Testing the *Whole Teacher* Approach to Professional Development: A Study of Enhancing Early Childhood Teachers' Technology Proficiency

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Abstract

The contribution of early education to children's well-being and school success is widely recognized. Effective teachers are the most critical factor in the quality of a child's education. The key to sustaining teacher effectiveness and supporting continuous growth is high-quality professional development. Despite its critical importance, professional development for early childhood teachers is inconsistent and fragmented. The field of early education lacks a common conceptual framework to organize and integrate teacher development experiences. In this paper, the *whole teacher* development approach is proposed as an organizing framework. The approach is distinguished by its simultaneous focus on teacher attitudes, skills and knowledge, and practices. Also distinctive is its application of an integrated developmental framework that promotes teacher proficiency in a wide range of specific domains. To test the approach, a study of teachers' technology proficiency was carried out. The study analyzed relationships among teacher attitudes, skills, and practices, using data collected from teachers in the process of developing computer proficiency. Among teachers who participated in a technology program based on the *whole teacher* development approach, significant degrees of association among attitudes, skills, and practices were found. Further, program participants reported significantly higher levels of technology skill and classroom practice than nonparticipants. Distinctive features of the approach are compared to other professional development practices in early childhood education. Implications for conceptualizing and designing effective professional development programs for early childhood teachers are discussed.

Introduction

Several decades of research have clearly demonstrated the short- and long-term positive effects that high-quality early childhood programs have on children's development. High-quality programs depend on teacher effectiveness (Hamre & Pianta, 2005; Loeb, Fuller, Kagan, & Carrol, 2004). To be effective, early childhood teachers must develop specialized knowledge, skills, and practices. The key to sustaining teacher effectiveness and promoting continuous growth is high-quality inservice professional development (Borko, 2004; Darling-Hammond & Bransford, 2005).

Access to effective inservice professional development has not kept pace with the growing recognition of its significance. The Committee on Early Childhood Pedagogy reported that, by and large, professional development for early childhood teachers is limited, inconsistent, and fragmented (Bowman, Donovan, & Burns, 2001). Limited availability may be related to low demand. State requirements for annual inservice professional development training for child care caregivers and preschool teachers are minimal, ranging from zero hours in Michigan to 24 hours in Maine (Hinds, 2001). Inconsistency refers to the wide variability in content, approach, duration, and quality of the inservice programs available. Exacerbating the problem of inconsistency, what teachers learn in different programs typically is not integrated or connected. Most professional development programs do not provide follow-up to support teacher implementation of new practices. Inconsistency and discontinuity fragment, rather than strengthen, professional development.

Contributing to a lack of coherence, the design of professional development programs often proceeds without a conceptual framework that characterizes teacher development and thus provides a basis for setting goals, selecting instructional strategies, and evaluating outcomes. Although there are guidelines for early childhood professional development, including a position statement issued by the National Association for the Education of Young Children (1993), the guidelines tend to recommend characteristics of program delivery, such as sustained activity and collective participation (Bowman, Donovan, & Burns, 2001; Epstein, 1993; NAEYC, 1993). As such, the guidelines help to establish standards of quality; they do not specify dimensions of teacher change, nor do they describe how teachers develop expertise in specific domains.

Systematic approaches based on the dynamics of teacher development could enhance the quality of professional development for early childhood teachers. Training programs focused on specific content (e.g., early literacy, environment assessment) do not necessarily support the processes of teacher development. By design, one-shot workshops cannot provide ongoing learning experience and support essential for teacher change to take place. In contrast to these models, we propose a comprehensive approach that integrates what we know about teacher development with program designs that promote specific forms of teaching expertise. Introduced in this paper, it is called the *whole teacher* approach to professional development.

The *Whole Teacher* Approach to Early Childhood Professional Development

Development of the whole child is a widely accepted principle in the field of early education (Copple, 2005). It stresses promoting all areas of child development—cognitive, language, physical, and social. It also calls for attention to the interrelationships among these areas of development. It further specifies learning goals for young children, including feelings, knowledge, skills, and predispositions (Katz, 2000). The concept of the whole child is based on contemporary child development theories and research. The practice related to the concept has been tested for its positive and lasting impact on the healthy growth of young children (NAEYC, 2005). For early childhood educators, the goal of education is development of the whole child (Bredekamp & Copple, 1997).

Analogous to the practice of developing the whole child, we propose the *whole teacher* approach to professional development. Designed specifically for early childhood teachers, the approach emphasizes promoting all aspects of a teacher's development, including attitudes, knowledge and skills, and classroom practices. Distinguished by four interrelated characteristics, the approach is multidimensional, domain-specific, integrated, and developmental (see Table 1). These features are briefly described in Table 1.

Table 1

Whole Teacher Approach to Early Childhood Professional Development

Distinctive Characteristics	Implementation
Multidimensional	Programs target teacher attitudes, skills, and practices; offer multiple ways to learn and develop; and accommodate diverse teacher needs and motivations.
Domain specific	Objectives are based on content and performance requirements of specific professional development domains.
Integrated	Instructional strategies facilitate dynamic interrelationships among attitudes, skills, and practices. Instruction engages the whole teacher, rather than limiting the learning process to narrow, isolated goals.
Developmental	Programs support teacher growth from novice to expert levels of proficiency, promoting continuous growth.

Rather than focusing almost exclusively on knowledge and skills, as many inservice workshops do, the *whole teacher* approach targets multiple dimensions of teacher development. In addition to knowledge and skills, the approach promotes the development of attitudes and classroom practices. All three variables play an equally important role in teacher professional development. The focus on multiple dimensions offers teachers multiple pathways to learning and success. For some teachers, attitudes will be the most important first step to progress; for example, overcoming fear of failure. For others, classroom practice will be the key; for example, being motivated by the need to teach diverse learners. The approach accommodates teachers' needs and motivations, rather than providing only one way in and out.

A second distinction of the *whole teacher* approach is that it is domain specific. Attitudes, skills, and practices are general target areas. When the approach is applied, objectives for these areas are defined in the context of specific professional domains, such as early literacy or music. Domain-specific objectives guide program design and provide the basis for selecting content and appropriate learning experiences to support teacher development in diverse domains.

The *whole teacher* approach is also integrated. It is based on the premise that teacher attitudes, skills, and practices interact and influence each other. The dynamics of these interrelationships provide a basis for facilitating teacher development. Rather than working to achieve isolated goals, the approach uses instructional strategies that build on interrelationships among goals. For example, building teacher confidence contributes to teacher readiness to develop skills and motivates the implementation of new practices (Ashton, 1984; Vartuli, 2005). By the same token, successful implementation of new practices increases a teacher's sense of efficacy and suggests specific needs for further knowledge and skill development (Berk, 1985; Chen & Horsch, 2004). Though specific attitudes, skills, and practices vary by domain, the principle of promoting multidimensional development by targeting these variables is applied to all domains of expertise. Deliberate integration of goal areas and instructional strategies maximizes the rate of teacher progress.

Its developmental perspective is a fourth distinctive feature of the *whole teacher* approach. This feature builds upon previous research on the developmental stages of teachers (Berliner, 1988; Eraut, 1994; Huberman, 1989; Katz, 1972). It further argues that for professional development programs to be effective, program objectives must correspond to different levels of expertise in *particular teaching domains,* such as mathematics, literacy, and technology. Program outcomes need to include descriptions of qualitative change in specific domains as well. The approach facilitates the full range of teacher development, supporting growth from novice to expert levels of proficiency. Working on different developmental levels, the same professional development experiences are not appropriate for all teachers. To be appropriate, experiences must be matched to the level, needs, and interests of teachers. To illustrate the need to match teachers' developmental levels, consider what is appropriate for novices and for more advanced teachers in the area of early literacy. Novices require time to become familiar with basic materials, including print materials, materials for storytelling, and writing tools. As they explore, they learn and practice basic methods for using instructional materials with children. In contrast, more advanced teachers are ready to experiment with creating print materials of high interest to the particular group of children they teach. Familiar with basic methods of promoting literacy, they are ready to experiment with adapting methods to meet individual children's needs.

In this paper, we report on an initial empirical test of the *whole teacher* approach to professional development. The domain selected for study was educational technology. A relatively new field, educational technology tends to elicit learners' emotional responses and requires specific operations to achieve expected outcomes of computer use. As a result, teachers' attitudes and practices, as well as their knowledge and skills, are relatively easy to detect and assess. For the study, we designed a professional development program in technology using the *whole teacher* approach. The basic premise of the approach is that teacher attitudes, skills, and practices are interrelated. To test this premise, we measured the degree to which these variables were associated among teachers who did and did not participate in the technology program. To test the assertion that the *whole teacher*approach is more effective than other approaches, we asked participants and nonparticipants to evaluate technology-specific attitudes, skills, and practices when the program concluded.

Testing the *Whole Teacher* Approach to Developing Technology Proficiency

Design of Technology Development Program

Program Goals and Objectives. Working in collaboration, the Head Start program in the Early Childhood Department of the Chicago Public Schools and Erikson Institute, a Graduate School in Child Development, designed and implemented a *whole teacher* professional development program in technology. Offered over the course of a school year, the program consisted of 26 sessions, each two hours in length. In addition to group sessions, program instructors offered teachers classroom-based assistance and technical support.

Targeting multiple dimensions, program goals for teachers were (1) to develop positive attitudes toward computer use, (2) to acquire knowledge and skills needed to integrate technology with teaching and the curriculum, and (3) to apply computer skills and knowledge through classroom practices that enhance teaching and learning. Specific objectives were defined for each goal area. Goals and objectives are outlined in Table 2 and described below.

Table 2

Goal Areas and Objectives for Teacher Proficiency in Technology

Goal Areas	Objectives
Attitudes	• Confident using a computer in the classroom • Comfortable using Internet and email communication • Comfortable teaching children how to use computers
Knowledge and Skills	• Understands basic computer functions and commands • Skilled in selecting developmentally appropriate software • Capable of learning new software programs using program manual, help files, and trial-and-error approach • Knows how to install new programs independently
Classroom Practices Teaching Methods	• Encourages children to explore software • Pairs a more-competent with a less-competent child • Works with children one on one • Uses computers as a learning center • Incorporates use of software when planning activities
Classroom Practices Computer-Generated Instructional Materials	• Newsletters • Lesson plans • School report cards • Child assessments • Calendars • Educational games

Teacher Attitudes: Confident and Comfortable. Confidence in one's ability to use computers and being at ease using them are keys to teachers' technology use (Gorard, Selwyn, & Furlong, 2004; Specht, Wood, & Willoughby, 2002). As teachers gain confidence, they challenge themselves to develop and apply new skills. They become less concerned about potential problems and more convinced that they can handle problems that do arise. Teachers who are

comfortable using computers put children at ease about computer use. They see problems and mistakes as learning opportunities, for themselves and for children. With confidence and security, teachers involve children in finding and creating new ways to learn using classroom computers.

To build confidence and help teachers become comfortable with computer use, teachers were actively engaged with computers throughout the *whole teacher* program. Learning by doing was a fundamental element of the program design. The group size was kept small, no more than 20 teachers in a group, so that instructors could interact with, assist, and give feedback to individual teachers. Instructors called attention to group progress and expressed confidence in each teacher's ability to become proficient in computer use. Focused on facilitating learning, rather than judging performance, instructors worked with participants to achieve program objectives.

Teacher Knowledge and Skills: Computer Functions and Educational Software. Relevant technology knowledge and skills are prerequisites for teachers' effective use of computers in the classroom (International Society for Technology in Education, 2002). In this program, teachers learned how to use computer functions and commands, including running operating systems, searching the Internet for curriculum activities, and protecting children's safety during computer use. Because computer technology is constantly changing, teachers learned*how to learn* to use software. They completed class exercises involving the use of program manuals and help files as tools for installing and navigating software. They also developed skills in evaluating and selecting developmentally appropriate software. When capable of accurate evaluation, teachers are equipped to take advantage of the wide range of learning opportunities that high-quality software offers children. One teacher summarized this experience well: "We learned a great deal about software, but most importantly how to evaluate software for children. I have thoroughly enjoyed this course and have greatly benefited from it."

Teacher Practices: Integrating Software with Curriculum, Teaching Children to Use Computers, and Creating Instructional Materials. Effective implementation of classroom practices was the ultimate program goal. Teachers were introduced to a variety of instructional methods to engage children in computer use. Teachers also learned how to use computers to prepare classroom materials. For example, in one of the program modules, instructors introduced a software program called "PrintMaster." Using this software, teachers created a range of instructional materials, including educational games, parent newsletters, and children's books. Computer-generated materials are not only economical for teachers, they also encourage creativity and inspire teachers to use more of these materials in the classroom.

Between program sessions, teachers implemented new practices in their classrooms. Children provided immediate feedback that helped teachers evaluate their efforts and reinforced the relevance of what they were learning. At the beginning of each program session, teachers described their classroom experiences, sharing what they had learned and gaining further insights through feedback from instructors and peers. Through implementing new practices, teachers consolidated their skills and adapted what they learned to fit a specific classroom environment.

Empirical Support for the *Whole Teacher* Approach

To test the approach, data were collected from two comparable groups of teachers: those who participated in the technology development program and those who did not. The *whole teacher* approach was tested by using the technology program, collecting data from comparable groups of teacher participants and nonparticipants. The research questions were (1) To what extent are teacher attitudes, skills, and practices interrelated in teacher technology proficiency? (2) Does participation in a technology program based on the *whole teacher*approach affect these relationships? (3) Do technology program participants report higher levels of technology-related

attitudes, skills, and practices than nonparticipants do?

Sample. A total of 175 teachers from the Head Start program in the Early Childhood Department of the Chicago Public Schools participated in the study. All teachers had two high-memory, high-speed computers in their classrooms. Of the 175 teachers, 134 had completed a two-day session of introductory computer training. The remaining 41 teachers completed a year-long professional development program in technology based on the*whole teacher* approach. Analyzing comparability of the two groups, we found no statistically significant differences in educational level, home computer access, number of years teaching in schools, or number of preservice technology courses (see Table 3).

Table 3
Comparability of Head Start Program Participants and Nonparticipants

Variable	Teachers	*N*	Mean	SD	*df*	*t*	*p*
Years of education	Nonparticipants	132	15.76	2.01	170	1.03	0.49
	Participants	40	15.38	2.23			
Percentage of teachers with home computer	Nonparticipants	133	0.86	0.34	172	0.94	0.35
	Participants	41	0.80	0.40			
Years teaching in schools	Nonparticipants	129	13.78	11.39	168	-0.73	0.46
	Participants	41	15.19	8.07			
Number of preservice technology courses	Nonparticipants	129	1.21	1.46	166	-0.61	0.54
	Participants	39	1.38	1.63			

Measures. All teachers completed a self-evaluation questionnaire (see the Appendix). The questionnaire was based on the program objectives identified for each goal area. The measure took approximately 10 minutes to complete. It was adapted from Landerholm (1995) and revised based on the results of Head Start classroom observation, focus groups with Head Start teachers regarding computer competencies, and field testing. Teachers completed the questionnaire at Head Start's end-of-year meeting for classroom teachers. Questionnaires were submitted anonymously. The return rate was 95%.

On the questionnaire, teachers rated their competence in terms of specific indicators for attitudes, skills, and practices (see Table 2). In the area of attitudes, teachers rated their confidence using classroom computers and their comfort level teaching children how to use them. Teachers' knowledge and skill ratings gauged understanding of basic computer functions, capacity to self-direct learning new software, and ability to select developmentally appropriate software. To evaluate classroom practices, teachers rated their frequency of using different methods to introduce software to children and to integrate computers in the classroom. They also rated their use of computers to create different instructional materials, including newsletters, lesson plans, and educational games.

Results. Pearson correlation tests were used to determine the degree of association among measures of teacher attitudes, skills, and practices. A significance level of .05 was set for all tests. Prior to correlation analysis, responses to attitude and skill questions were tested using factor analysis. Results indicated a strong common factor among responses to 5 of the 8 attitude questions (see Table 4). Responses to the 5 questions about knowledge and skills formed a single factor (see Table 5). Factor scores for attitudes and skills were used in correlation analyses.

Table 4
Factor Loading of Teacher Attitudes toward Computer Use

Questionnaire Items	Main Factor Loading
1. Confident when using a computer in the classroom	0.86957

2. Comfortable using the Internet and email communication	0.76110
3. Comfortable teaching young children how to use computers	0.86721
4. Comfortable teaching my colleagues to use computers	0.93275
5. Comfortable teaching parents how to use computers	0.92865
6. Fear computer may take over some parts of my job	0.06175
7. Using a computer would make my work easier	0.25678
8. Computer use is good for low SES children	0.29238

Table 5
Factor Loading for Teachers' Computer Knowledge and Skills

Questionnaire Items	Main Factor Loading
1. Need other's help when using a computer*	-0.2460
2. Can use software manual to teach self	0.78136
3. Can learn a new program via trial and error	0.80173
4. Can install new software on a computer	0.55596
5. Know criteria for selecting children's software	0.41647

*This question presents a negative loading because of the way it is phrased. That is, the lower a teacher rates this item, the less likely she needs another person's help when using a computer.

To rate their frequency of using computer-related teaching methods and instructional materials, teachers used a 5-point scale, ranging from "never" to "always." For correlation tests, frequency ratings were transformed to either 1 or 0. For instructional methods, a 1 represented teacher ratings of "often" or "always." A zero represented ratings of "never," "seldom," or "sometimes." For instructional materials, a similar method was used. If a teacher's rating was "I can do it with some assistance" or "I can do it independently," a 1 was given. For the three ratings that indicated a need for greater assistance, the response was assigned a zero. Sums of each teacher's ratings for instructional methods and materials questions were used for correlation analysis.

Pearson correlation analyses were run separately for participants and nonparticipants (see Table 6). In both groups, statistically significant correlations were found between all pairs of variables. Confidence and skills were the most highly correlated variables, with $r = 0.69$ for participants and $r = 0.70$ for nonparticipants. Degree of association among variables tended to be higher for participants. In the participant group, correlations involving the variables of skills, teaching methods, and instructional materials ranged from 0.39 to 0.43. For nonparticipants, correlations between these variables were in the 0.23 to 0.27 range.

Participants and nonparticipants also differed in their ratings of skill and classroom practice. A *t*-test indicated that teachers who participated in the *whole teacher* technology program reported significantly higher ratings than nonparticipants for level of technology knowledge and skills, $t(168) = 2.60$, $p = 0.01$; implementing a variety of instructional methods in computer areas, $t(151) = 2.10$, $p = 0.037$; and using computers to create instructional materials, $t(155) = 2.47$, $p = 0.015$ (see Table 7).

Table 6
Relationship among Attitudes, Knowledge, Teaching Methods, and Instructional Materials

	Attitudes	Knowledge	Teaching Methods
Program Participants			

Knowledge and Skills	0.69**		
Teaching Methods	0.47**	0.43**	
Instructional Materials	0.44*	0.39*	0.43*
Nonparticipants			
Knowledge and Skills	0.70*		
Teaching Methods	0.31*	0.23*	
Instructional Materials	0.34*	0.27*	0.26*

**$p < .01$, *$p < .05$.

Table 7

Mean Difference in Attitudes, Knowledge and Skills, Teaching Methods, and Instructional Materials between Program Participants and Nonparticipants

	N	**Mean***	**SD**	***df***	***t***	***p***
Attitudes						
Participants	35	0.18	.76	144	1.03	0.305
Nonparticipants	111	-0.01	1.02			
Knowledge and Skills						
Participants	40	0.24	0.58	168	2.60	0.010
Nonparticipants	130	-0.07	0.71			
Teaching Methods						
Participants	39	3	1.68	151	2.10	0.037
Nonparticipants	114	2.39	1.53			
Instructional Materials						
Participants	40	2.38	1.71	155	2.47	0.015
Nonparticipants	117	1.84	1.66			

*Means for attitudes and knowledge and skills are not based on raw data but on standard scores as the result of factor analysis. The mean of standard scores is zero.

Critical Examination of the *Whole Teacher* Approach

In this discussion, we use the technology program design and the study results as leverage points to elaborate on the characteristics of the *whole teacher* approach outlined earlier; namely, that it is multidimensional, domain specific, integrated, and developmental. We link these results to studies of related variables and indicate how these distinctive features compare to other professional development practices in early childhood education. We conclude by underscoring the need for early educators to engage in dialogue and take action to increase the quality and effectiveness of early childhood professional development.

The Whole Teacher Approach as Multidimensional

Targeting multiple dimensions of attitudes, skills, and practices is readily distinguished from the workshop model that focuses on the single dimension of knowledge and skills. Despite increasing recognition that one-shot, cursory workshops are not effective in helping teachers translate knowledge into practice, the model still dominates the field of teacher professional development (Viadero, 2005). In a typical workshop, an expert delivers knowledge on a particular topic to a large audience within a limited time period. Teachers' attitudes toward the

topic are not deemed relevant. Practice may be discussed by the expert, but there is not sufficient time for teachers to practice classroom applications. Follow-up to support implementation of new practices is not included in the workshop design.

There may be several reasons why attitudes are not a primary concern in many professional development programs. In contrast to knowledge and skills, which tend to be external and objective, attitudes tend to reflect subjective evaluation, affect, and judgment (Pajares, 1992). Knowledge and skills are relatively explicit and easy to measure; attitudes are implicit and difficult to articulate. Knowledge and skills are more readily defined as deliverables that can be covered in specific time periods. In contrast, attitudes that are associated with belief systems and permeable by nature cannot easily be altered in one-day time frames. Because attitudes are subjective and difficult to articulate, program instructors may be unclear about how to promote them. Teachers themselves may be hesitant to openly discuss their attitudes.

Despite the lack of attention to attitudes in teacher workshops, research on teacher professional development consistently indicates that attitudes are closely related to teachers' knowledge acquisition and classroom practice (Pajares, 1992, 1996; Vartuli, 2005). In the current study, the high degree of association between attitudes and skills in both program participant and nonparticipant groups suggests that gaining confidence plays a central role in increasing technology proficiency. In statistical terms, confidence accounted for approximately half of the variability found in all teacher ratings of knowledge and skill levels. In applied terms, teachers who developed positive attitudes toward computer use were more likely to be enthusiastic about computers as learning tools, confident in their ability to learn and apply new skills, and successful in computer integration.

Numerous other studies indicate that teachers' attitudes are associated with their sense of self-efficacy. Positive attitudes are strongly correlated with positive mindsets. Attitudes influence teachers' thinking, behavior, and motivation (Berk, 1985; Cassidy, Buell, Pugh-Hoese, & Russell, 1995; Pajares, 1996). The strength of teachers' attitudes helps determine "how much effort they will expend on an activity, how long they will persevere when confronted with obstacles, and how resilient they will be when faced with adversity" (Vartuli, 2005, p. 76). Given their influence and effects, targeting attitudes contributes significantly to the effectiveness of teacher professional development programs (Chen & Chang, in press).

The ultimate goal of focusing on teacher attitudes and skills is to improve classroom practice. The *whole teacher* approach holds that implementing new practices requires more than rote applications of skill and knowledge (Beaudin & Grigg, 2001; Donnelly, Dove, & Tiffany-Morales, 2002). Applying new knowledge and methods learned through professional development programs, teachers inevitably encounter unexpected challenges that require adaptations to make practices effective. Implementation also requires teachers to apply what they have learned in the context of existing practices used with a particular group of children. Practice entails both knowledge-constructive and knowledge-internalization processes. As teachers implement new practices, they deepen their understanding through the active processes of elaborating and integrating knowledge. Without time and support for practice, a teacher professional development program is bound to fail (Borko, 2004; Elmore & Burney, 1999).

Insufficient time is frequently mentioned as the reason that practice is not included in the workshop model. In the *whole teacher* technology program, teachers spent 26 sessions for a total of 52 clock hours with instructors over the school year. This program design promotes and supports implementation of new classroom practices. A two-hour session allows instructors to relay just enough information for teachers to digest. Neither overwhelmed nor bored, teachers feel more confident and are motivated to use what they learned in their classroom. The week between sessions provides teachers ample time for practice. Teaching children to use a computer is the best check on what a teacher knows, how attitudes affect practice, and what skills need further work. When teachers share their experiences in the next program session, lessons learned are expanded and consolidated through instructor feedback and peer

suggestions. Teachers are then primed for further instruction and classroom experience. Confirming the effectiveness of targeting practice, program participants rated their repertoire of methods for teaching children to use computers and their rate of creating computer-generated materials at significantly higher levels than nonparticipants did (see Table 7).

The Whole Teacher Approach as Domain Specific

Deemed critical for the success of professional development, domain specificity is achieved by defining goals, objectives, and outcomes in the context of particular areas of teaching expertise such as early literacy and music. Goals and objectives are defined for teacher attitudes, skills and knowledge, and practices. Contributing to the formulation of objectives, program design draws on content standards and key concepts identified and adopted for specific domains. For example, a math professional development program based on the *whole teacher* approach would define objectives in relation to the Number and Operations and Geometry Content Standards set for mathematics curriculum for young children from prekindergarten to second grade (National Council of Teachers of Mathematics, 2004). Integrating content standards prepares teachers to support young children's thinking and activity in ways that are developmentally appropriate for particular domains (NAEYC, 2001a, 2001b; NAEYC & NAECS/SDE, 2002)**.**

Domain specificity is typically characterized in terms of knowledge and skills. The *whole teacher* approach recognizes that attitudes and practices are also domain specific. A teacher's comfort level, confidence, and interest may vary by domain. Whether or not a professional development program recognizes them, attitudes affect teacher motivation and progress as well as implementation of new practices. Practices include teaching methods and materials. Some teaching methods, such as actively involving children in learning, hold across domains. Others are more appropriate for particular domains. For example, correcting a child's responses promotes word recognition but does not encourage experimentation in science. Domain-specific practices also include assessment, observation, and evaluation. Assessment tools appropriate for sampling early numeracy skills differ from those relevant to assessing the emerging understanding of literacy. Carefully constructed objectives make it possible to support and advance teacher development in attitudes, skills, and practices. Objectives for the program in the current study exemplify multidimensional objectives specific to the domain of computer technology (see Table 2).

The focus on domain-specific teacher development is not typical in the field of early childhood education. Early childhood teachers have long been trained and respected as educational generalists. The field of early education for years has given relatively little attention to the issue of teachers' content knowledge (Cohen & Hill, 2000; Melendez, Chen, & McNamee, 2005). In response to initiatives such as the standards movement and the No Child Left Behind legislation, the field has begun to seriously examine the role of teacher content knowledge in high-quality instruction and effective learning. It is clear now that the single most important determinant of what children learn is what teachers know (Darling-Hammond & Bransford, 2005). Emphasizing domain specificity, the *whole teacher* approach highlights the importance of developing early childhood professionals who are content knowledge experts.

The Whole Teacher Approach as Integrated

The *whole teacher* approach is based on the premise that attitudes, skills, and practices are interrelated in teacher development. Results of the study lend support to this claim. Overall, the participant group showed higher degrees of association among measures of these variables than the nonparticipant group did (see Table 6). Consistent with the *whole teacher* approach*,* the pattern of correlations for participants indicated a greater degree of integration.

Also important to note are relationships between the variables of knowledge and practice. As shown in Table 6, correlations between knowledge and practice are moderate for the participant

group (0.43 for teaching methods and 0.39 for instructional materials), but they are low for the nonparticipant group (0.23 for teaching methods and 0.27 for instructional materials). As Borko (2004) points out, a gap between skill and practice is often found after participation in a training program. The *whole teacher* approach effectively narrows this gap. Program participants reported using more different teaching methods in computer work with children and producing a greater variety of computer-generated instructional materials than nonparticipants did (see Table 6).

In previous studies of teacher technology proficiency, investigators have studied relationships between two variables at a time. Studying three variables suggests alternative interpretations of some earlier findings. For example, Stables (1992) reported that teacher expressions of low confidence were related to lack of skills. Based on the current study, low confidence and low skills may be associated with limited practice. Level of practice is a critical third variable to measure if the goal is promoting teacher proficiency. Moallem and Micallef (1997) reported that greater computer use was associated with more positive teacher attitudes. They did not examine whether greater use is also associated with higher skill. Promoting computer use, without supporting skill development, may lead to teacher frustration rather than positive attitudes.

With instructional strategies that build on interrelationships and integrate attitudes, knowledge and skills, and practice, the *whole teacher* approach offers teachers multiple pathways to learning and development. Knowledge and skills can be a starting point for professional development; attitudes and practice can also be starting points. In the technology program, one option was to begin by inviting teachers to play with children's software. With hands-on experience and increased confidence through using children's software, teachers felt more comfortable and more prepared to learn computer knowledge and skills related to using software in the classroom. At different points in the program and in their development, teachers might find one pathway more appealing or more meaningful than the other two. Integrally related, all pathways lead to the achievement of program goals.

Returning to study results, finding moderate, rather than consistently high, correlations for program participants warrants comment. One factor may be the measures used. Attitudes, skills, and practices are complex variables. For practical reasons, the study used a limited number of indicators. Further, indicators sampled primarily from a beginner level of expertise. Measuring a larger number of indicators and a wider range of expertise is expected to yield higher correlations. A second consideration is the cross-sectional design of the study. The *whole teacher* approach does not maintain that development of attitudes, skills, and practice is uniform and evenly paced. Uneven profiles of children's learning and development have been documented (Gardner, 2004; Piaget, 1969; Siegler & Chen, 2002). We hypothesize similar patterns of unevenness in teacher development. To the extent that this hypothesis holds, degrees of association among variables will vary at different points in time. Longitudinal studies are needed to test this hypothesis.

The Whole Teacher Approach as Developmental

As formulators of the *whole teacher* approach, we agree with the view that professional growth is a developmental process that continues over the course of a teacher's career (CEO Forum on Education and Technology, 1999; Fleet & Patterson, 2001; NAEYC, 2001a, 2001b). The *whole teacher* approach facilitates the full range of teacher development with programs that help teachers progress from novice to expert levels of competence. Expected outcomes of the *whole teacher* approach describe qualitative changes in what teachers expect, what they know, and which practices they use in the classroom. These changes equip teachers to go beyond their experience in professional development. They become capable of adapting what they learn, creating new applications for skills, and problem solving as they implement practices.

The developmental emphasis of the *whole teacher* approach requires a fundamental shift from the model of "teacher training" to the framework of "teacher development." This shift requires

substantial changes in thinking and practice. These include changes in the instructor's role, program location and duration, and program selection. In the model of teacher training, an instructor is regarded as the expert. In a developmental model, the instructor is a leader, but he or she is also a facilitator, observer, and resource. Instructors actively involve teachers, inviting them to share their professional strengths and their classroom experiences. Typically, teacher training takes place outside the classroom and focuses primarily on transmitting knowledge and skill. A developmental approach integrates formal instruction with practice in the classroom. Teacher training workshops tend to be brief, typically lasting a day or less. Development requires sustained periods of time. In the training model, teachers' choices for professional development are often limited to a prescribed set of workshops deemed appropriate for all teachers in a district. Experts decide what teachers need to know. In a developmental framework, teachers participate in programs aligned with their interests and readiness level. A point of clarification about widespread use of the term "professional development": Using the term does not mean that the experiences are developmental. Though dominating the practice of professional development, one-shot workshops do not promote teacher development.

In addition to setting developmental goals and objectives, the *whole teacher* approach uses instructional strategies that promote development, including teaching for understanding and integrating instruction with practice. Teaching for understanding begins with involving teachers in actively constructing and internalizing concepts and information presented. Further, teacher participants help set the pace for instruction. Rather than moving ahead in accord with time constraints to complete an agenda, instructors move ahead as teachers demonstrate their understanding of material. Instructors facilitate development by scaffolding specific attitudes, skills, and practices. Tracking shifts in their zones of proximal development, instructors build on individual teacher advances (Vygotsky, 1978).

With publication of the Early Childhood Generalist Standards, the National Board for Professional Teaching Standards (2001) affirmed the professional status of early childhood education. As recognition of this status grows, the demand for high-quality professional development for teachers will increase significantly. Given that early childhood professional development is currently deemed inconsistent, limited, and fragmented (Bowman, Donovan, & Burns, 2001), improving professional development presents major challenges to the field. Its effectiveness directly affects the more than 2,000,000 paid teachers and caregivers of children birth to 5 years of age (Whitebook, Young, Bellm, Wayne, Brandon, & Maher, 2002).

Efforts to improve the quality of early childhood professional development are underway. Zaslow, Tout, Maxwell, and Clifford (2004) have identified the need for a consistent definition of professional development for early childhood educators. The National Association for the Education of Young Children is currently revising its 1993 position statement on professional development. These are positive indicators of the field's readiness to address the challenges ahead.

To increase effectiveness through use of the *whole teacher* approach, two fundamental shifts in the field are required. The first is a shift from the limited concept of teacher training to the expanded framework of teacher development. The second is a shift from focusing on teachers' general attitudes, skills, and knowledge to targeting their development in specific domains of teaching. To promote and sustain these shifts, teachers, administrators, and policy makers must be encouraged to reflect on current practices. Through raising questions, discussing needs, and generating alternatives, teachers and administrators can actively contribute to improving support for teacher development. As with any developmental process, this process will take time.

Whether or not further research recommends use of the *whole teacher* approach, the need for conceptual frameworks to organize and integrate early childhood professional development will remain. Comprehensive frameworks that provide alternatives to the training model seem particularly appropriate in a profession that specializes in development. We hope that proposal of the *whole teacher* approach will stimulate dialogue and debate that contribute to stronger

professional development for early childhood teachers.

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Appendix: Computer Technology Survey

Background Information

(Please fill in the blank space or circle one choice)

1. Are you a teacher or a teacher assistant?
   Teacher Teacher-Assistant
2. Do you have a computer at home?
   Yes No
3. Does your home computer connect to the Internet?
   Yes No
4. How many years have you worked in *schools*?
   _____Years
5. How many years have you worked in *Head Start classrooms*?
   _____Years
6. What is the highest education you have completed?
   High-School Some-College A.A. B.A. M.A. Other_____
7. Are you working in a full-day program or a half-day program?
   Full-Day Half-Day

Computer Training

(Please fill in the blank space or circle one choice)

1. How many years has it been since you completed your last degree program (e.g., AA, BA, or MA)?
   _____Years
2. How many credit courses in instructional technology (relating technology to classroom teaching) did you take during your college and graduate school years?
   None 1 2 3 More than 3

3. How many hours of inservice training on computer technology have you had during the last school year (9/00-6/01)?

None ½ Day 1 Day 2-3 Days 4-5 Days >1 Week

4. On a scale of 1 to 10, please rank how effective your last year's inservice training was in improving your*computer skills.*

1 2 3 4 5 6 7 8 9 10

Not Effective Somewhat Effective Very Effective

5. On a scale of 1 to 10, please rank how effective your last year's inservice training was in helping you*integrate computer technology with classroom teaching.*

1 2 3 4 5 6 7 8 9 10

Not Effective Somewhat Effective Very Effective

Attitudes

(Please circle ONE number that best describes your experience)

1. I feel very confident when I use a computer in my classroom.

1 2 3 4 5 6 7 8 9 10

Strongly disagree Neutral Strongly agree

2. I feel comfortable using the Internet (email, Web browsing, etc.).

1 2 3 4 5 6 7 8 9 10

Strongly disagree Neutral Strongly agree

3. I feel comfortable teaching computers to young children.

1 2 3 4 5 6 7 8 9 10

Strongly disagree Neutral Strongly agree

4. I feel comfortable teaching computers to my colleagues.

1 2 3 4 5 6 7 8 9 10

Strongly disagree Neutral Strongly agree

5. I feel comfortable teaching computers to my parents.

1 2 3 4 5 6 7 8 9 10

Strongly disagree Neutral Strongly agree

6. I fear that computers may take over some parts of my job I enjoy.

1 2 3 4 5 6 7 8 9 10

Strongly disagree Neutral Strongly agree

7. I think that using a computer would make my work easier.

1 2 3 4 5 6 7 8 9 10

Strongly disagree Neutral Strongly agree

8. I think it is more beneficial for children from low SES backgrounds to be exposed to classroom-based computer experience in early childhood.

1 2 3 4 5 6 7 8 9 10
Strongly disagree **Neutral** **Strongly agree**

Knowledge & Skills

(Please circle ONE number that best describes your experience)

1. I usually need someone's help when I use a computer.
   1 2 3 4 5 6 7 8 9 10
   Strongly disagree **Neutral** **Strongly agree**

2. I usually can teach myself a new computer program from the manual or the help files.
   1 2 3 4 5 6 7 8 9 10
   Strongly disagree **Neutral** **Strongly agree**

3. I usually can teach myself a new computer program from trial and error.
   1 2 3 4 5 6 7 8 9 10
   Strongly disagree **Neutral** **Strongly agree**

4. I know enough about computers to install a new computer program onto a machine.
   1 2 3 4 5 6 7 8 9 10
   Strongly disagree **Neutral** **Strongly agree**

5. I know a lot about the criteria for selecting children's educational software.
   1 2 3 4 5 6 7 8 9 10
   Strongly disagree **Neutral** **Strongly agree**

6. Please list the criteria you consider when you select educational software for young children.

Instructional Methods Practice

How often do you use the following methods when using computer technology in your classroom? Please check ONLY ONE CATEGORY next to each method.

Method	Never	Seldom	Sometimes	Often	Always
Encourage children to explore the software freely					
Pair a more-competent child with a less-competent child					
Teacher works with children one on one					
Computers are used as a learning center activity					
Computer software is integrated into other classroom teaching activities					

Instructional Materials Practice

What is your experience in using a computer to create classroom/instructional materials? Please check ONLY ONE CATEGORY next to each classroom/instructional material listed.

Classroom/Instructional Material	I do not know how to use a computer to do this.	I have watched someone do it but never tried myself.	I have tried myself but often have a hard time doing a good job.	I can do it but it often requires a great deal of effort and assistance.	I can do it with ease and confidence.
Newsletter					
Lesson plan					
Prepare school report card					
Child assessment					
Calendars					
Educational games					

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