

## A Correlational Study of Six Professional Development Domains in E-learning Teacher Professional Development

*Un Estudio de Correlación de Seis Dominios de Desarrollo Profesional de E-learning  
para el Desarrollo Profesional de Profesores*

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### Abstract

This paper presents the results of a quantitative, descriptive correlational study that included K-12 public school teachers that had participated in in-service professional development courses offered through an e-learning program. The results of the study indicated that K-12 e-learning professional development courses in which teachers participated aligned with three domains of quality instruction as defined by three sets of professional standards. Five recommendations for future research are presented. This study can inform professional development providers, designers, and potential participants on the efficacy of e-learning professional development offerings.

**Keywords:** Asynchronous, Course facilitator, Distance education, Educational Technology, E-learning, Synchronous

### Resumen

Este trabajo presenta los resultados de un estudio cuantitativo, descriptivo y correlativo que incluyó a maestros de escuelas de educación primaria y secundaria K-12, que habían participado en el servicio de cursos e-learning de desarrollo de aprendizaje profesional. Los resultados del estudio indicaron que cursos e-learning de desarrollo profesional para K-12, en el que participaron profesores alineados con tres dominios de instrucción de calidad, definidos por tres conjuntos de normas profesionales. Se presentaron cinco recomendaciones para futuras investigaciones. Este estudio puede informar a los proveedores de desarrollo profesional, a los diseñadores, y a futuros participantes sobre la eficacia de las ofertas de e-learning de desarrollo profesional.

**Palabras clave:** Asincrónico, facilitador del curso, educación a distancia, tecnología para la educación, e-learning, sincrónicos, transferencia de conocimientos

### Introduction

This study examined teacher professional development delivered through an e-learning program. The theoretical framework for this study incorporated technology with the knowledge of the learning process, and understanding the needs of diverse learners; which is the essence of a learner-centered structure (McCombs, 2000). The study is grounded in a learner-centered framework incorporating technology with the knowledge of how learning occurs, course design, and the needs of diverse learners (McCombs, 2000). The study sought to examine the first-hand experiences of K-12 teachers who took e-learning professional development courses. Thirty K-12 New York City public school teachers participated in the study. The study framework included e-learning standards developed by the National Staff Development Council (2001), and the Southern Regional Education Board (2004); and the American Psychological Association Learner-Centered Psychological Principles (1997). The six domains derived from the framework for this study are: 1) variety of multimedia resources; 2) participant interaction and collaboration; 3) instructor/facilitator quality; 4) participant understanding and ability to implement the skills and strategies learned; 5) whether the training was standards aligned; and 6) assessment and evaluation. A literature review identified two concerns regarding teacher professional development offered through e-learning. The first was that the rigor of e-learning professional development is not verifiable. The second was that professional development delivered through e-learning may not be substantive and rigorous.

### *E-learning Background*

Professional development to support K-12 teachers in becoming highly qualified is a key component of education reform. The current accountability era emphasizes meaningful and longitudinal professional development that does not require time away from class, supports teachers on an ongoing basis, and transfers to teaching practices. Teacher professional development is transitioning from face-to-face events to increasing e-learning options due to the necessity in meeting student achievement goals (Dede, 2006; Fullen, 2001; Grandzol & Grandzol, 2006; Showers & Joyce, 1996). E-learning can support K-12 teacher expertise by offering: 1) longitudinal professional development, 2) potential transfer to teaching practices, 3) resources beyond local sources, 4) just-in-time support, and 5) no loss of instructional time (Boethel & Dimock, 1999; Dede, 2006; NSDC, 2001b; Phipps & Merisotis, 1999; Smith, Clark, & Blomeyer, 2005; U.S. Department of Education, 2005a; U.S. Department of Education, 2005b). A U.S. Department of Education (2005a) e-learning initiative for K-12 teacher professional development featured increased professional development options, flexible access, collegial discourse, and the ability to work with master teachers (U.S. Department of Education, 2005b).

### **E-learning Research**

Studies may provide data to answer questions that arise on e-learning efficacy (Mandinach, 2005). Several studies reported that online professional development provides options to update skills and knowledge (Smith, Clark, & Blomeyer, 2005). However, gaps exist in online professional development research and professional development program effectiveness (Smith, Clark, & Blomeyer, 2005). Comparative or quantitative studies have focused on individual courses (Frydenberg, 2002; Phipps & Merisotis, 1999). As online professional development momentum gathers, published standards conforming to accreditation benchmarks are essential (Grandzol & Grandzol, 2006). Further inquiry on the link between standards and participant evaluation of online teacher professional development is needed (Dede, 2006). An essential need exists for quality research to inform the use of Web 2.0 applications in education and professional practice (Boulos & Wheller, 2007).

Bryant, Kahle, and Schafer (2005) discussed the Equivalency Theory, which proposed that learning outcomes in distance education should be identical to those achievable in traditional classroom settings. The No Significant Difference website (<http://www.nosignificantdifference.org>) provides information to complement Thomas L. Russell's book, "The No Significant Difference Phenomenon: A Comparative Research Annotated Bibliography on Technology for Distance Education" (2001, IDECC, fifth edition). Russell (2001) examined research studies published from the late 1920s through the late 1990s that explored differences in student outcomes between distance learning and traditional courses. The studies indicated that in terms of student outcomes, there is no significant student achievement difference between face-to-face course delivery and alternative delivery methods.

### **E-learning Design**

E-learning course design is important for effective delivery (Grandzol & Grandzol, 2006). Courses heavily comprised of teacher-directed learning modules do not engage students whereas courses designed with interactive and student-directed activities, synchronous exchange in real time, streaming video and audio, and collegial sharing of ideas provide engagement (Islam, 2002). In e-learning content design it is important to facilitate the development of a learning community, collaborative environment, course material delivery modes, outcomes, assignments, and assessments that create an effective course (Palloff & Pratt, 2007). E-learning is evolving, and progress towards an effective model is contingent upon placing the student as the focal point of the experience (Carver, King, Hannum, & Fowler, 2007). Web 2.0 technologies offer the promise of collaboration, social networking, immediacy, social presence, and mobility (Boulos & Wheller, 2007; Scollins-Mantha, 2008). A matrix developed in 2004 identified content, delivery, and learning-related issues as essential considerations for course developers seeking to align courses to education goals (Grandzol & Grandzol, 2006).

### **E-learning Accreditation**

E-learning accreditation, a process of educational institution review and evaluation by third party agencies to formally verify the quality of education, is evolving (Charmonman, & Chorpothong, 2004; Schmidt, Geith, & Hakley, 2009). Although accreditation in the United States is more advanced than in other countries, such as the Association of Southeast Asian Nations, published independent evaluations of e-learning professional development offerings have not kept pace with course offerings growth and are not recognized across the world (Charmonman & Chorpothong, 2004; Ginsburg, Gray, & Levin,

2004; Mandinach, 2005). Some professional development services that offer e-learning courses to K-12 teachers do not supply independent evidence of effectiveness (Phipps & Merisotis, 1999).

In the United States, individual states publish professional development standards for face-to-face courses. An understanding of effective professional development is emerging and identifies higher-order teaching strategies, cooperative-learning, transformational practices, and cohesiveness as indicators of effectual professional development experiences (Danielson & McGreal, 2000; Porter, Garet, Desimone, Suk Yook, & Birman, 2000; U.S. Department of Education, 2000). However, most teachers do not experience high quality professional development because most professional development lacks active learning, and the number of weekly contact hours are less than 25 (U.S. Department of Education, 2000).

### **Framework for This Study**

The framework for this study was: 1) E-Learning for Educators: Implementing the Standards for Staff Development (NSDC, 2001a), 2) Standards for Online Professional Development (SREB, 2004), and 3) Learner-Centered Psychological Principles (APA, 1997). The six domains derived from the framework for this study are: 1) variety of multimedia resources used to support various learning styles; 2) participant interaction and collaboration; 3) instructor/facilitator quality; 4) participant understanding and ability to implement the skills and strategies learned; 5) whether the training was standards aligned; and 6) assessment and evaluation.

### **Technology and Professional Development**

The increase in lifelong learners and households with computers and Internet access should lead universities to offer distance education (Bryant, Kahle, & Schafer, 2005). Technology is changing education curriculum and empowering learners to independently acquire information, rather than passively receive information (Johnston & Cooley, 2001). Junco and Timm (2008) observed that in an era when college students have had access to technology tools and the Internet since an early age, higher education faculty is "behind the curve in their use of technology" (p. 1). The second wave of the Web, Web 2.0, supports collaboration, content created and disseminated by users; and is changing the way the Web is used in education, continuing professional development, and professional practice (Boulos & Wheller, 2007).

### **Research Method and Design Appropriateness**

#### *Population and Sampling*

As the research study sought to assess the first-hand experience of K-12 teachers who took e-learning professional development courses, the study used participant-oriented evaluation. The sampling frame consisted of 2000 New York City public school K-12 teachers who participated in e-learning professional development courses. Thirty K-12 New York City public school teachers that took e-learning professional development courses participated in the study.

#### *Data Analysis*

In the study, data were analyzed to evaluate the training provided in the e-learning professional development courses, as perceived by 30 K-12 New York City public school teachers. The training was evaluated on the six domains derived from the study framework.

Following data collection, missing values and outliers screening occurred. Data analysis included Pearson's  $r$  and descriptive statistics. Descriptive statistics were used to determine that further analysis on these intervening variables was unnecessary, and to analyze participant demographic questions. Cronbach's alpha produced a reliability index for the data collection instrument. As the study sought to measure the relationship among the six research variables based on the perception of the course participants, the Pearson Correlation Coefficient ( $r$ ) was used. Hypothesis testing incorporated the results from both the descriptive and correlation analyses. The software program used for data analysis was Statistics Package for Social Science 15.0 (SPSS) for Windows. To prepare for the analysis, data were entered into a Microsoft Excel spreadsheet.

#### *Data Collection*

Using a descriptive correlational research design, the quantitative study involved an investigation of e-learning professional development courses, as perceived by 30 K-12 New York City public school teachers. The study employed a cross-sectional survey consisting of 18 5-point, Likert-type scale survey questions. In the study, descriptive analysis and correlation analysis of the quantitative data collected occurred. The data collection method was a survey to which a convenience sample of voluntary study

participants responded (Neuman, 2003). The research variables are six domains of professional standards in the e-learning professional development courses offered by the provider. The study followed data collection and confidentiality procedures recommended by the literature.

### *Descriptive Statistics*

Of the 30 participants, four were male. The age range was 21 through 60 and the majority of participants (19) ranged in age from 26 through 40. Eighteen participants (60%) taught kindergarten through fifth grade. Seven participants taught sixth, seventh, or eighth grade, and four participants taught high school. One participant did not report grade taught. All 30 participants had a master's degree. Five participants did not report certification type, if any, that they held. Of the remaining, 13 held certification in elementary (1-6), and other certifications. The majority reported having earned 22 or more credits through the e-learning program.

## **Results**

### *Findings*

The data showed a high level of agreement by participants with the presence in the e-learning professional development of three of the six domains: *Multimedia Resources used to Support Various Learning Styles, Domain 1; Understanding and Implementation, Domain 4; and Standards Aligned, Domain 5*. Responses indicated no consensus on the *Instructor/Facilitator* domain or the *Assessments and Evaluation* domain. The majority rated the *Interaction and Collaboration* domain in the disagree to strongly disagree range. The high level of agreement of participants to the presence of three of the six domains in the e-learning, and the correlation of all domains to domain 1 and 6, served to support the rejection of the null hypotheses.

### *Results of Research Question Analysis and Hypothesis Testing*

#### Research Question 1

RQ1: How do successful completers, rate and evaluate the e-learning professional development against the following six domains: 1) the variety of multimedia resources; 2) participant interaction and collaboration; 3) the quality of the instructor/facilitator; 4) participant understanding and ability to implement the skills and strategies learned; 5) whether the training was standards aligned; and 6) assessment and evaluation.

Table 1 presents the descriptive statistics of the six domains. The scale used on the survey rated *strongly agrees* as 5, *neutral* as 3, and *strongly disagree* as 1. The results indicate that participants rated the learning experience highest (participants disagreed or strongly disagreed this level of quality instruction was met) in domains 1, 4, and 5, and lowest (participants agreed or strongly agreed this level of quality instruction was met) in domains 2 and 6.

A score of 3 indicates a neutral position, a score of 2 indicates disagreement, and a score of 4 indicates agreement. The results indicate near agreement on the domains 1, 4, and 5; and neutral to disagreement on domains 2, 3, and 6. The following sections evaluate the individual domains in more detail.

Table 1 reveals that participants scored the training from 1.14 (*strongly disagree*) to 5 (the maximum available – *strongly agree*). Eighteen of the 30 respondents (60%) rated the training 4.00 or higher; indicating they *agreed* or *strongly agreed* the training met the criteria for quality instruction in this domain.

Domain 1. Domain 1 examined the variety of multimedia resources used to support various learning styles. Total scores were the sum of 7 responses divided by the number of responses.

Descriptive statistics for each statement in Domain 1 are presented in Table 2. The results indicate that participants rated video and audio presentation the highest, with mean scores between *agree* and *strongly agree*. Participants rated *access to experts in subject matter were included in the class* lowest, with a mean score between neutral and agree.

Domain 2. Domain 2 examined participant interaction and collaboration. Descriptive statistics for each statement in Domain 2 are presented in Table 3. The results indicate that participants rated all statements between *disagree* and *strongly disagree*. Participants rated *engaging in collegial sharing discussions in the form of discussions* closest to *strongly disagree*.

Table 1. Descriptive Statistics: Six Domains

	Domain 1	Domain 2	Domain 3	Domain 4	Domain 5	Domain 6
<i>M</i>	3.88	2.46	3.36	3.98	3.93	2.92
<i>SE</i> of Mean	0.15	0.19	0.16	0.12	0.11	0.15
Median	4.00	2.25	3.50	4.00	4.00	3.00
Mode	3.71	2.00	3.83	4.00	4.00	2.00(a)
<i>SD</i>	0.84	1.02	0.87	0.68	0.61	0.80
Range	3.86	4.00	3.67	3.00	2.50	2.67
Minimum	1.14	1.00	1.00	2.00	2.50	1.33
Maximum	5.00	5.00	4.67	5.00	5.00	4.00

Note: Multiple modes exist. The smallest value is shown.

Table 2. Descriptive Statistics: Domain 1

Statement	<i>M</i>	<i>SE</i> of Mean	Median	Mode	<i>SD</i>	Range	Min	Max
Text files	3.97	0.20	4	4	1.07	5	0	5
Video	4.23	0.20	4	5	1.07	5	0	5
Audio	4.23	0.20	4	5	1.07	5	0	5
Web resources	3.7	0.23	4	4	1.24	5	0	5
Experts in subject matter	3.43	0.27	4	4	1.46	5	0	5
Learning style accommodated	3.73	0.20	4	4	1.08	4	1	5
Learning strategies aligned with objectives	3.83	0.19	4	4	1.02	3	2	5

Table 3. *Descriptive Statistics, Domain 2*

Statement	<i>M</i>	<i>SE</i> of Mean	Median	Mode	<i>SD</i>	Range	Min	Max
Engage in collegial sharing discussions	2.4	0.23	2	2	1.25	4	1	5
Discussion boards, email to support mentoring and collaboration	2.47	0.22	2	2	1.20	5	0	5
Opportunities for working collaboratively	2.43	0.22	2	2	1.19	4	1	5
Collaborative climate, interactivity, and group development	2.53	0.23	2	1(a)	1.28	4	1	5

*Note: Multiple modes exist. The smallest value is shown.*

*Domain 3.* Domain 3 examined the quality of the instructor/facilitator. Descriptive statistics for each statement in Domain 3 are presented in Table 4. The results indicate that participants rated the first four statements between *neutral* and *strongly agree*. Participants rated *e-learning instructor has content knowledge* highest, with a mean score of 4.17. The results indicate participants rated *the immediacy of feedback* ( $M = 2.60$ ) and *the instructor played an interactive role* lower ( $M = 2.73$ ).

Table 4. *Descriptive Statistics: Domain 3*

Statement	<i>M</i>	<i>SE</i> of Mean	Median	Mode	<i>SD</i>	Range	Min	Max
E-learning instructor delivers course	4.13	0.18	4	4	1.01	4	1	5
E-learning instructor has content knowledge	4.17	0.20	4.5	5	1.12	4	1	5
E-learning instructor communicates in multiple ways	3.33	0.22	4	4	1.18	4	1	5
Instructor understands and uses e-learning strategies	3.17	0.24	3.5	4	1.29	5	0	5
Feedback is timely and adequate	2.60	0.24	2.5	3	1.30	4	1	5
Instructor was interactive	2.73	0.23	3	2	1.26	4	1	5

*Domain 4.* Domain 4 examined participant understanding and ability to implement the skills and strategies learned. Descriptive statistics for each statement in Domain 4 are presented in Table 5. The results indicate that participants rated between *neutral* and *agree* the first statement, *I was able to*

*implement my skills and strategies after the course.* Participants agreed with second statement, *I had the opportunity to link course activities to my teaching.*

Table 5. *Descriptive Statistics: Domain 4*

Statement	<i>M</i>	<i>SE of Mean</i>	Median	Mode	<i>SD</i>	Range	Min	Max
I was able to implement my skills and strategies after the course	3.87	0.14	4	4	0.78	3	2	5
I was able to implement my skills and strategies after the course	3.87	0.14	4	4	0.78	3	2	5
I had the opportunity to link course activities to my teaching	4.10	0.14	4	4	0.76	3	2	5

Domain 5. Domain 5 examined whether the training was standards aligned. Descriptive statistics for each statement in Domain 5 are presented in Table 6. The results indicate that participants agreed with the statements in Domain 5. Statement 1, *research access is evident in activities*, rated the lowest ( $M = 3.57$ ).

Table 6. *Descriptive Statistics: Domain 5*

Statement	<i>M</i>	<i>SE of Mean</i>	Median	Mode	<i>SD</i>	Range	Min	Max
Research access is evident in activities	3.57	0.16	4	4	0.86	3	2	5
The course extended my knowledge	4.10	0.11	4	4	0.61	3	2	5
The course provided me with research-based instructional activities	4.07	0.15	4	4	0.83	3	2	5
I can assist my students in meeting academic standards because of this course	4.00	0.14	4	4	0.74	3	2	5

Domain 6. Domain 6 examined assessment and evaluation. Descriptive statistics for each statement in Domain 6 are presented in Table 7. The results indicate a mean response of *neutral* for the statements: 1) *the course included assessments that evaluated my learning against course objectives* and, 2) *there were formative and summative evaluations to summarize my learning*. The mean response for the last question was 2.37, indicating slight disagreement that the course *included assessments and/or projects with timely feedback*.

#### Research Question 2.

RQ2: What is the extent of the relationship among the six domains of professional standards in the e-learning professional development courses?

To answer research question 1, the null hypothesis that a significant relationship does not exist among the six domains of the professional standards in the e-learning professional development, was tested. A correlation analysis was performed utilizing one-tailed Pearson product moment correlation coefficients to

determine if there are significant relationships among the domains. The results indicated that all domains are positively correlated with domains 1 and 6 (Table 8).

Table 7. *Descriptive Statistics: Domain 6*

Statement	<i>M</i>	<i>SE of Mean</i>	Median	Mode	<i>SD</i>	Range	Min	Max
Course included assessments that evaluated my learning against course objectives	3.30	0.19	3.5	4	1.02	3	2	5
There were formative and summative evaluations to summarize my learning	3.10	0.19	3	4	1.03	4	1	5
Course included assessments and/or projects with timely feedback	2.37	0.17	2	2	0.93	3	1	4

When evaluating a correlation, the results are interpreted by examining both the significance when compared to an alpha of .05, and the amount of variance explained ( $r^2$ ). Because small values of  $r^2$  indicate only a small amount of the variance in one variable is accounted for by variance in another variable, only  $r^2$  values of .20 or greater will be examined in more detail. Three pairs of domains, 2 and 3, 1 and 5, and 3 and 6 had a variance explained of more than .20.

The results indicated that domains 2 and 3 were significantly and positively related ( $r = .52$ ,  $r^2 = .27$ ). This result indicated that if a participant found participant collaboration and interaction encouraged in the course, they rated the instructor/facilitator highly. The results indicated that domains 1 and 5 were significantly and positively correlated ( $r = .59$ ,  $r^2 = .35$ ). This result indicated that if the participant found there were a variety of multimedia resources supporting various learning styles, they were more likely to indicate the course was standards aligned.

The results indicated that domains 3 and 6 were significantly and positively related ( $r = .66$ ,  $r^2 = .44$ ). This result indicates that if the participants believed the course included assessments and evaluation of learning they rated the instructor/facilitator highly. While other correlations were significant, it was not unexpected that there would be significant and positive correlations among all six domains, as the domains were all measuring some dimension of national standards for online teacher professional development.

## Conclusions, Implications, and Recommendations

### Conclusions

Research question and hypothesis discussion. The descriptive analysis revealed agreement by participants on the presence of three of the six domains of the professional standards in the e-learning professional development. The three domains were: 1) Learning Styles, 2) Understanding and Implementation, and 3) Standards Aligned domains. The descriptive analysis of the data indicated that for two domains, Interaction/Collaboration and Assessment/Evaluation, the participant responses lacked consensus. On the domain of Interaction/Collaboration, participant responses registered disagreement.

The Pearson Product-Moment Correlation results indicated that all domains are correlated with domains 1 and 6, therefore the Pearson  $r$  correlation served to reject the null hypothesis. The six domains served as the six research variables. The Pearson  $r$  correlation analysis does not provide an outcome analysis. This means that the relationship may or may not be causal (Trochim, 2006). The present study does not make any assumptions about causal relationships.

Table 8. Correlation Matrix: Six Domains

Domain	Domain 1	Domain 2	Domain 3	Domain 4	Domain 5	Domain 6
1	—	0.29	0.32	0.41	0.52(*)	0.32
2		—	0.59(*)	0.02	0.16	0.41
3			—	0.11	0.33	0.66(*)
4				—	0.89(*)	0.34
5					—	0.38
6						—

Note. N=30; \*Correlation is significant at the 0.05 level.

The study contributed to the body of research on e-learning K-12 public school teacher professional development and provides a starting point for future studies. The findings and implications of the study may guide teachers, leaders, and professional development providers in making decisions about participating in, approving, and constructing e-learning professional development. The present study contributed to the knowledge that standards for teacher professional development correlate to each other. Additionally, the present study provided knowledge that may serve to inform the process of e-learning course design architecture.

The results of the data analysis demonstrated that participants recognized the extent of the relationship among the six research variables that were six domains of professional standards in the e-learning professional development courses. The study results were important because the results provided information on the extent of the relationship among the six domains of professional standards in the e-Learning professional development courses. The results of the study are important for education leaders, teachers, e-learning course architects, and professional development providers because the current study contributes to the body of knowledge on e-learning professional development and lays the groundwork for needed future studies.

Professional standards indicators specify that a variety of multi-media resources to differentiate instruction to support participant understanding of course content be present in the design. Differentiated instruction requires multi-modality materials (Gardner, 1993; Tomlinson, 2001). One result of the present study indicated that if e-learning professional development courses are aligned with standards then the course design will include access to research, address individual learning styles, and provide opportunities for collegial discussions. A significant finding of the present study was that the e-learning offered multiple ways of presenting materials electronically such as graphics, audio, video, and animation; accommodated individual learning styles; and used of a variety of technologies (McCombs & Vakili, 2005). The results of the study indicated that the e-learning professional development provided the opportunity for participants to acquire knowledge and skills.

#### *Implications*

The current political and cultural climate in education advocates for standards-based learning experiences for all learners. If e-learning professional development is standards-based, the implication is that the public school education community can accept such e-learning in the present era of accountability; assessment results provide a measurement of accountability for learning (Tozer, Violas, & Senese, 2002). The stimulus for e-learning teacher professional development initiatives was to accommodate individual learning styles and schedules (U.S. Department of Education, 2005b). Teacher professional development must promote deep understanding of new topics. Deep understanding is possible when opportunities exist for active learning, collaboration, and when individual learning styles are accommodated (NSCD, 2001b). Professional development should transfer to teaching practices and be implemented in the classroom (Fullen, 2001, Joyce & Showers; Noyce, 2006; Odden, Picus, Archibald, Goetz, Turner Mangan & Aportela, 2005).

Teacher professional development should include assessments (NSDC, 2001a; SREB, 2004). The design of the study was to describe the relationship of e-learning professional development to professional standards documents. The present study may provide a foundation for a study of e-learning professional development and may provide future researchers a basis for further investigations using different methodologies into standards in e-learning professional development for teachers. One possible future investigation is qualitative research, which in the form of evaluation research could examine e-learning (Patton, 2002). The current study provided survey data and demographic data that might offer characteristics from which to identify a case sampling for a future qualitative evaluation research study (Patton, 2002). Such qualitative research could gather data that probes deeper than the present study into areas such as: 1) the ability to implement the e-learning knowledge into instruction, 2) the kinds of assessments in e-learning professional development, 3) the causes of the deficiency of collegial collaboration in the e-learning professional development, 4) the relationship between a variety of resources supporting various learning styles, standards aligned, and 5) the relationship between collaboration, interaction, and instructor/facilitator in e-learning courses. To measure the extent of the implementation of e-learning professional development, ethnographic studies could investigate what occurs during an average period in the classroom of teachers who participated in e-learning professional development (Fraenkel & Wallen, 2003). To examine causality, future quantitative projects could address causality by studying the variables that influence an outcome of the e-learning professional development (Creswell, 2003).

If e-learning professional development is standards-aligned, it provides access to research, addresses individual learning styles, and promotes collegial interactions. If it is meaningful, then K-12 public school administrative policies may change in favor of e-learning professional development. In addition, the findings of the study were significant because e-learning professional development provided participants with the opportunity to participate in research-based, standards-driven professional development (NSDC, 2001b; SREB, 2004).

A conclusion from the study is three of six professional standards domains exist in the e-learning examined, and all domains were correlated to domains 1 and 6. Further implications based upon the findings were if e-Learning professional development design aligns with professional standards, a measurement of accountability exists. The results of the present study suggest that e-learning professional development for teachers can be effective when there is a relationship to professional standards. From this finding, we can conclude that e-learning professional development can have a relationship to professional standards. That relationship can provide accountability to educators of the quality of e-learning professional development.

#### *Recommendations*

The findings of the study led to several recommendations for future research and educational leadership. The recommendations resulting from the study findings contributed to the body of knowledge on teacher K-12 teacher professional development. The recommendations were based upon the study results.

*Recommendations for Future Research.* The current study sought to determine the relationship among the six domains of the professional standards in e-learning professional development offered by a provider. The U.S. Department of Education (2005b) suggested the development of standards for e-learning that are synchronous with standards for traditionally delivered courses. It is recommended that future research be conducted to explore the relationships among the six domains of the professional standards in e-learning professional development because the current study provides the foundation for exploring standards-based e-learning professional development for teachers.

The purpose of the present study was to evaluate the training provided in e-learning professional development courses, as perceived by 30 K-12 New York City public schools teachers. The descriptive analysis of the data for the study revealed that participants did not reach consensus on the presence of formative and summative evaluations and timely feedback from the instructor. In the e-learning environment, formative and summative assessments are requisite to the learning cycle (McKenzie, 2005). Future studies should explore *Assessment and Evaluation* and the relationship to the role of the *Instructor/Facilitator*.

Another recommendation for future research is an investigation of the relationship between the *Learning Style* domain and the *Understanding and Implementation* domain. Since a significant high correlation between the *Learning Style* and the *Understanding and Implementation* domains was identified, future research should continue to explore the connection between *Learning Style* and *Understanding and*

*Implementation.*

Participants in the present study disagreed as to the inclusion of collegial interaction and collaboration and further investigation of this domain in e-learning might contribute to the body of knowledge of standards-aligned K-12 teacher e-learning professional development. The study recommends future investigations of the *Interaction and Collaboration* domain in K-12 teacher e-learning professional development and the relationship to the role of the instructor/facilitator.

The final recommendation for future studies is an investigation of causal relationships among the variables, as the present study did not address causal relationships. According to Trochim (2006), while the Pearson *r* indicates there may be a relationship, it may or may not be a causal one. Trochim (2006) stated if a causal relationship exists; a third variable could be the causal one. The present study has not made any assumptions about the correlations being causal. The type of relationship, causal, inverse, or negative, could be the basis for other studies.

*Recommendations for Leadership.* One recommendation for K-12 public school leadership is to change administrative policies to accept and promote e-learning professional development. A second recommendation is that leadership, when considering teacher requests for e-learning professional development, frame e-Learning professional development evaluation in professional standards and make participants aware of the value of e-learning standards when selecting providers. A third recommendation is for K-12 public school leadership to advocate for the adoption of e-learning professional development standards by K-12 teacher professional development providers.

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