical Framework

The theoretical framework for this study comes from preschool teacher preparation theory which is about helping the classroom teacher to be informed and to use effective teaching strategies that are research-based and current. The preschool teacher should learn to study, critique, select, apply and eventually to conduct research within the learning environment. It is important that research influences the classroom in a very real way but the gulf between the two can seem large (CEE, 2005).

The first two goals are that preschool teachers become aware of the current research and supportive information that is being generated within their field and they learn to critique it appropriately. The next goals are for teachers to incorporate this information into their environment by selecting methods and applying them skillfully within the instruction process (CEE, 2005). Bringing theory into practice can be a great challenge and requires reflective teaching skills (NCLRC, 2004). Preschool teachers must not only be avid readers themselves, but then must translate hypotheses and findings from a research journal into techniques that fit into their own style and meet the needs of their students (McKenzie, 2004). The research question addressed the first goal above.

That was to see if CL is a way to increase awareness and knowledge of crucial concepts in the early childhood classroom because memory is one of the basic elements of learning.

Guskey developed a rubric to assess the effectiveness professional development techniques for teacher preparation. Guskey's rubric is called Professional Development Evaluation (See Appendix D) and it has five evaluation levels: (a) Participants' Reaction which asks "Was it helpful?"; (b) Participants' Learning which asks "Did the participants acquire the intended knowledge and did attitudes, beliefs or dispositions change?"; (c) Organization Support and Change which asks, "Do you have the support and resources to make changes?"; (d) Participants' Use of New Knowledge and Skills which asks "Did the new information get implemented in the classroom?"; (e) Student Learning Outcomes which asks "Did the students benefit?" Guskey's tool was useful in evaluating the results of this study and indicating on the very basic levels, whether or not CL was useful as a teacher preparation method.

Further research should be conducted to address the higher level goals to reveal whether or not CL is facilitating the long term cognitive incorporation of knowledge and also if knowledge is changing the practices of the teachers. The scope of this study was one delimitation. Other delimitations followed by the limitations are delineated in the next sections.

Delimitations

Delimitations were carefully chosen in order to narrow the focus and to define the

population clearly. Only preschool centers in an Urban Midwest area with student enrollment between 25 and 170 were included. The criteria for the site selection included: (a) it is a private preschool or daycare center (can be faith-based or secular, non-profit or for profit) because they are in the same legal category and they may have less anti-technology sentiments, less restrictions on what can be affixed in the classroom and on allowing private individuals to conduct research; (b) working computers or tablets are used daily by the children at the center, otherwise the information may not be relevant or implementable; and (c) the staff has not had previous training on the benefits of the use of technology for young children because their pre-knowledge about the benefits of technology would likely be more than the average teacher involved in the study.

Those surveyed in this study were limited to sixty-three female teachers, in any age bracket as well as both part time and full time. This increased the possibility of sufficient and consistent, daily contact with the intervention information. The level of education, experience and amount of classroom time of the teachers was noted as a possible limitation but not used as a delimitation because it is not probable that these factors will change a person's ability to learn in a significant way. It is postulated that it is not the length of time that the teachers are exposed to the information on the CL, because after one viewing, the material may be relegated to background visuals. The important factor is that the information was received and parts were retained into the consciousness of the teachers. After reading and retaining the information, every time the teachers see the CL during the day, they are reminded of the information that was gleaned earlier from its contents.

Limitations

The delimitations helped to define the boundaries of the study by making decisions on what was going to be included and excluded from the design. There were; however, aspects of the plan, that were limitations and could not be controlled. In the social sciences, there are always uncontrollable matters or occurrences which must be mentioned because they could have affected the outcomes in some way. Claims of casual conclusions are confounded when the random assignment of participants is not able to be conducted. Although many variables were controlled through delimitations, all could not be controlled, and true random assignment was not accomplished. Because of this, the inferences made are limited as well as the generalizability of the results.

The use of surveys with time constraints are not natural forms of evaluation in real settings. Surveys tend to lead the respondents into a limited range of responses, which can, as opposed to personal interviews, force participants to answer in a way that is not exactly true to their beliefs. Because surveys were chosen as the primary source of data collection, the inherent faults of this method should be stated. Most of the participants were unknown to the researcher, so their scores are taken at face value without the context of the personality traits, peer influences, current moods, or the setting of the respondents.

Operational Definitions

Classroom labeling is a term that is introduced into the literature throughout this study therefore it and other pertinent terms used in this line of inquiry were defined:

Classroom labeling - posters, words, pictures, instructional displays and other decor that contain educational and instructional information for adults within a learning environment. They are placed on the walls and shelves in the classroom where the information can be read and it is directly applied to the teaching and learning process. The classroom labels have detailed explanations and implications for the type of activities that are encouraged in the area and extensions for learning in that instructional setting (R. Crawford, original work, August 30, 2013).

Knowledge utilization - intervention activities aimed at increasing the use of knowledge to solve human problems (Estabrooks, et. al., 2006).

Knowledge implementation- implementing the new information into their specific situation using active participation of all important members of the classroom community over a sustained period of time (Fixsen, et. al., 2005).

Pre-service preparation- traditional, college degree or certification programs

In-service preparation- on-the-job training, typically in the form of one day seminars

Summary

It was suggested that preschool classrooms can be labeled with information not only for the children in the classroom learning community, but also for adults. That

information used for classroom labeling can include new research or textbook knowledge to increase teacher professional knowledge and ideas for extending the student learning and engagement. The use of classroom labeling was measured in this study to determine whether or not teachers learned through this method as evidenced by their ability to retain and recall the information on the CL.

Chapter Two: Literature Review

The classroom labeling (CL) intervention was developed to determine the efficacy of labeling for increasing the teacher awareness of information related to a specific training topic. In this chapter, the theory of knowledge utilization training, (Estabrooks, Thompson, Lovely & Hofmeyer, 2006) often known as knowledge implementation (Fixsen, Naoom, Blase, Friedman & Wallace, 2005), is discussed and its implications for CL in light of typical service models that are used more frequently in the early childhood field. Visuals in the classroom and the importance of classroom environment are also explored because they are essential components of CL. In order to justify employing the method of CL for teacher instruction, there is a section included in this chapter, describing the findings of a pilot study that was conducted using CL. The subject matter chosen as the topic for the CL is "the benefits of the use of technology for young children." The participants were asked to recall the benefits of technology that are posted in their classroom. To explain it more thoroughly, the concluding section of this chapter includes research supporting using technology with preschool children within the early childhood program.

Theories Supporting Classroom Labeling

Although the benefits of technology for young children is the chosen topic of dissemination, knowledge utilization is the actual theory that classroom labeling is designed to put into practice and what was tested (Winton & McCollum, 2008). Knowledge utilization has been defined, in part, as intervention activities aimed at

increasing the use of knowledge to solve human problems (Estabrooks, et. al., 2006). Knowledge is not helpful until it is put into use. There are two established learning formats for teachers in the field of early childhood education. Firstly, pre-service training which is accomplished by obtaining a traditional degree or secondly, on-the-job training which is usually gained through in-service sessions. Because pay scales are so low for early childhood teachers, with 19% of whom earn less than ten dollars per hour, and because teaching degrees are not required by most states, there are numerous situations where on-site training is the main format for professional development, if not the only one (Winton & McCollum, 2008). Unfortunately, the in-service and workshop training model has been shown to have poor effectiveness in making changes in the classroom. (Joyce and Showers, 2002). Classroom coaching that is collaborative, sustained over time, interactive and classroom focused has been deemed as the most effective training (NEA.org). Information dissemination and training alone do not result in knowledge utilization.

The methods suggested in this study are related to post-employment education and training, therefore pre-service education is not discussed. In-service training, which is usually carried out in the form of one-shot seminars and workshops, has been consistently shown in a review of studies completed over a thirty-year span that they are inadequate and lack effectiveness (Guskey, 1986). Because of the inadequacies of the methods being widely used for teacher training, in 2000, Thomas Guskey borrowed a construct developed by Donald Kilpatrick for use in the business industry and created a rubric for evaluating types of professional development for educators. After trial and error and further revisions, five levels of assessment were created. In an interview with

Guskey, he states that is in important to know that the levels are dependent on each other and build up. One cannot be used in isolation of the others (Kreider & Bouffard, 2005)

Collaboration, interaction, coaching grounded in practice, and sustained content-focused experiences are recommended and favored by teachers above the common classroom style approaches of traditional in-service training practices (Joyce and Showers, 2002; NSDC, 2014). These elements are more in-line with the practices of knowledge implementation, which holds that information dissemination and training alone are ineffective in creating well-informed changes in classroom practices (Winton & McCollum, 2008). There must be a "boots-on-the-ground" approach to implementing the new information into their specific situation using active participation of all important members of the classroom community over a sustained period of time (Fixsen, et. al., 2005). Classroom labeling is an approach that takes information and applies it directly to the areas and items in the classroom. It is information on posters or other decor that is displayed in the classroom over a period of time in the proximity to the areas where children are playing and adults are observing, thus the research is displayed in the area where it can be directly applied to a real learning scene.

Classroom Environment

It is theorized in this study, that CL can disseminate knowledge to adults in an early childhood learning community by infusing information into the classroom environment. There are three teachers in the classroom: adults, peers, and the physical environment. The classroom environment traditionally plays a key role in early childhood instruction and has even been referred to as "the third teacher" (Ritchie &

Willer, 2008). NAEYC depicts classroom displays as phenomenon that help children reflect and extend their learning and require that they are at eye level and are created around topics of interest for children. They assert that the classroom should be arranged in predictable ways which organizes the habiliments and encourages autonomy, responsibility and empathy. If it is important to children, it is postulated in this study, that the environment can also be important to the development and life-long learning of the crucial adult members of the classroom community who may be teaching staff or parents of preschoolers. The needs of the adults are often overlooked and almost never considered when deciding the room decor. Children, other adults and the physical environment could also be the three teachers of adults.

To give supporting theory for the use of display materials in the classroom for adults, the idea of classroom layers was developed (R. Crawford, original work, August 30, 2013). The following is a description of the four layers of words, pictures and décor which can create a classroom environment that is conducive to the inclusion of all of the participants, both children and adults, in the instructional scene. The names of each level have been borrowed from the layers of the rainforest.

EMERGENT LAYER

In the classroom, this is the brightest and most open area. The materials and displays are large and friendly. Ceiling danglers soaring overhead create an atmosphere of warmth that brings the ceiling down closer to the participants in the room and somewhat reduces the glare from the overhead fixtures. The decor in this layer creates a mood and is inviting to both children and adults.

CANOPY LAYER

In the classroom, this layer is for the adults and family members who are in the room for relatively short amounts of time. This area is mainly between the middle and top half of the interior walls and also includes the aesthetics and

layout of the classroom habiliments. The decor entertains, labels, and provides beauty. It should clearly define the activities in the room, indicate the age group served and the season of the year as well as signal the flow of traffic in each area. The items posted should help visitors entering the room to get their bearings easily. The Canopy Layer makes a point, sends a message or simply conveys that adult visitors are important and welcome.

UNDERSTORY LAYER

In the classroom, this is the level of decor that has the most extensive amount of educational and informational materials for the essential adult companions that will be residing in the classroom for longer amounts of time as well as those who come in and out for child delivery and pick-up. It has labels that arrange the materials and help to keep them organized. It also includes detailed explanations of the importance of the items placed there, implications for the type of activities that are encouraged in each area, and extensions for learning that give adults suggested ways to interact with the children in that specific instructive scene. Through classroom labeling, this layer gives terms and vocabulary as well as meaning by naming and revealing the educational importance of common classroom items that may just be seen as toys, manipulatives, furniture, school supplies, etc. or of common places such as learning centers, bathrooms, cubbies, etc. Another important function of this layer is to apply research findings and suggestions to the actual setting where it will be used.

FOREST FLOOR

In the classroom, this is a place that children play and relax. This is where adults come and go to set up instructive play scenes, provide suggestions for problem-solving, assist in clean up, de-clutter during activity transitions or enter into the play scenario at the special invitation of a child. During playtime, adults act as behind-the-scenes support for the actors and directors on the "main stage." The décor should complement the scene construction as well as spark curiosity, imagination and self-affirmation. Pictures, props, special toys, and costumes with one word names and picture labels should be thoughtfully placed on low shelves to facilitate play, reinforce self-help skills, provide a language-rich environment and help the children to organize their materials. Decorations are more non-permanent in nature and can be placed and replaced in this area during playtime, by children or teachers. Materials should be provided for the children to perform their decoration duties and to affix them temporarily to their scene.

Four Layers of the Classroom (R. Crawford, original work, August 30, 2013)

The classroom labeling (CL) is focusing on only the one layer of classroom labeling that is intended to inform and support adults in the classroom; the Understory Layer. The NAEYC Early Childhood Program Standards and Accreditation Criteria

states that early childhood teachers should use a variety of teaching methods, foster their curiosity and extend their engagement using prompting questions, scaffolding and individualized questioning (NAEYC, 2014). Classroom labeling at the Understory level would provide rich information and idea starters for teachers and parents to use in interacting with the children while they are actively playing. By using the methods described, one may be able to bring textbook knowledge into the classroom and make research relevant. By labeling the areas of the room for adults, meanings of theories are "re-implicated" into the flow of an individual's attention (Boulton, 2011). Otherwise abstract ideas on a page, can be directly applied in a visual way to an instructional scene. While the general public does not usually read textbooks or professional educational journals, it is believed that this published information can be brought into the classroom via posters and other visuals in a natural and integrated way. The explanatory text on one poster is a "wonderful thing for an adult and it fulfills almost a chapter of knowledge" (Hubenthal & O'Brien, 2009, p. 3). CL utilizes posters in the classroom for the purpose of increasing teacher awareness of information related to various professional development topics and ultimately for knowledge utilization.

According to Dodge and Kittredge (2003), authors of the video; *Room Arrangement as a Teaching Strategy*, a well-designed classroom should convey six positive messages for pre-school children and why could not these also be messages for adults in the classroom community also? These messages are (a) This is a good place to be (adults also need places that are positive, cheerful, organized and accepting); (b) You belong here as a valued member of the community (This message can be partially be given to adults using the Understory layer and classroom labeling to make them feel that

educational information for them is also important.) (c) This is a place you can trust (Adult members of the classroom develop confidence by gaining validation and explanations for the practices that they employ in the classroom.); (d) There are places you can be by yourself when you want to be (Adults can go on break or have curriculum design time at appropriately designated times during the day.) (e) You can do many things on your own (Teachers should have the autonomy to make some choices during the day.); and (f) This is a safe place to explore and try new ideas (The classroom is informative as a teaching environment and socially secure. It is safe to try new things and risk making a mistake). (p.1)

At least three of these messages (a, b and f) can be directly related to classroom labeling because they are obviously written for adults which conveys that they are important members of the classroom community. The CL give motivating thoughts, inspiring ideas and extensions for teachers to try which gives subtle permission and encourages further explorations. These inherent benefits are the reasons that CL is hypothesized to be an effective strategy and form of communication for adults within the early childhood classroom.

Pilot Study Findings

In order to informally ascertain whether or not the effectiveness of the use of CL are worthy of pursuit, a pilot study of very simple design was initiated. The pilot study was conducted over the period of one month with two assistant teachers at a center-based preschool. When the researcher asked the teachers about the children's perceptions of their time in the dramatic playroom, on a scale of one to ten, with ten being their favorite time of the day, the first said 8 in both the pre and post interviews and the second said 7

in both. When they were both asked about their view of the playroom's importance, again, their opinions did not change but the reasons for its importance did change.

Results from the data collection

Table 1

Teacher Reponses on the Purposes of Play

Responses and Items Recalled from the Classroom Labels by Teachers

Teacher	Pre-Condition:		Post-Condition:		Label Info. Recalled:		
	# Physical	# Cognitive	# Physical	# Cognitive	#1	#2	
Teacher #1	5	3	5	5	4		Not interviewed separately
Teacher #2	2	1	8	11	7		Not interviewed separately
Total	7	4	13	16	11		23 (from both teachers combined}
Combined Total	11		29				

Table 1

The first two columns give the number of purposes of the children's time in the dramatic playroom that the teachers could think of before the classroom was labeled. The teachers had a total of 11 different responses upon their Pre-Condition interview. At their post-condition interview, four weeks later, there was a 62% increase in the average number of purposes of play that the teachers were able to list. There was a seventy-five percent increase in the number of cognitive purposes noticed by the teachers and a forty-six percent increase in physical purposes. When re-interviewed just one day later, there was a fifty-two percent increase in the actual items recalled that were posted on the wall of the dramatic playroom with classroom labels.

When questioned about their perceptions, both of the teachers interviewed made positive statements about classroom labeling and a few critical statements. Some suggestions were given for future implementation. Altogether there were 15 positive statements and 6 critical statements about labeling. Some interview excerpts from each of the participants includes: "It made me more aware. A lot of the things that were there brought back those days that I spent in college classes … I don't know that everything needs to be on the wall because a child can't read it. I do think that teachers need to read it though…They could do that either by talking to them or to print it out on paper and hand it out. You might want to consider doing a binder for people."

They were asked, "Would parents and teachers, especially new ones to the room, be able to know all of that information on an on-going basis? Would teachers remember it later if they read a binder? Is there a chance that it would be more likely to be immediately applied if it were in the room where it had direct meaning?" #1 replied, "Yeah, I guess you're right. It might be good to have on the wall. I would suggest that you add more pictures and that it's not so wordy." (#1)

#2 had this to say: "It's made me think more... I think more about what they are doing…I have read some of the information and I know some of that would have never crossed my mind. As a parent it helps them. If they didn't see that information they probably wouldn't think it is real learning time but they would think, 'This is for their play time.'" (#2)

"At first it's overwhelming. At first you think, "What is this?" When you read it, you really do understand it more. It doesn't feel overwhelming now. I don't feel like I have to have it." (#1)

As a final question, they were asked, Do you feel like you're a better teacher because of it? "Yes, I know more." (#2) (personal communication, November 14, 2013)

There was some discussion in the interviews and in later discussions with the participants about the proper implementation of this method of knowledge transmission. Visuals are most effective when they are easy to read, have picture cues, very organized information and when they are carefully designed to be aesthetically pleasing. Adults who are working in the room can read them in the natural course of their daily activities and quickly engage in content that informs, calls attention to current topics and sparks questions for their personal inquiry. Pedagogically speaking, using visuals in this way is similar to a well-crafted lecture that grabs attention and provides cues for expected outcomes (Hubenthal & O'Brien, 2009).

One teacher felt that some of the items were disorganized. At first they both felt it was too overwhelming. The term "wordy" was used several times. If time was taken to make the presentation more visually pleasing it might be easier to conceptualize.

The researcher also felt that thought should be given to the motivation of the teacher to read and learn the provided content. What would motivate them to take in and be influenced by learning material while they are monitoring children? If teachers could actually see the positive results of their efforts, they would be more likely to apply themselves to learning the information. The problem is that positive results like the success of children in future learning, their level of self-esteem, with problem-solving skills, their excitement about education, and their integration of concepts are not always easily measured. However, there are some very visible outcomes that can be tied directly to teacher knowledge and intervention such as calmer interactions between children

because they are engaged in deeply-rewarding play, students' use of conflict-management and questioning skills employed by the teachers, students discussing deeper ideas with their peers and facilitators, and students moving from one stage of block play or dramatic play to the next, signaling cognitive growth. Recognizing results and making the connection between the teacher techniques and the student behaviors may not be automatic for teachers, but can be pointed out and documented to make them become cognizant of the effect that they are producing.

After the final interview where the teachers tried to remember the lists of facts on the wall of the playroom, it was obvious that the teacher who had no formal college training was able to recall many facts, very quickly. She was asked why she had never pursued college. She replied that her husband was always trying to get her to enroll, but she did not think that she would be able to do well in that level of coursework. By bringing college level material into the field of practice using this simple method, sparked the attention and possibly the ambitions of a person who undervalued her abilities. Academia can be intimidating, and often there are people who have not been exposed to its terminology or practices. Accordingly, CL may change student outcomes and may have also changed the professional development course of a teacher. The in-depth study of these results, pointed to the efficacy of CL.

Limitations and/or Suggestions from the Pilot Study

This pilot study examined a small sample of teachers from one institution. Because it was informal, the reliability and validity of the study and the measure was not addressed. Only two participants were interviewed, so the findings could not be

generalized but indicated the need for further study. The pilot study could also have been strengthened by interviewing more teachers, administrators and parents. Suggestions by the participants to take more time with the visual aspects of the displays were useful in designing the full study. The original pilot study was expanded to other similar centers, using more participants and that the suggestions for the upgrade of visuals were implemented.

Propelled forward by the results of this pilot study, the technique of CL was explored further through the design of a new study, recruiting more preschools, more classrooms and more teachers in order to obtain results that can be generalized to a larger population. A new topic was chosen as the focus of the classroom labels: The Benefits of the Use of Technology for Young Children. This subject was chosen because many preschools utilize technology but it can be controversial and not much information has been made widely available to early childhood educators on the topic. It is relevant and pertinent to educators, yet has not been addressed thoroughly within the early childhood community.

The Benefits of the Use of Technology for Young Children

This section delineates the benefits of technology in order to substantiate the importance of this topic for its use in CL for professional development. Technology has the potential to play an important role in the future of the early childhood classroom by providing for young children the most current access to information in an efficient, attractive format that is developmentally appropriate. Recent trends in society have tried to pit play against technology and suggest that technology will hinder a child's ability to

interact socially, will inhibit their ability to think clearly and make good decisions. Skeptics of electronic devices believe that computers will mesmerize children and not allow them to naturally develop self-regulation skills or engage in rigorous, outdoor physical activities (Cordes & Miller, 2000). With the guidance of caring adults using digital integrity, this dismal prediction does not have to be the reality. When used appropriately, technology should offer learning and teaching opportunities, expand creativity, support healthy lifestyles, solve problems and accomplish tasks, meanwhile promoting relationships among children and between children and adults. Just as all other manipulatives and visual aids used in the classroom, technology is a tool and a toy that should be enlisted for work and play in responsible ways.

Technology research has grown tremendously in the past decade. Much has yet to be learned, but many misconceptions and fears have been put to rest through the collection of evidence-based studies by researchers of educational technology (Karray, Alemzadeh, Saleh, & Arab, 2008). More emphasis is now being placed on the proper use of electronics rather than dismissing them simply because they are machines (Karray, et.al., 2008). The tool that we use is less important than the way that it is used. Technology does not create change but humans do (O'Sullivan 2000).

Many in the past have argued against the use of computer technology for young children's learners (Cordes & Miller, 2000). Possible negative outcomes related to computer and media use have been identified, such as irregular sleep patterns, behavioral issues, focus and attention problems, decreased academic performance, negative impact on socialization and language development (Cordes & Miller, 2000). Research findings are divided and often oppose each other; therefore, can be confusing to both parents and

educators. Research such as the Ready to Learn Initiative, have found no evidence to support the belief that screen media is harmful. Findings suggest that when television shows and electronic resources have been carefully designed to incorporate effective reading instruction strategies, they serve as positive and powerful tools for teaching and learning (Pasnik, Strother, Schindel, Penuel, & Llorente, 2007).

There are substantial differences, even polarities of evidence that support opposing viewpoints, in reported published research findings. It is important to note the year when the research was published. Media has matured and learned from its past mistakes. Those in the industry have listened to their critics and created many formats that are portable, interactive, people-friendly, physically and cognitively healthy. Copious applications of responsible technology and media are being released. Technology has evolved and children can be the beneficiaries. Researchers of children's media, such as the Ready to Learn Initiative has found that electronic resources which have been carefully designed, serve as positive and powerful tools for teaching and learning (Pasnik, et. al., 2007). The following six benefits of technology were developed using current research combined with the rubrics, *NETS for Students: Extended Rubric for Grades PK–2,* created by Learning Points Associates. This rubric is based on the International Society for Technology in Education's (ISTE*) National Educational Technology Standards for Students: Connecting Curriculum and Technology* (NETS, n.d.).

1. Provides Learning and Teaching Opportunities and Resources.

Current research is now widely documenting the positive effects of technology in educational settings on the development of young children. Some studies have shown

that children who use computers in their learning have shown greater gains in intelligence, structural knowledge, problem solving, and language skills compared with those who do not use technology (Haugland, 1997; Vernadakis, Avgerinos, & Tsitskari, 2005).

Students can use technology to locate, evaluate, and collect information from a variety of sources. They can learn how to access developmentally appropriate Web resources to process data and report results, and how to collect information from a variety of sources. Students learn where to go for information that they need or tasks they are trying to accomplish. Students can identify the monitor, keyboard, earphones, and drives and they understand their purpose.

2. Expands Creativity and Accomplishes Tasks

Creativity is an intellectual process (Hughes, 2010) and creative thinkers will be highly valued in the coming economic climate (Brien, 2011). It is an essential attribute that should be fostered in childhood. Children who use technology in creative ways display characteristics of persistence, self-confidence, high energy, independence, flexibility, openness to new experiences, tolerance of ambiguity and a good sense of humor. They are playful and curious (Runco, 2003). Students can learn how to navigate developmentally appropriate multimedia resources (e.g., interactive books, educational software, drawing and presentation programs) to support learning, productivity, and creativity. They can be taught to use productivity tools to collaborate and produce creative works (NETS, n.d.).

3. Encourages Problem-Solving

The early childhood educator should be forward-thinking by recognizing and supporting cognitive needs of young children and the unique ways that they solve problems and gather information. Educationists should understand both the needs of students as well as the attributes of the world into which they will eventually assimilate. Technological literacy is very important and will become increasingly more important as the world rapidly becomes more digitized (Ribble, n.d.). The needs of this generation should not be accommodated only when it is demanded by students when they tune out the teacher and drop out mentally by third grade because of boredom or irrelevancy.

Students can be taught to use developmentally appropriate technology for problem- solving and decision-making (e.g., matching, counting, ordering and sequencing, patterns, sorting by shape or color, classification, hidden items, measurement, directional words, critical thinking, logic and prediction, same or different). Technology should be used at school for academics as well as for solving problems in real world settings such as their home for learning and entertainment (NETS, n.d.).

4. Increases Knowledge and Builds Skills

Children who participate in decision-making processes increase their proficiency and confidence. In turn, keen decision-making skills are crucial for the development of independence which is shown to increase achievement and lower misconduct (Rubin and Schoenefeld, 2009). Video game players have markedly increased scores on tests in every area necessary for higher level thinking skills: visuospatial ability, working memory, critical thinking, problem solving, and advanced literacy skills (Gray, 2012).

Students should be taught an understanding of the nature and operation of technology systems. Students should be able to recognize and name the major hardware components of a computer (e.g., CPU, monitor, mouse, and keyboard), know how they are used and how to take care of them. Students are then able to use the computer mouse to open or close a program or app, activate a hyperlink or drag and drop. Students can be taught to recognize common symbols and icons (e.g., the arrow symbol, EXIT, ESC, underlined and colored text, sound, waiting clock). Students should be able to use the keyboard to type letters, numbers and special key functions (e.g., delete, shift, arrow keys, space bar). They should know basic digital terminology (e.g. double-click, boot, reboot, mouse, drive, loading) (NETS, n.d.).

5. Promotes Communication and Relationships

A study by the Pew Research Center concluded that video games, far from being socially isolating, serve to connect young people with their peers and to society at large (Gray, 2012). Prensky (2010) uses the term, digital natives to describe children born into today's techno-savvy, digitally-integrated society and who are fluent in the terminology of technology. These children are more deeply connected to each other in ways that no generation has ever been before. Even the executive functions of their minds work in new ways. They are quick learners and processors (Prensky, 2009). This makes them closely connected to their peers who are wired to think the same way (Karray, et al., 2008). Students should use various media (e.g., text, clip art, photos, video, Web pages, newsletters) to collaborate, communicate ideas and interact with peers and teachers (NETS, n.d.).

6. Teaches Responsibility and Supports Healthy Lifestyles

Systematic surveys have shown that regular video-game players are, if anything, more physically fit, less likely to be obese, more likely to also enjoy outdoor play, more socially engaged, more socially well-adjusted, and more civic minded than are their non-gaming peers (Gray, 2012). With the onset of technologies, children are exposed to a plethora of information on a regular basis and in a variety of forms. Rubin, Schoenefeld and Poole (2009) seem to agree that children must be taught how to process such information in meaningful ways and how to make wise decisions in their use of technology. Digital citizenship should be modeled and taught to every child who is born into a digital society.

Students should be taught the social, ethical, and human issues related to technology and that machines helps people work, learn, communicate and play. Students should learn to use computers, information, and software responsibly, be aware that passwords protect privacy of others and develop positive attitudes toward technology (NETS, n.d.).

Six benefits of technology for young in the preschool classroom have been delineated in this section with supporting research. Many educators believe that technology should be fully integrated into the early childhood curriculum so new ways can be found to encourage the active engagement and thinking of young children (Couse & Chen, 2010).

Classroom labeling can provide words and descriptions from research for common electronic devices and practices by using visuals posted in the room, thus elevating the use of technology to its deserved level. When an item that a layperson

might simply deem "a tablet" is labeled, not only is the common educational vocabulary for play objects and activities articulated but its educationally significant aspects are also validated and explained. For teaching staff, it is on-the-job training. For families, it is parent education. For the community and administrators, it is a defense for including technology into the schedule and the curriculum day. Labeling explains to both educational outsiders and to uninformed teaching staff, how technology provides skills that transcend mere book learning to help a child develop a deep connection with the world (Christakis, 2010).

Chapter Three: Methods

The use of classroom labeling and its effectiveness in increasing the teacher awareness of the benefits of the use of technology for young children was explored through quantitative research is for educational research and development.

Design

A quasi-experimental design was employed in order to understand the causal relationships between variables. Quasi-experimental research is a type of experimental research that seeks to determine whether there is a causal relationship between the treatment and the dependent variables. Although experimental research, in which random assignment of research participants into control and experimental groups, greatly increases the strength of the study and the internal validity of the study, it is not always practical or possible. If a study is set up as an experiment with similar design of a control group and testing, but there is no random assignment of the participants to groups, this is considered a quasi-experimental study (Gall, M., Gall, J. & Borg, 2007).

A non-equivalent control-group design was used and statistical measurements were taken using the ANCOVA to determine the level of equality of the groups. Two quasi-experimental designs are the static-group comparison design and the non-equivalent control-group design of which the latter is the strongest because of the use of a pre-test. This design has no random assignment so in order to account for that possible source of internal invalidity and ANCOVA should be used to compensate for initial group differences and equalize them (Salkind, 2008). The analysis of the groups will be based on the results of the ANCOVA and description.

Validity

Internal validity is often considered the essential ingredient of all experimentation because it is about the "plausibility of causal inferences and depends on the clarity with which a set of previously identified threats to causal inference have been ruled out" (Cook, 1999, p. 30). The threats to validity have been carefully delineated and decreased as much as possible. Issues related to history, maturation, testing, instrumentation, regression, selection, mortality and interaction of several categories are controlled by using a control group design.

The quasi-experimental treatment was conducted in a timely manner, within the space of one month, to reduce any confounding factors related to maturation or mortality of the participants.

Because both the pre-test and post-test were exactly the same, pre-test sensitization and test-retest threats to validity were possible, it was believed that the familiarity with the format would clarify their thoughts on the topic and they could concentrate on the knowledge that was acquired when answering the questions. In order to account for prior knowledge that the teacher had, but may not have been recalled at the time of the pre-test, only the information that was presented on the labeling posters was counted from the post-test data.

Because one treatment may be seen as more highly desirable than the other, at the end of the study, the director of each respective center received the classroom labeling materials to use in each classroom that participated from both Groups A and B. Neither experimental treatment diffusion nor compensatory equalization of treatments was a

threat to validity because both groups received the same labeling materials at the end and all individuals received a gift card for their participation as well as a video that provided information and training for everyone in the study. Compensatory rivalry by either group was reduced as a validity threat because the groups both received the same opportunities for the benefits of classroom labeling at the end of the study, and the teachers in one center were not able to view the treatment in another participating center due to the anonymity of the other centers who were involved. Teachers who were not receiving the classroom labeling treatment would not be working in the same center as those who did receive it. Because the teachers in preschool classrooms often work very closely together, and they are often in each other's classrooms, if one room was labeled, all of the teachers in nearby classrooms would see the labels often and possibly learn the information on them without having their own room labeled. For this reason, every class in a center was placed into the same treatment group.

One limitation to external validity is the experimenter effect because she is the director of one of the centers in the study. Her teachers enthusiastically participated in the study because of her long-term relationship with them although their final mean scores were not elevated above the others in the group to which their center was assigned.

Site and Sample Selection

This research was conducted between two groups of teachers who are employed at nine different private preschools in the same geographical area. The sampling frame for this research were teachers in cooperating Midwest, private, center-based, pre-school or daycare settings where all of the children enrolled in the preschool program are ages

zero to five years old. Only preschool centers in an Urban Midwest area with student enrollment between twenty-five and one hundred and seventy were included. Those surveyed in this study were from any age bracket. They all had to be employees with regular scheduled hours each week, both part time and full time. This increased the possibility of sufficient and consistent, daily contact with the intervention information.

The site and sample were chosen because of their close proximity and willingness to participate in the study. They were all in the category of private schools. The criteria for the site selection included: (a) it is a private preschool or daycare center (can be faith-based or secular, non-profit or for profit) because they are in the same legal category and they may have less anti-technology sentiments, less restrictions on what can be affixed in the classroom and on allowing private individuals to conduct research; (b) working computers or tablets are used daily by the children at the center, otherwise the information may not be relevant or implementable; and (c) the staff has not had previous training on the benefits of the use of technology for young children because their pre-knowledge about the benefits of technology would likely be more than the average teacher involved in the study.

It is important to describe the sites where the study was conducted for comparison purposes. All sites were full-day preschool programs and followed the same basic schedule as outlined by state guidelines of morning and afternoon snacks, lunch, two-hour nap time and curriculum or a program before and after lunch. Three sites were associated with a school and located in the same building. Seven sites were in church facilities. All sites, except one, were administrated by a church. Two centers had a designated technology room that had mouse and keyboard computers and a technology

instructor for those who signed up and paid for the class. The regular classroom teachers were not involved in the special class.

A consent form to participate was procured from the director of the center as soon as she consented to allow the center to participate in the study, in order to document the permission for the center staff to be recruited for the study. All directors were given the incentive of receiving free staff training, and classroom labels that can be used after the study was complete. The researcher personally visited each center to recruit teachers into the study and present a cover letter along with a consent form, which the participants completed at the time of their consent. The teachers and the director were offered a five-dollar gift card for their participation in the study. A record was kept of the consent forms returned and a number assigned to each participant.

Size

The preschools where the study was conducted have enrollment capacities of 25-100 students. All of the teachers employed were recruited to participate in the research study, with the expectation that at least 80 teachers altogether would agree to be involved. The completed consent forms were kept together with the others from their center and placed into groups A or B in a way that makes the two groups the most even in number. All of the respondents from each of the preschool centers were tallied and then the eight preschools were divided evenly into one of two groups (Group A: treatment and Group B: control) until both groups were equally populated with at least thirty participants in each.

Description of Participants

Those surveyed in this study were limited to sixty-three female teachers. All of the participating teachers varied from each other in age, education, experience, hours employees, years employed at the center, hours employed and position. By virtue of the fact that they all work at center-based preschool programs that have similar pay rates, all of the teachers were assumed to be in approximately the same socioeconomic status, which is working, middle class (average household income is provided for the area where the center is located). All of the differences between the participants could be confounding factors to the study and they present possible limitations to the findings. Demographic information was collected about each participant's level of education, years and type of experience. The directors reported that they had not previously received training on the topic of benefits of education. This information was collected for the purpose of analyzing the results to rule out or note confounding factors (see Appendix E for a chart of results).

The center directors' demographic information was collected. This included: (a) number of students (b) number of teachers (c) teacher's years of experience (d) teacher's average level of education (e) legal status of center: registered, licensed, for profit, not for profit, (f) faith-based or secular (g) children's uses of technology, (h) percent of time students use technology per day. This data was collected for comparative purposes in order to determine if they may be confounding factors which change the results in significant ways.

Table 2

Child Care Center Demographic Information Reported by the Center Directors

Responses from Center Directors in Experimental and Control Groups

Experimental Group:

#	# Students Enrolled	# Teachers	Avg years exp. of teachers	Avg level of teacher ed	Legal Status of Center	Faith-based or Secular	Avg % time students use of technology per day	Population of urban/ suburban city	Avg Household Income
1	72	20	4	Some college	school, NP	faith-based	10%	11,600	43,100
2	170	26	5	Some college, CDA	licensed, FP	secular	10%	79,300	77,200
3	24	3	5	Bachelor	licensed, FP	secular	10%	47,520	96,900
4	36	5	4	Bachelor	registered, NP	faith-based	10%	35,400	55,200
7	146	9	5	Bachelor	licensed, NP	faith-based	2%	12,900	66,296
8	51	9	1	Some College	registered, NP	faith-based	10	4,000	47,380

Control Group:

5	121	16	10	ECH	registered, NP	faith-based	30%	60,800	31,900
6	43	7	10	Some College	registered, NP	faith-based	20%	25,700	46,400
9	146	12	5	Bachelors	licensed, FP	faith-based	2%	10,823	37,337

Table 2

Limitations of Design

The results of this quasi-experimental study are generalizable to similar populations based on the sample size of 30 or more per subgroup and the semi-random selection of the centers into groups. A limitation and a benefit is that all of the participants were recruited from private preschool settings. With this in mind, the results can only be applied to similar preschool settings. Private school centers were chosen based on their availability.

There are always potential threats to the internal and external validity and it is important to recognize and note them as possible limitations to the results of the study. One limitation of the design is due to the possible variations of the participants and their work environments. Private centers can vary immensely so the centers that are participating may not be representative of the population. It can be difficult to recruit centers to voluntarily participate so this can potentially affect the results. Some teachers may be prone to accepting the invitation to participate when they are offered a Starbucks gift card, but then it can become evident throughout the study that they are not interested in the more difficult process of learning new information and assimilating it into their classroom practices. Centers who are agreeable to being involved in research might have different results from the similar, private centers who will not be involved. Also the programs can vary dramatically as well as the license status. Because of these issues, it may be difficult to get a representative sample. One possible confounding factor was that, although all of the centers were in urban Midwest settings, one of the centers in the control group was in a different state than the other centers. This factor is addressed though, through the process of using the ANCOVA technique which essentially equates the two groups. In the final analysis, this was not found to be a limitation.

The researcher was aware of the threats and as the study progressed, made adjustments as was possible and necessary. One such course correction was that it was suggested by the researcher to the teachers who agreed to go into phase three, to move the posters in their rooms to a place where they could read it easily while they were relaxing at nap time or to were the children interacted with computers. Proper placement may have helped the teachers to learn the content more efficiently.

Methods of Data Collection

Instrument

Both Groups A and B were administered a pre-test (or a questionnaire) which was reviewed by a curriculum expert, research expert, a classroom teacher and facilitator to ascertain the validity of the tool before being distributed. The validity was determined through careful examination of the pre-test and comparing it to the outcome objectives of the study for alignment. The instrument was created to ascertain what the participants could recall and was not intended to assess their understanding of the information. Recall is a fairly simple and straightforward data set to gather. The pre-test gathered fore-knowledge and the post-test gathered new knowledge that a person was able to recall. The two questionnaires asked the same questions, in the same format so the reliability of the outcomes really had more to do with the frame of mind of the participants as well as their comfort and setting rather than the questions on the instrument. The format of the questions was intentionally simple, unobtrusive and non-intimidating. Some have test anxiety and are afraid to answer incorrectly, so the instrument was called a questionnaire and they were told there were no right or wrong answers. The pre-test and post-test were

both administered to teachers in their own preschool of employment, at the same time of day and in the same place for their comfort which was believed to bring more reliability of the data. Also recreating the same scenario for the test-retest process was intentional in order to increase the reliability.

The six question survey instrument, that was developed, was chosen because of its simple format and direct approach.

1. Pre-test survey: Administered to ask questions and collect data to ascertain teacher knowledge and position prior to the treatment (see Appendix A). The initial pre-test data was collected in a personal, confidential hard copy survey that solicited answers to questions that were analyzed quantitatively.

2. Post-test survey: Instrument will be identical to the pre-test

In the survey, the teachers were asked about how much time students spend using technology that is connected to learning objectives and how much time for play. These questions ascertained why and how much the children are using the computers and that can be compared to the other classes using descriptive statistics. The survey then asked for the respondent to rate on a Likert scale of 1-10, how important is the time that children spend using a computer or tablet in the classroom during the day. This helped to determine the attitudes of the teachers about the importance of technology in the classroom. The final three questions were open-ended and gathered information directly related to the research question: (a) Are there benefits of children's use of technology in the early childhood classroom? (If yes, what are they?) (b) What should young children know about technology? (c) What should a child be able to do using technology in the

classroom? The answers to these questions were recorded and tallied then compared to the answers on the same questions at the end of the study. By comparing the pre-knowledge with the post-knowledge, it is evident if using CL increased the teacher awareness of the benefits of the use of technology for young children.

Collection Methods

The same labels (six 8.5x11 posters), with information about the benefits of technology for young children and ways of extending children's interaction with technology, were placed in the classrooms of each participating center on a particular, pre-determined day. The teachers were given the classroom labels to post in their classrooms but not given any instruction as to where to place them or whether or not to read and study the information or what to do with the ideas presented on the posters that were used as labels in the classroom. The labels were hung in varying places in each classroom: by the bathroom, above the computers, in the entryway, above a high stack of cots, near the group circle time area, above the library center, on the cabinets above the food preparation counters, and in an out-of-the-way corner. Some were at the children's height and some at an adult's sitting or standing height and some were completely out of sight range of the teacher. Group B served as the control group and their classroom did not receive any treatment materials.

The posters were left up for two weeks. The information used on the posters was adapted from International Society for Technology in Education's (ISTE) standards as well as education journals. The ISTE standards were developed as guidelines for the use of technology in grades pre-kindergarten through second grade. Because CL is proposed

as an effective continuing education strategy, a shorter two-week time period of instruction was chosen because this would possibly replace a one two-hour in-service training session (It is estimated that each week that a teacher works in a classroom with CL, would be the equivalent of one hour of in-service training, when CL is implemented properly, and used with guidance and purpose.)

After two weeks of the participants working in the rooms that have received the labeling treatment, the same teachers were asked to complete the same survey in order to gather post-instruction assessment data The same survey was administered to non-instruction teachers. Following the submission of the completed survey, an explanation of the purpose of classroom labeling was given in the format of an informative meeting. Some centers could provide coverage for the participants to join a small group meeting of three to four teachers. In other centers, the researcher had to meet with each of the teachers individually in their classroom while they monitored the sleeping children. One center was too busy for a follow-up meeting, so a video was made for distribution to every participant in the entire study. The video explained the study, its purpose and significance and how the viewer could get the results after March 31st. This video was a way to make sure that everyone had the chance to get the same knowledge and information in spite of their working hours and schedules. One of the centers who declined participating in the study did so because they did not want to cover the cost for the teachers to attend a follow-up twenty-minute meeting during nap time. Even after it was explained that it could be done with a video and individually from room-to-room, the director still declined.

At the conclusion of each of the meetings, the participants were asked to work

one more day in the classroom and to read the posters with intentionality for remembering the information. They were then asked individually to recount all of the information that they could remember. The results for each participant were recorded and placed on chart. An incentive was offered for this extra day of retention and recall by the teachers and was not be mandatory. Twenty-four of the participants from Group A agreed to complete this third phase and were given gift cards. Nineteen of them did complete it and returned their answers. After a briefing that was given to Group B and the same incentive given, the classroom labeling was given to the director and the teachers were given the opportunity to try to recount the information after one day. This offer was not accepted by any of the teachers in Group B, but would not have been used in the report. The offer was given in order to give the same fair treatment and incentive opportunities to both groups.

The answers on the first post-test were intended to ascertain whether or not teachers would take initiative and learn new information by only introducing it into their classroom environment with no additional purpose or instruction. The answers from the third phase were actually the key responses to answer the focal research question of this study: “Does classroom labeling increase the awareness of the benefits of the use of technology for young children as evidenced by the teachers' ability to recall them?” Because ten of the participants in Group A did not choose to respond to the second posttest, the researcher used the results from their first post-test as the evidence of their recall of the information on the CL. The number of items that were recalled would have most likely risen if they had participated in the third phase.

The collected post-assessment data was recorded and compared against the pre-

questionnaire and then between groups to ascertain gains in understanding the benefits of technology for young children and what implications there are for classroom instruction. Experimenter effects were reduced by having only the researcher and a trained assistant disseminating, collecting, coding and recording data.

Data Analysis

Descriptive and inferential statistics were employed for the pre-treatment I scores as well as the post-treatment II scores. A test of the homogeneity of variance assumptions was conducted using Levene's test of equality of error variances. The analysis of variance (ANCOVA) was also used to assess the assumption of homogeneity of regression slopes.

Variables

Independent variable (IV)- Classroom Labeling. After the surveys were returned, CL was applied in the classrooms of the participants in Group A. Labeling consisted of six carefully and artistically designed posters with graphics, information on the benefits of technology for young children as well as suggestions for extending learning during technology use. These remained in place for two weeks.

Dependent variables (DV)- a post interval level covariate (pre-test) and a covariate (pre-test). The scores were added together in order to obtain the interval level scores for the dependent variable (post-test) and the interval level covariate (pre-test).

Statistical Analysis

Once the pretest and post-test data was collected, the ANCOVA was used for statistical analysis to determine if there were statistically significant differences in mean post-test scores after controlling for initial differences based on the pre-assessment. The

ANCOVA was first run using the initial post-test scores to show whether or not intervention was needed along with the CL in order to create positive results. Then a second ANOVA was administered on the post-test data after the third phase was completed. This data was collected after a discussion and explanation of CL was conducted with the teachers and they were asked to learn the information on the posters intentionally.

The ANCOVA was chosen because there is only one interval level dependent variable (post-test), one interval level covariate (pre-test), and a categorical fixed factor independent variable (experimental or control group). The analysis of covariance (ANCOVA) controls for initial differences between Groups A and B before the comparison is made of the within-group variances and between group variances of the two groups. In effect, The ANCOVA makes Groups A and B equal in terms of one or more control variables (Gall, Gall & Borg, 2007). This is helpful because it is important to have a control group and an experimental group which are very similar in order for the results of the study to be accurate and meaningful. A level of statistical significance of $p < .05$ was established.

Two researchers processed the data using a simple process which allowed for inter-rater reliability. One person initially processed each answer and using the chart of all possible answers on the CL posters listed in Appendix C, and assigned it a number and letter which corresponds to one the items on the chart. The wording was not always exactly the same as the CL, so a decision had to be made as to whether or not the answer of a participant fit with a certain item. The first researcher would code all answers that were similar under the same categories in order to establish a reliable pattern. The second researcher then took the processed answers and entered each item into a chart, checking for the accuracy and consistency of each code given. After comparing the number of agreements between the

coding of the two researchers, the resulting inter-rater reliability coefficient was 93%. The differences of opinion were discussed and in most cases corrected therefore resulting in the high inter-rater reliability.

When data is missing, it was important to ask why the data was left out. Earlier in this chapter, the discussion delineated how it was decided that the loss was random (unintentional) or not random (intentional). If an answer on the survey was missing by design, then it is counted as zero because of the implied intent of the respondent to leave it unanswered thus believing there to be no correct answers. If the answer was missing unintentionally, then a mean substitution was made for the missing number in the final statistical analysis (Williams, 2015). Of the three hundred and sixty possible answers (There are sixty participants, each answering three questions on both the pre-test and post-test and that comes up to three hundred and sixty answers.) on the final three interval level questions, there were only six that were deemed blank unintentionally and nineteen intentionally.

The results were interpreted using the rubric that Guskey developed to assess professional development techniques. Because CL is in its infancy, only the first two evaluation levels were assessed in this study. Participants' Reaction which asks "Was it helpful?" (Level 1) and Participants' Learning which asks "Did the participants acquire the intended knowledge and did attitudes, beliefs or dispositions change?" (Level 2). In the follow-up interview, participants were asked what they thought about CL and whether or not the type of information that it displayed helped them in that format. (See Appendix F for the complete Interview Protocol with questions created to obtain information related to Guskey's Professional Development Evaluation.) These results were reported through descriptive narrative. Also the statistical analysis of the answers for the final three question on the

survey gave information related to Guskey's (Level 2) by indicating if the participants acquired the intended information through the CL method and if their beliefs changed (Guskey, 1998).

Ethics and Human Relations

All of the participants received the same information; only it was delivered either during the study or after the study. Because of this, all participants had the same opportunities for engagement and involvement. All participants received the same remuneration for their involvement.

The researcher conducting the study is the director of one of the preschool facilities in which the study was conducted and access was permitted. The researcher was a prior acquaintance of one of the directors of the other centers in the study, six were referred by friends and two were complete strangers. The participants were each solicited in person using request letters and with the understanding that they would get classroom labels, gain consulting opportunity, knowledge and experiences throughout this study as well as a five-dollar gift card upon completion of their role in the study.

At the time that the participants were recruited and completed the pre-test survey, they were made aware that a study was being conducted about the benefits of technology in the classroom in which participants were asked to complete two surveys and then be involved in a thirty-minute debriefing session. The participants were not made aware of the classroom labeling treatment that would take place in their preschool room; however, the director was informed at the outset before agreeing to join the study.

Chapter Four: Results

The purpose of this study, as stated in chapter one, was to explore the effectiveness of classroom labeling as a knowledge implementation strategy for the professional development of early childhood teachers. The research question that was constructed to address this purpose was, "Does classroom labeling increase the teachers' awareness of the benefits of the use of technology for young children as evidenced by the teachers' recall of them?" This study utilized quasi-experimental elements in the design, recruitment, data collection and analysis of the data. This study was conducted in order to understand the causal relationships between variables. Chapter four will outline the results of the statistical analysis output of the ANCOVA as well as provide descriptive statistics.

Descriptive Data

The participating preschools were separated into the treatment groups regardless of the number of children enrolled, the number of classrooms or how long the preschool had been in operation. The two groups had approximately equal number of participants and an analysis of covariance (ANCOVA) was conducted between the sets of data collected to establish a baseline data and equate the two groups using the pre-questionnaire as the covariate. This also controlled for initial variances that may be a threat to internal validity and selection maturation. In the end, thirty-three members populated the experimental group and thirty were in the control. More teachers were recruited than minimally necessary in order to counteract the possible internal validity threat of experimental mortality. When examining the potential data source, the decision was made, in order to make the groups more homogeneous by only using centers that are medium to large in size, to not include

preschools where the director reported to have an enrollment of less than twenty-five. Also, one set of data was discarded due to the fact that the participant unintentionally did not complete the back of the survey for either the pre-test or the post-test. Two of the three key questions were on the back so it was almost as if the survey had not been taken. The final decision for exclusion of data was to not include any centers that were located in rural towns. One school, although it was within less than an hour from a metropolitan, urban city was eventually deemed more rural than urban and discarded for this reason due to its population, distance and location in an adjacent state.

All missing data was marked as *i* for intentional or *u* for unintentional. Data was deemed intentionally missing if it was marked n/a, none, or 0 by the participant or if the item before and after were completed and the one between them was left blank. In this case, it is obvious that that person saw it but decided not to answer. With only six questions on the survey that took about 5 minutes to complete, it was most likely not the case that the subject just skipped over an item and forgot to come back to answer it later. One of the questions had a part A and a part B. If the part A was answered as "no" and part B was left blank, then that was also considered intentional. The unintentional category included any item where it was unclear whether a person meant to leave it blank or not. It also included those in which it was obvious that the respondent just did not see the question because it was on the back of the page and none of the answers were completed and there was no signature at the bottom. Only one of these sets of data from a consenting participant was not included at all because of the lack of a verifying signature on the post-test and the fact that over half of the pertinent data was missing.

The following charts show the results of the data collected from each group, after the pre-test and after the post-test.

Table 3

Descriptive Pre-Test Data

Data Reported According to Child Care Centers

Experimental Group

#	# Teacher Part	Mean	Standard Deviation	Range
1	12	6.77	2.77	4-12
2	7	5.29	2.43	3-10
4	3	5.67	1.53	4-7
8	8	3.38	2.20	1-8
Total/Avg	**30**	**5.28**	**2.23**	**1-12**

Control Group

#	# Teacher Part	Mean	Standard Deviation	Range
5	14	5.36	2.79	0-8
6	4	3.0	1.41	2-5
9	12	4.67	1.97	2-9
Total/Avg	**30**	**4.34**	**2.06**	**0-9**

Table 3

Table 4

Descriptive Post-Test Data

Data Reported According to Child Care Centers

Experimental Group

#	# Teacher Part	Mean	Standard Deviation	Range
1	12	15.46	7.01	2-27
2	7	12.29	8.73	4-30
4	3	17	3	14-20
8	8	5.13	3.04	1-10
Total/Avg	**30**	**12.47**	**5.45**	**1-30**

Control Group

#	# Teacher Part	Mean	Standard Deviation	Range
5	14	12.07	5.38	0-23
6	4	5.75	2.5	3-9
9	12	7.42	2.54	3-10
Total/Avg	**30**	**8.41**	**3.47**	**0-23**

Table 4

The overall mean for the pretest of the experimental group was 5.28. The standard deviation was 2.23 and the range was 1-12. The group's posttest had a mean of 12.47, with a standard deviation of 5.45 and the range of 1-30. Now, as for the control group, its mean for the pre-test was 4.34 with a standard deviation of 2.06 and the range of 0-9. The post-test for the same group had a mean of 8.41, with a standard deviation of 3.47 and a range of 0-23.

The ANCOVA was conducted to see if there is a statistically significant difference in post test scores after controlling for differences that existed from the pre-test scores. In the test of the homogeneity of regression slopes, the covariate (control/experimental) did not significantly affect the dependent variable (p>.05) therefore the treatment 2, after controlling for the effect of treatment 1 (the pre-test), was not influenced by the group (control/experimental). The control and the experimental group were statistically shown to be equal p=.004. This was important to establish due to the fact that random sampling was not possible. Other variables were ruled out as confounding factors to the final results. The covariate was significantly related to the post-test, $F(1,57)=94.243$, $p = .000$.

When comparing the change in the post-test with the pre-test for each group, after controlling for pre-test differences, the first ANCOVA results, using the initial post-test scores only without the intervention strategies, showed the covariate was not significantly related to the post-test, $F(1,57)=.001$, $p = .979$. Then a second ANOVA was administered on the post-test data after the third phase was completed. This data was collected after a discussion and explanation of CL was conducted with the teachers and they were asked to

learn the information on the posters intentionally. The experimental group after phase three, showed significant increases in the knowledge of the teachers after the treatment. The SPSS output indicated that the positive results of the experimental group are statistically significant to the one hundredth percentile $F(1,57)=9.207$, $p=.004$ ($p < .00$), which means that when CL is coupled with intervention strategies, there is a nearly one hundred percent assurance that the increase of knowledge in the experimental group were a result of the classroom labeling treatment with the discussion and reinforcement of the concepts presented on the CL conducted in the classroom. The teacher's knowledge about the topics on the labels went up significantly when CL was applied with proper implementation. Without the discussion and reinforcement of the concepts presented on the CL, there were not significant results. Teachers' awareness of the benefits of the use of technology for young children did increase using CL as evidenced by the ability of the teachers to recall them compared to the control group.

Chapter Summary

The findings presented here indicate that classroom labeling when used with discussion, does increase the teachers' awareness of the benefits of the use of technology for young children as evidenced by the teachers' recall of them. The teachers who worked in classrooms that had CL, showed significant increases in their knowledge about the benefits of the use of technology as compared to those who were similar but did not have the CL treatment. The crucial finding is not about the topic of the CL but that the method was effective in providing professional development for teachers in similar settings.

Chapter Five: Discussion

Summary of Findings

Classroom labeling (CL) is proposed as a way of providing knowledge utilization and an alternative to in-service education for preschool teachers by intentionally applying layers of information directly to the learning environment through visual displays usually in the form of posters. Using classroom labeling, educators can be impacted by bringing new research as well as textbook knowledge into the preschool classroom through words and pictures attractively displayed around the classroom. A research question was asked, participating teachers were asked to complete a pre-assessment before their early childhood classrooms were labeled with posters placed around the room in places where they were seen by adults, and could be read and directly applied. After the classrooms were labeled for two weeks, the teachers completed a post-assessment to ascertain whether this method increased the knowledge base of the teacher as evidenced by their recall of the information on the posters. The results indicate that the CL technique was significantly effective in increasing the knowledge of the teachers in the classroom.

Analysis of Results

When comparing the change in the post-test with the pre-test for each group, after controlling for pre-test differences, the group which received the treatment of CL showed significant increases in the knowledge. The positive results of the experimental group are statistically significant and are not due to chance. There is almost a one hundred percent assurance that the outcomes for the experimental group were a result of the classroom

labeling treatment that was conducted in the classroom. The teacher's knowledge about the topics on the labels went up significantly when CL was applied. The research question asked, "Does classroom labeling increase the teachers' awareness of the benefits of the use of technology for young children as evidenced by the ability of the teacher to recall them?" This study was trying to ascertain whether or not teachers could learn new information, in this case it was the benefits of technology for young children, through the innovative approach of classroom labeling (CL). The standard by which this would be judged was through the increase of teacher's recall of the items on the labels in their rooms after a two-week exposure period. According to these results, classroom labeling did increase the teacher awareness of the information on the labels.

In order to judge what impact the results of this study would have on professional development for early childhood teachers, the results were interpreted using the rubric that Guskey developed to assess professional development techniques (Guskey, 1998). Guskey's Professional Development Evaluation (Guskey, 1998) (See Appendix D) has five evaluation levels however only the first two are pertinent for this study: (a)Participants' Reaction which asks "Was it helpful?" and (b) Participants' Learning which asks "Did the participants acquire the intended knowledge and did attitudes, beliefs or dispositions change?" In the follow-up interview, participants were asked one or more of the following questions to evaluate CL as a form of professional development using Guskey's rubric as a framework for assessment of this technique.

Questions from four perspectives or domains, were asked during the feedback sessions to gain evidence of whether or not the first two levels of Guskey's chart were satisfied. The first set of question addressed the affective domain (1) Did you like the

classroom labels? Would you like CL as a form of professional development? Would you prefer it?

The teachers were in agreement that the design, color, font size and size of the posters are important but they were in disagreement with whether or not they like the posters in this study. Some were jubilant about how pretty they were and how much they loved the color and for others, it was not their taste. Several said they would have liked it if there was not so much information on them but they all liked the idea of having the information on the wall in front of them and that it would make integrating the information easier. One teacher said, "I can't look at something and not read it."

Everyone who voiced their opinion said they liked this format for learning and professional development. It was lauded as a good way to accommodate the teachers' schedule and to keep them from having to come to meetings after hours. One teacher dislikes in-service training sessions where people are sitting and listening to a person because it is hard to focus. Several suggested that they would like CL along with discussions,

The second question was from the physical domain (2) Did the physical conditions of the classroom allow for you to learn from the posters? Although an official count was not taken, at least half of the teacher's interviewed admitted that they had not read the posters during the two weeks that they were up. One teacher reported that she had read the poster as she was hanging them up but with a busy classroom, it was hard for her to go in depth. Another teacher said she did not read them because they were not at the right height placement at her eye level, although she chose to place it where it was. For the most part, though, it was not difficult to incorporate them into the room's décor. It was suggested that the font should be larger, that the posters had fewer information and were rotated in and out

frequently. They need to be thoughtfully placed in an area that relates to the topic and where the teacher frequents. One teacher put it like this, “If it's not on a poster in front of my face I don't know about it unless it's on Facebook!” (personal communication, February 16, 2016)

The third set of questions came from the cognitive domain (3) Did the labels make sense? Was the information on the labels useful? Were you able to discuss any of the information with others? What was the impact of the posters on your classroom? The posters definitely generated discussion among teachers and between teachers and parents. They were thought to be collaboration-friendly and easy to integrate. One person reported that a couple of her parents who work in technology read them and said, “That's really cool.” (personal communication, February 16, 2016)

Tapping into the teachers’ internal motivators is key. If the poster is not a topic of interest to the teacher or an area where she teaches and no one is telling her to read the information, then most likely she will not read it even if it is placed directly in her line of sight and she passes it every day and her classroom. When this method is paired with discussion and or video it is most effective. In this way several modes of learning are engaged as well as learning from peers and constructing higher level internal webs of thought.

Every person interviewed who did not read the posters regretted it after our discussion and everyone said they would participate in the follow up phase. During the follow-up discussion sessions, those who did not read the posters felt like they probably would have found it interesting if I they would have just read it. Most who read them said they were interesting. When asked what would have made them more likely to read the

posters, one teacher quipped, “Can I put them in the bathroom?” (personal communication, February 17, 2016)

One teacher hung the posters up and did not read them even as she was mounting them. When asked whether it was the format or the information that made her not want to read them, she said that computers do not pique her interest and it is not the area she is responsible for so it did not sink in. Several other people chimed in with their opinions saying that they read them thoroughly during play time, lunch, nap time or when they were first posted in the room.

As far as its impact in the classroom, all of the teacher’s reported positive results. “You can see it, you can read it, you can translate it immediately into the classroom” (personal communication, February 18, 2016). Some said that just glancing across the room and seeing the posters reminded them to use it more technology. The posters actually changed the practices in the classroom for some because it kept the information in front of them. “Out of sight out of mind…if it's in sight, it's in my mind.” (personal communication, February 18, 2016)

The output from the statistical analysis of the answers for the final three questions on the survey gave information related to Guskey's level two by indicating that the participants did acquire information through the CL method and that their beliefs changed (Guskey, 1998).

Surprises

Over eighty percent of all the centers in my study were located in two counties. This represents fifty-seven zip codes. At times, every center in a zip code was contacted, only to find that there was not one program in that zip code that provided computers for the children

in their center to use. After much frustration, Child Care Aware of Missouri was consulted for statistics on centers who self-report to have computers for the children.

Table 5

Centers with Computers for Use by Children

Centers from two counties in the CL study self-reporting to have computers in their program

	Total Centers	Centers w/computers	%
County #1	199	38	19%
County #2	600	84	14%
Total	799	122	17%

Table 5

There were seven hundred and ninety-nine centers located within those two counties and only one hundred and twenty-two (17%) of those centers offered computers in their program. This was the reason that recruiting was so difficult. After collecting results from the surveys even among the teachers who worked in centers that offered technology, there were polarities of thought within the opinions gathered as to whether or not technology was appropriate for young children. This is obviously a debated topic among early childhood caregivers as well as the general public.

It was surprising how many teachers who self-reportedly, did not read the CL or who only read them once just before or as they were hanging them on the wall. Several said that when they walked into the room and saw them, basically after one look, they were relegated to background information that they did not think about anymore. Conversely, one person

said that every time she looked over at the CL, it reminded her to use technology with the children. It all depended on the mindset of the viewer.

It was surprising how much some of the scores went up on the posttests of the control group. This could be attributed to the fact that before the pretests, were given, not much conversation had been going on amongst the teaching staff on this topic. After the pre-test, two threats to validity were present: pretest sensitization and test-retest threats. Just knowing that they were in the study about the benefits of technology for young children and that it is framed in a positive way on the survey, may have made the participants think further over the course of the two week and also talk about it to their co-workers. It was explained that the post-test would have the exact same questions on it, so the subjects may have been better prepared to answer with more depth on the post-test. This strategy was employed in order to relieve testing anxiety of the participants to keep them from dropping out. Also because on this level of knowledge acquisition, it was only important that they could remember and not that they understood the information. This is why they post-test did not have to be worded differently than the pre-test. Although these are threats to validity, they are accounted for and diffused by using a control group design with an ANCOVA statistic.

Conclusions

Implications for On-going Professional Development of Preschool Educators

Because accepted forms of professional development, pre-service and in-service, that were discussed in chapter two, are not as effective as is hoped, CL is proposed as an innovative form of knowledge utilization that has the potential of being highly effective if implemented correctly.

Classroom labeling at the Understory level, which is for the significant adults in the classroom community, would provide rich information and idea starters for teachers and parents to use in interacting with the children while they are actively playing. By using the methods described, one may be able to bring content knowledge into the classroom and make research relevant. The directors of centers could create these posters quickly after reading an impacting article. This form of continuing education is very economical and effective as compared with the cost of an in-service speaker and paying teachers during their time spent in professional development seminars or courses. It is truly on-the-job training. Also those who publish articles and journals with new research and ideas for educators, could make the professionally designed corresponding poster available to preschool directors for a price. Policy makers could benefit from the findings of this study also and consider redefining continuing education units (CEUs) to include other innovative approaches to the professional development hours required each year for centers with licensure status. Many other professional communities have used the techniques of CL in settings such as marketing, hospitals and even fast food for on-going knowledge implementation for their staff. Educators have not adequately embraced this technique on a consistent basis as compared with other vocational communities

Recommendations

This study was a fact-finding mission. In order to make the results more dramatic, the CL should be set up properly where the rooms are arranged similarly and the labeling is placed strategically in the room where it will most likely be read and discussed by adults when they are in a more relaxed environment. Lunch time is the most hectic and focused

time of the day, and their traditional morning meeting with the students may come in at second place. Placing the posters near those high energy work areas may not be the best fit. The teachers' chair, desk or by the computer center may be a better choice for placement. It would be good to ask the teachers where they most often sit during nap time. By standardizing the room and making choices for optimal readability, font and colors the results may be even higher.

Recommendations for Further Study

Further studies need to be conducted to complete the full implementation of Guskey's five levels. This research only scratches the surface by addressing the first two levels, but the goal is to also consider what it will take for organizational support and change, how the participants use their new knowledge and skills and ultimately how CL affects student learning outcomes. For this, other instruments will need to be developed to properly measure how their newly acquired knowledge is being utilized in the classroom setting. This study was conducted within an early childhood setting. It would be helpful to study how it would be implemented in other educational settings such as elementary, secondary or higher education classrooms as a method of professional development.

Another suggested avenue of study might be to couple the CL with other forms of innovative training techniques to increase its effectiveness. Before the labels are posted in the classroom, the person in charge of professional development could have an online discussion board about the topic of the labels. Also custom-made short videos are very effective. The trainer could send a vlog out to introduce the topic and then keep an online

dialogue open to engage conversation and keep teachers interested and revisiting the information on the poster.

It was also suggested that having an incentive or a deadline for remembering and assimilating the knowledge would be motivating. For instance, the director could tell the staff that if they would like to use this method to accrue Continuing Education Units, that they will be placed in their room, but the teacher who wishes to count it toward professional development credit must show a proficiency in the topic after the two-week time period. There could be a post proficiency test which would ensure that the teacher was reading and incorporating the information with purposefulness.

Chapter Summary

CL is an innovative method that is introduced as a form of professional development that employs aspects of knowledge utilization by labeling a classroom with information for the critical adults who are in the classroom community. This layer of information is termed in this study as the Understory Layer. CL informs all participants in the learning community by creating an environment that encourages exchange of knowledge, curiosity, logic, collaboration and critical thinking. It has been shown in this study to not only be an effective mode of information dissemination, but can transform classroom practice. Using CL teachers' awareness of the benefits of the use of technology for young children did increase as evidenced by the teachers' recall of them. It is a preferred method for some teachers. CL is a simple concept but can be implemented relatively easily and at a low cost to administrators which makes it a powerful tool with endless implications for its use.

References

Alliance for Childhood. 2000, Computers and children. Retrieved from http://drupal6.allianceforchildhood.org/computer_position_statement

Barnett, W.S., Carolan, M.E., Squires, J.H., Clarke Brown, K. (2013). *The state of preschool 2013: State preschool yearbook*. New Brunswick, NJ: National Institute for Early Education Research.

Children's Television Act of 1990. Retrieved from: http://thomas.loc.gov/cgi-bin/bdquery/z?d101:HR01677:@@@L&summ2=m&

Cordes, C. & Miller, E. (2000). *Fool's gold: A critical look at computers in childhood*. College Park, MD: Alliance for Childhood.

Couse, L.J. & Chen, D.W. (2010). A tablet computer for young children? Exploring its viability for early childhood education JRTE. Retrieved from: http://dawnbennett.wiki.westga.edu/file/view/a+tablet+computer+for+young+children.pdf

Dodge, D. & Kittredge, B. (2003). Designing a classroom for learning. Retrieved from: http://www.claytonearlylearning.org/images/uploads/designing-a-classroom-for-learning.pdf

Early, D., Maxwell, K., Burchinal, M., Bender, R., Ebanks, C., & Henry, G., (2007). Teachers' education, classroom quality, and young children's academic skills: Results from seven studies of preschool programs. child development. (78). 558–580. [PubMed]

Estabrook, C.A. (2001). Research utilization and qualitative research. In J. M. Swanson, & A.J. Kuzal (Eds.), The nature of qualitative research (pp.275-298). Thousand Oaks, CA: Sage.

Fixsen, D. L., Naoom, S. F., Blase, K. A., Friedman, R. M. & Wallace, F. (2005). Implementation research: A synthesis of the literature. Tampa, FL: University of South Florida, Louis de la Parte Florida Mental Health Institute, The National Implementation Research Network (FMHI Publication #231). Retrieved from: http://nirn.fpg.unc.edu/sites/nirn.fpg.unc.edu/files/resources/NIRN-MonographFull-01-2005.pdf

Gall, M. D., Gall, J. P., & Borg, W. R. (2007). *Educational research: An introduction* (8th ed.). Boston: Pearson Education.

Gray, P. (2012). The many benefits, for kids, of playing video games. Retrieved from http://blog.iste.org/the-many-benefits-for-kids-of-playing-video-games/

Guskey, T.R. (1998). Evaluating professional development. Thousand Oaks, CA: Corwin Press.

Haugland, S. W. (1997). How teachers use computers in early childhood classrooms. *Journal Of Computing In Childhood Education,8*(1), 3-14.

Hubenthal, M. & O'Brien, T. (2009). Revisiting your classroom's walls: The pedagogical power of posters. IRIS Consortium, Education and Outreach Program, University of Binghamton, School of Education.

Hughes, F (2010). Children, play, and development 4th Ed. SAGE Publications.

International Society for Technology in Education (ISTE). (2000). National educational technology standards for students: Connecting curriculum and technology. Retrieved from: www.iste.org

Joyce, B. & Showers, B. (2002). Student achievement through staff development. 3rd ed. Alexandria, VA: Association for Supervision and Curriculum Development.

Jump Start, (n.d.). Brain development. Retrieved from http://www.jumpstarttulsa.com/brain_development.htm

Karray, F., Alemzadeh, M., Saleh, J.A. & Arab, M.N. (2008). Human-computer interaction: Overview on state of the art. *International Journal on Smart Sensing and Intelligent Systems, 1*(1), 137-159.

Kreider, H., Bouffard, S. (2005). A conversation with Thomas R. Guskey. The Evaluation Exchange. 11(4). Retrieved from: http://www.hfrp.org/evaluation/the-evaluation-exchange/issue-archive/professional-development/a-conversation-with-thomas-r.-guskey

Learning Point Associates (2004). Retrieved from: /tech/nets/netsrubricp2.pdf

McKenzie, J. (2004). Quality teaching from theory into practice. The Question Mark, 1(2), September. Retrieved from http://questioning.org/sep04/qt.html

NAEYC, (2013). Q&A with Laura J. Colker. Retrieved from: http://www.naeyc.org/event/planning-for-learning-centers

NAEYC. (2014). NAEYC early childhood program standards and accreditation criteria & guidance for assessment. Retrieved from: http://www.naeyc.org/academy/files/academy/file/AllCriteriaDocument.pdf

NETS for Students: Extended Rubric for Grades PK-2. (n.d.). Retrieved from: /tech/nets/netsrubricp2.pdf

NSDC. (2014). Learning forward. retrieved from: http://learningforward.org/standards/implementation#.VH9N4THF9nY

Neugebauer, R. (2005). Trends in religious-affiliated child care. Exchange. September/October, 79-80.

O'Sullivan, P.B. (2000). Communication technologies in an educational environment: lessons from a historical perspective. In R.A. Cole (Ed.), *Issues in Wed-Based Pedagogy* (pp. 48-64). Westport, CT: Greenwood Press.

Pasnik, S., S. Strother, J. Schindel, W.R. Penuel, & C. Llorente. 2007. Report to the Ready To Learn Initiative: Review of Research on Media and Young Children's Literacy. New York; Menlo Park, CA: Education Development Center; SRI International. http://ctl.sri.com/publications/downloads/EDC_SRI_Literature_Review.pdf

Penuel, W.. Pasnik, S., Bates, L., Townsend, E., Gallagher, L., Llorente, C., Hupert, N., (2009). Preschool teachers can use a media rich curriculum to prepare low-income children for school success: Results of a randomized controlled trial. Summative Evaluation of the Ready to Learn Initiative Technical Report. Education Development Center, Inc. and SRI International. Retrieved from: http://cct.edc.org/sites/cct.edc.org/files/ms-resources/RTLEvalReport.pdf

Ribble, M. (n.d.). Nine themes of digital citizenship. Retrieved from: http://www.digitalcitizenship.net/Nine_Elements.html

Ritchie, S. & Willer, B. (2008) Physical Environment: A Guide to the NAEYC Early Childhood Program Standard and Related Accreditation Criteria. *NAEYC* Retrieved from: https://www.naeyc.org/store/node/402

Reflective teaching practice. (2004). The National Capital Language. Resource Center, Washington, DC. Retrieved from: http://www.nclrc.org/essentials/whatteach/reflect.htm

Roberts, C. (2010). The dissertation journey 2nd Ed. Thousand Oaks, CA; SAGE Publications.

Rubin, R., & Schoenefeld, J. (2009). Becoming our own leaders: Decision-making at school and home. Reclaiming Children and Youth, 18(3), 7-11.

Runco, M. A. (Ed.) (2003). Critical creative processes. Cresskill, NJ: Hampton.

Understanding the relationship between research and teaching. A CEE Position Statement: A statement on an education issue approved by the CEE Executive Committee. Retrieved from http://www.ncte.org/cee/positions/researchandteaching

Vernadakis, N., Avgerinos, A., & Tsitskari, E. (2005). The Use of Computer Assisted Instruction in Preschool Education: Making Teaching Meaningful. *Early Childhood Education Journal*, *33*(2), 99-104.

Williams, R. (2015). Missing data part 1:Overview, Traditional Methods. University of Notre Dame. Retrieved from: http://www3.nd.edu/-rwilliam/

Winton, P. J., & McCollum, J. A. (2008). Preparing and supporting high-quality early childhood practitioners: Issues and evidence. In P. Winton, J. McCollum, & C. Catlett (Eds.), Practical approaches to early childhood professional development: Evidence, strategies, and resources (pp. 1-12). Washington, DC: ZERO TO THREE.

Appendix A: Participant's Questionnaire

(Please do not include your name or any identifying marks on this questionnaire. All information will be kept confidential and will not be shared.)

Demographic Information (optional):

Years employed at the center where you currently work: _____

Educational Level: (circle one)
1. No formal training 2. On The Job Training 3. Associates Degree 4. Bachelors Degree
5. Other:
_____

Hours employed weekly: _____ Position: _____

Survey Questions:

1. Student time on computer connected to learning objectives?
    a. Zero minutes
    b. 15 minutes
    c. 30 minutes
    d. 45 minutes
    e. one hour
    f. no set time

2. Student time on computer for play?
    a. Zero minutes
    b. 15 minutes
    c. 30 minutes
    d. 45 minutes
    e. one hour
    f. no set time

3. How important is the time that children spend using a computer or ipad in your classroom during the day?

1	2	3	4	5	6	7	8	9	10
Extremely UN-Important		Moderately UN-Important		Neutral			Moderately Important		Extremely Important

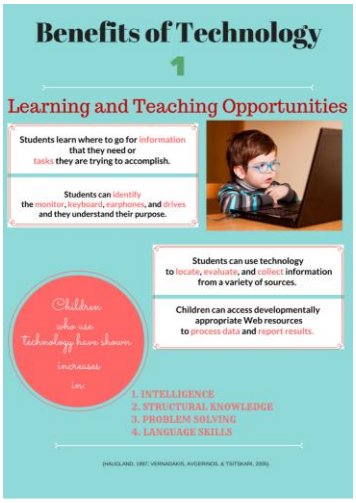
4. Are there benefits of children's use of technology in the early childhood classroom?
    a. Yes or No (Circle one)

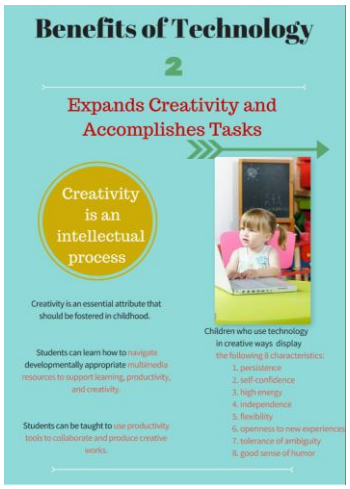
    b. If yes, please list all of the benefits below:

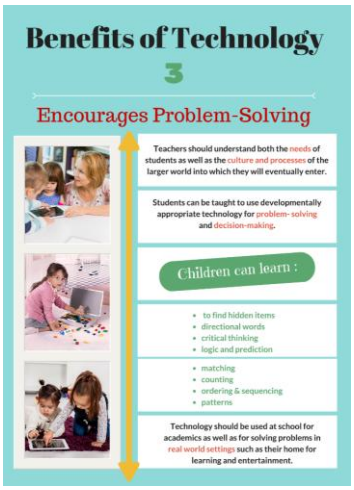
5. What should young children know about technology?

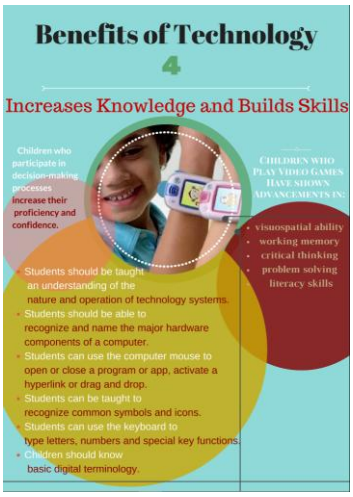
6. What should a child be able to do using technology in the classroom?

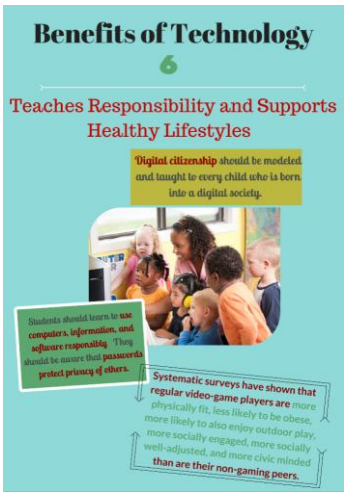
Appendix B: Classroom Labels (Actual size 11x17)











Appendix C: Content of Classroom Labels

Benefits of Technology for Young Children In The Preschool Classroom:

1**. Provides Learning and Teaching Opportunities and Resources (17)**

a. Students learn where to go for information
b. Students learn where to go for tasks they are trying to accomplish
c. Students can identify the monitor
d. Students can identify the keyboard
e. Students can identify the earphones
f. Students can identify the drives
g. And they understand their purpose
h. Students can use technology to locate information from a variety of sources
i. Students can use technology to evaluate information from a variety of sources
j. Students can use technology to collect information from a variety of sources
k. Children can access developmentally appropriate Web resources to process data
l. Children can access developmentally appropriate Web resources to report results
m. Children who use technology have shown increases in intelligence
n. Children who use technology have shown increases in structural knowledge
o. Children who use technology have shown increases in problem solving
p. Children who use technology have shown increases in language skills

2. Expands Creativity and Accomplishes Tasks (15)

a. Creativity is an intellectual process
b. Creativity is an essential attribute that should be fostered in childhood
c. Students can learn how to navigate multimedia to support learning
d. Students can learn how to navigate multimedia to support productivity
e. Students can learn how to navigate multimedia to support creativity
f. Students can be taught to use productivity to collaborate and produce creative works
g. Children who use technology in creative ways display persistence.
h. Children who use technology in creative ways display self-confidence.
i. Children who use technology in creative ways display high energy.
j. Children who use technology in creative ways display independence.
k. Children who use technology in creative ways display flexibility
l. Children who use technology in creative ways display openness to new experiences.
m Children who use technology in creative ways display tolerance of ambiguity.
n. Children who use technology in creative ways display a good sense of humor.

3. Encourages Problem-Solving (14)

a. Teachers should understand both the culture and process of the larger world into which they will eventually enter.
b. Students can be taught to use developmentally appropriate technology for problem-solving.
c. Students can be taught to use developmentally appropriate technology for decision making.
d. Children can learn to find hidden items.
e. Children can learn directional words.
f. Children can learn critical thinking,
g. Children can learn logic and prediction.
h. Children can learn matching.
i. Children can learn counting.
j. Children can learn ordering and sequencing.
k. Children can learn patterns.
l. Children can learn academics.
m. Children can learn problem solving in real world settings such as their home for learning and entertainment.

4. Increases Knowledge and Builds Skills (15)

a. Children who participate in decision-making processes increase their proficiency.
b. Children who participate in decision-making processes increase their confidence.
c. Children who play video games have shown advancements in visuospatial ability.
d. Children who play video games have shown advancements in working memory.
e. Children who play video games have shown advancements in critical thinking.
f. Children who play video games have shown advancements in problem-solving literacy skills.
g. Students should be taught an understanding of the nature and operation of technology systems.
h. Students should be able to recognize and name the major hardware components of a computer
i. Students can use the computer mouse to open or close a program or app,
j. Students can use the computer mouse to activate a hyperlink.
k. Students can use the computer mouse to drag and drop.
l. Students can be taught to recognize common symbols and icons.
m. Students can use the keyboard to type letters, numbers and special key functions
n. Children should know basic digital terminology.

5. Promotes Communication and Relationships (8)

a. Video games connect young people with their peers and society at large
b. Video game players are more deeply connected to each other
c. Executive functions of their minds work in new ways
d. They are quick learners and processors
e. Students use various media to collaborate
f. Students use various media to communicate ideas
g. Students use various media to interact with peers and teachers

6. Teaches Responsibility and Supports Healthy Lifestyles (9)

a. Digital citizenship should be modeled and taught to every child who is born into a digital society.
b. Students learn to use computers, information and software responsibly.
c. They should be aware that passwords protect privacy of others.
d. Video game players are physically fit and less likely to be obese.
e. Video game players are more likely to enjoy outdoor play.
f. Video game players are more socially engaging.
g. Video game players are more socially well-adjusted.
h. Video game players are more civic-minded.

Appendix D: Guskey's Five Critical Levels of Professional Development Evaluation

Five Levels of Professional Development Evaluation

Evaluation Level	What questions are addressed?	How will information be gathered?	What is measured or assessed?	How will information be used?
1. Participants' reaction	• Was the facilitator knowledgeable and helpful? • Did you have the opportunity during the session to effectively practice or apply the concepts provided? • Did the session activities facilitate the sharing of work experiences among participants? • Did the session materials contribute to your learning during the session? • Were the facilities and equipment conducive to learning? • Were the stated session objectives met? • In terms of preparing you to do your job better, how would you rate the overall quality of the session?	• Questionnaires administered at end of a session • Focus groups • Interviews • Personal learning logs	• Initial satisfaction with the experience	• To improve program design and delivery
2. Participants' learning	• Did the participants acquire the intended knowledge & skills? • Did participants' attitudes, beliefs or dispositions change?	• Paper-and-pencil instruments, including self assessments and tests • Simulations & demonstrations • Participant reflections • Participant portfolios • Case study analyses	• New knowledge and skills of participants	• To improve program content, format and organization
3. Organization support & change	• Was implementation advocated, facilitated, and supported? • Was the support public and overt? • Were problems addressed quickly & efficiently? • Were sufficient resources allocated? • Were successes recognized and shared? • What was the impact on the organization? • Did it affect the organization's climate and procedures?	• District and school records • Minutes from follow-up meetings • Questionnaires • Structured interviews with participants and district/ school administrators • Participant portfolios	• The organization's advocacy, support, accommodation, facilitation, and recognition	• To document and improve organizational support • To inform future change efforts
4. Participants' use of new knowledge & skills	• Did participants effectively apply the new knowledge and skills? • Did teachers' instructional practice change? • Are the teachers consistently applying the knowledge & skills?	• Questionnaires • Structured interviews with participants and their supervisors • Participant portfolios • Participant reflections • Direct observations • Video or audio tapes	• Degree and quality of implementation	• To document & improve the implementation of program content
5. Student learning outcomes	• What was the impact on students? • Did it affect student performance or achievement? • Did it influence students' physical or emotional well-being? • Are students more confident as learners? • Is student attendance improving? • Are dropouts decreasing?	• Student records • School records • Questionnaires • Structured interviews with students, parents, teachers, and/or administrators • Participant portfolios	• Student learning: o Cognitive (performance & achievement) o Affective (attitudes & dispositions) o Psychomotor (skills & behaviors) • Student participation & attendance	• To focus & improve all aspects of program design, implementation, and follow-up • To demonstrate the overall impact of professional development

Adapted from a handout by Thomas R. Guskey shared at NCREL's Annual Meeting, 2002

Porter Center @ NCREL with ASCD

ND Title 1 Program Improvement Workshop - 2007

-

http://connectingcantycommunities.wikispaces.com/file/view/Guskey+5+levels.pdf

Appendix E: Demographic Data for Individual Participants

Demographic Data for Individual Participants

Participant #	Years Employed At Current Center	Educational Level	Hours Employed at Current Center	Position
102	4	2	35	Assistant
103	No Answer	2	40	Lead Teacher
104	21	2	40	Lead Teacher
105	3	4	No Answer	Assistant
106	>1	3	40	Lead Teacher
108	5	4	16	Assistant
110	No Answer	2	No Answer	No Answer
111	3	2	23	Assistant
112	>1	2	10	Assistant
113	5	2	40	Assistant
114	>1	4	15	Assistant
115	>1	1	40	Assistant
216	2	2	40	Teacher
217	5	2	39	Teacher
218	7	6	40	Teacher
219	2	2	40	Teacher
220	No Answer	2	40	Teacher
221	1	2	40	Teacher
222	1	5	40	Teacher

428	3	4	40	Lead Teacher
429	3	4	40	Lead Teacher
430	1	4	40	Assistant
532	15	3	40	Teacher
533	2	4	40	Teacher
534	No Answer	2	40	Teacher
535	No Answer	3	40	Lead Teacher
536	V	2	8	Teacher
537	No Answer	2	40	Teacher
538	>1	1	40	Teacher
539	2	6	40	Admin
540	0	1	40	Teacher
541	>1	2	30	Assistant
542	>1	1	40	Teacher
543	2	2	40	Teacher
544	No Answer	1	15	Assistant
545	15	2	40	Teacher
646	2	2	8	Teacher
647	1	5	40	Teacher
648	6	No Answer	40	Teacher
649	2	2	40	Teacher
850	>1	2	40	Teacher
851	No Answer	2	40	Teacher
852	1	3	40	Teacher
853	>1	3	40	Teacher
854	3	6	40	Admin
855	>1	2	25	Teacher
856	>1	2	40	No Answer
857	1	2	40	Teacher

958	19	4	40	Admin
959	1	2	20	Teacher
960	9	3	30	Teacher
961	4	2	25	Teacher
962	No Answer	2	No Answer	No Answer
963	20	2	40	Admin
969	16	1	40	Admin
965	1	3	20	Teacher
966	11	2	40	Teacher
967	3	2	35	Assistant
968				Teacher
969	1	2	20	Teacher

Appendix F: Possible Questions for Classroom Labeling Follow-Up Session

Possible Questions for Classroom Labeling Follow-up Session:

Did you like the classroom labels?

Was reading and posting the labels in the classroom time well spent?

Did the labels make sense?

Was the information on the labels useful?

Were the labels informative?

Did the physical conditions of the classroom allow for you to learn from the posters?

What was the impact of the posters on your classroom?

Did the posters affect the classroom's climate or procedures?

Was implementation advocated, facilitated, and supported?

Was the support public and overt?

Were problems addressed quickly and efficiently?

Were sufficient resources made available?

Were successes recognized and shared?

Appendix G: NETS extended rubric for Grades PK–2

NETS extended rubric for Grades PK–2

Purpose: This draft version of the NETS extended rubric for Grades PK–2 is available online for educational technology professionals to review and provide feedback to the developers.

More information: If you have questions about the rubric, please contact the developers at **netsrubric@learningpt.org**.

NETS for Students: Extended Rubric for Grades PK–2

NETS for Students	Novice *By the End of Kindergarten*	Basic *By the End of Grade 1*	Proficient *By the End of Grade 2*	Advanced
1. Basic Operations and Concepts **a. Students demonstrate a sound understanding of the nature and operation of technology systems.** ***(nature and operations)***	1) Students **recognize** the major hardware components in a computer system (e.g., computer, monitor, mouse or trackpad, and keyboard), and **identify** the functions and care of them.	1) Students **name or label** the main parts of a computer system (e.g., central processing unit [CPU], monitor, keyboard, disk drive, printer, mouse or trackpad or joystick) and **identify** functions of each.	1) Students **describe** how to use basic input devices (e.g., keyboard fingering and mouse or trackpad manipulation), output devices (e.g., monitor and printer use), and software resources (e.g., diskette, CD-ROM use).	1) Students **identify** characteristics that describe input devices and output devices and **name** some devices that can provide input and output.
	2) Students **know how to use** the mouse (or trackpad) to access an application, indicate a choice, or activate a hyperlink.	2) Students **know how to start up** the computer; **locate** applications; **choose** icons to select, open, save, print, and close files; and **shut down** the computer, monitor, and printer.	2) Students **name** common technology found in homes (e.g., VCRs, tape or digital recorder, CD player, digital still and video cameras, radios, telephones).	2) Students accurately **identify** common uses of technology found in daily life (at home and in the community).
	3) Students **recognize** symbols and icons used to identify common hardware and software functions within prepared materials (e.g., the arrow symbol as the icon for proceeding to the next page of a curriculum-related software, underlined and colored text to represent a link).	3) Students **recognize** symbols and icons commonly used in curriculum-related software to identify options (e.g., icon of printer to represent printing option, diskette to represent save file, music notes icon to represent link to music, movie camera icon to access movie, speaker symbol to indicate sound or audio is available).	3) Students **identify functions** represented by symbols and icons commonly found in application programs (e.g., font, size, bold, underline, alignment, color of type).	3) Students **recognize functions** represented by symbols and icons commonly found in the drawing toolbars of application programs (e.g., arrange, select, rotate, text box, Word Art, insert clip art, insert picture, line, rectangle, shapes, lines, line style, font color, line color, and fill color).
	4) Students **know how to use** the keyboard to type letters and numbers and know how to use special key functions (e.g., delete, shift, arrow keys, space bar).	4) Students **know how to use** correct sitting, hand, and arm positions and fingering to **type** words and phrases.	4) Students **know how to use** correct sitting, hand, arm, and fingering positions to **type** complete sentences (including shift key for capital letters, space bar for spacing, and punctuation keys).	4) Students **know how to use** correct sitting, hand, and arm positions and fingering to **type and edit** a brief story or message employing the full **alphabetic** keyboard.
	5) Students **identify** basic care of the computer, monitor, keyboard, mouse or trackpad.	5) Students **discuss how to** properly care for and use software media (e.g., CD, DVD, diskette, zip disk).	5) Students **discuss how to** properly care for and use software media (e.g., mini-DV tapes, videotapes, audiotapes).	5) Students **describe how to** properly care for and use the computer system hardware, software, peripherals, and storage media.

NETS for Students	Novice *By the End of Kindergarten*	Basic *By the End of Grade 1*	Proficient *By the End of Grade 2*	Advanced
b1. Students are proficient in the use of technology. *(information management)*	Students know how to **select** applications and curriculum-related software by associating icons with resources they wish to access (e.g., students **understand** that clicking on icons or hyperlinks may allow them to access applications, or Internet resources).	Students **understand** and **know how to use** basic commands for saving and printing their work, and **understand** that file names and folders are used to identify and organize stored information and programs.	Students **recognize** functions of basic file menu commands (e.g., new, open, close, save, save as, print) and folders to manage and maintain computer files on a hard drive or other storage medium (e.g., diskette, CD-ROM).	Students **identify** software for graphing as a way to gather, organize, and display numerical information; multimedia as a way to organize information and/or illustrate it in a presentation (e.g., draw and label a picture, type and illustrate a story or report, create a simple slide show); and access age-appropriate multimedia dictionaries and encyclopedias as resources for gathering information.
b2. Students are proficient in the use of technology. *(terminology and problem solving)*	Students correctly **identify** technology terminology that labels major technology hardware components (e.g., computer, monitor, keyboard, mouse or trackpad, printer).	Students **identify** technology hardware peripherals (e.g., speakers, earphones, projector) and storage components (e.g., disk drive, hard drive, CD-RW drive), and can **name** software used for typing, drawing, and electronic slide presentations.	Students **recognize** accurate terminology to describe hardware, software, multimedia devices, storage media, and peripherals, and can **identify** the basic functions of technology resources (hardware and software) commonly used in early elementary classrooms.	Students **identify** characteristics of computers that support multimedia (e.g., letters, sound, pictures, video) and the technology through which these are produced and displayed.
2. Social, Ethical, and Human Issues **a. Students understand the ethical, cultural, and societal issues related to technology.**	Students **identify** a computer as a machine that helps people work, learn, communicate, and play.	Students **identify** ways that the computer is used at home and in school.	Students **identify** common uses of information and communication technology in the community and in daily life.	Students **discuss** advantages and disadvantages of use of technology, and know how lack of access to technology can affect a person's access to information, learning opportunities, and future job prospects.
b. Students practice responsible use of technology systems, information, and software.	Students **recognize** that using a password protects privacy of information.	Students **recognize** that passwords protect the security of technology systems.	Students **recognize** that copyright affects how one can use technology systems, information, and software resources.	Students **describe** consequences of irresponsible use of technology resources at home and at school.
c. Students develop positive attitudes toward technology uses that support lifelong learning, collaboration, personal pursuits, and productivity.	Students **recognize** technology as a source of information, learning, and entertainment.	Students **understand** appropriate uses of computers in the classroom and **identify** a variety of learning and communications opportunities available through use of technology resources.	Students **describe** acceptable and unacceptable computer etiquette and **demonstrate** how to work cooperatively with peers, family members, and others when using technology in the classroom or at home.	Students **identify** places in the community where one can access technology.

NETS for Students	Novice *By the End of Kindergarten*	Basic *By the End of Grade 1*	Proficient *By the End of Grade 2*	Advanced
3. **Technology Productivity Tools** **a. Students use technology tools to enhance learning, increase productivity, and promote creativity.**	Students **know how to navigate** developmentally appropriate multimedia resources (e.g., interactive books, educational software, drawing and presentation programs) to support learning, productivity, and creativity.	Students **create, edit, move, and save** using multimedia resources (e.g., word processors, concept-mapping software, writing tools, drawing tools, graphing software) to communicate and illustrate thoughts, ideas, and stories.	Students **know how to use** word processing, drawing tools, presentation software, concept-mapping software, graphing software, and other productivity software to illustrate concepts and convey ideas.	Students **identify** the best type of productivity software to use for a certain task.
b. Students use productivity tools to collaborate in constructing technology-enhanced models, prepare publications, and produce other creative works.	Students, with assistance from teacher, parents, or student partners, **know how to use** developmentally appropriate technology tools to produce creative works.	Students **know how to** collaborate to **develop, print, and present** a document using a word processor, and/or drawing software.	Students **know how to** work together to **collect and create** pictures, images, and charts for development of word-processing reports and electronic presentations.	Students **know how to collaborate** to **plan, organize, develop, and orchestrate** presentation of a multimedia slide show that communicates information and ideas to classmates (and possibly to family members and others).
4. **Technology Communications Tools** **a. Students use telecommunications to collaborate, publish, and interact with peers, experts, and other audiences.**	Students, with assistance from teachers, parents, or student partners, **recognize and respond to** a bulletin board (or e-mail) posting projected on a large screen by their teacher.	Students, with assistance from teacher, parents, or student partners, **know how to use** telecommunications resources (e.g., electronic bulletin board, e-mail, teacher-selected Web site) to gather information, share ideas, and respond to questions posed by the teacher and other classmates.	Students, with assistance from teacher, parents, or student partners, **identify** procedures for safely and securely using telecommunications tools (e.g., e-mail, bulletin boards, newsgroups) to read, send, or post electronic messages for peers, experts, and other audiences.	Students **know how to** safely and securely use telecommunications tools to **read, send, or post** electronic messages to peers, experts, and family members.
b. Students use a variety of media and formats to communicate information and ideas effectively to multiple audiences.	Students **identify** media formats (e.g., text, clip art, photos, video, Web pages, newsletters), demonstrated by their teacher, that are used to communicate ideas.	Students, assisted by teachers, parents, or student partners, **know how to select** media formats (e.g., text, clip art, photos, video, Web pages, newsletters) to **communicate and share ideas** with students in other classrooms.	Students **know how to use** a variety of developmentally appropriate media (e.g., presentation software, newsletter templates, and Web pages as resources for clip art, music, and information resources) to **communicate** ideas relevant to the curriculum to their classmates, families, and others.	Students **know how to independently use** a variety of media to **gather** information and ideas relevant to the curriculum, accurately **summarize and illustrate** the material, and effectively **present** the final information using a variety of media.
5. **Technology Research Tools** **a. Students use technology to locate, evaluate, and collect information from a variety of sources.**	Students, with assistance from teacher, parents, or student partners, **know how to access** developmentally appropriate Web resources preidentified (as a hyperlink) by their teacher or parents.	Students **know how to recognize** the Web browser and associate it with accessing linked resources on the Internet.	Students, with assistance from teacher, parents, or student partners, **identify** steps for using technology resources, such as CD-ROMs (reference or educational software) and Web-based search engines to locate information on assigned topics in the curriculum.	Students **know how to apply appropriate steps** independently to access technology resources such as CD-ROMs (reference or educational software) and Web-based search engines to locate information on assigned topics in the curriculum.

NETS for Students	Novice *By the End of Kindergarten*	Basic *By the End of Grade 1*	Proficient *By the End of Grade 2*	Advanced
b. Students use technology tools to process data and report results.	*(There are no expectations with regard to using databases or other data-processing and report-generating software for this level.)*	*(There are no expectations with regard to using databases or other data-processing and report-generating software for this level.)*	Students, with assistance from the teacher, **know how to use** existing common databases (e.g., library catalogs, online archives, electronic dictionaries, encyclopedias) to locate, sort, and interpret information on assigned topics in the curriculum.	Students independently **know how to use** existing common databases (e.g., library catalogs, online archives, electronic dictionaries, encyclopedias) to **locate, sort, and interpret** information on assigned topics in the curriculum.
c. Students evaluate and select new information resources and technological innovations based on the appropriateness for specific tasks.	Students **identify** uses of common hardware components (e.g., monitor for viewing, keyboard for typing or selecting, earphones for hearing privately, drives for inserting storage diskette or CD).	Students **choose** software that is appropriate for the task they are completing (e.g., word processor to write a story or paragraph, drawing program to make a picture, developmentally appropriate graphing program to make a graph).	Students **identify** technology resources (e.g., simple conceptual mapping software, drawing software) to show steps in a sequence; to demonstrate likenesses and differences; and to recognize, record, and organize information related to assigned curricular topics.	Students **provide** a logical rationale for choosing one type of hardware or software over another for completing a specific assigned task.
6. Technology Problem-Solving and Decision-Making Tools **a. Students use technology resources for solving problems and making informed decisions.**	Students **know how to use** developmentally appropriate software focused on early learning problem-solving skills (e.g., matching, counting, ordering and sequencing, patterns, sorting by shape or color, classification, hidden items, measurement, directional words, critical thinking, logic and prediction, same or different).	Students **know how to use** developmentally appropriate software to collect classroom data, create a graph, identify the questions that could be answered by the information in the graph, and interpret the results from the graph.	Students **know how to select** information and communication technology tools and resources that can be used to solve particular problems (e.g., concept-mapping software to generate and organize ideas for a report, illustrate same or different, or indicate sequence of a story; a drawing program to make a picture; presentation software to communicate and illustrate ideas; a graph program to organize and display data; a Web browser and search engine to locate needed information).	Students **know how to use** technology resources to access information that can assist them in making informed decisions about everyday matters (e.g., which movie to see, time and location of entertainment, what product to buy, how to build a kite).
b. Students employ technology in the development of strategies for solving problems in the real world.	Students **recognize** how technology is used in their home or at school for learning and entertainment.	Students **identify** how technology is used in their community to support different types of jobs.	Students **identify** ways that technology has been used to address real-world problems.	Students **identify** a strategy for solving a problem or completing a task by applying information generated using technology tools and resources.