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Development of Charter School Teacher Development Inventory

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T*he aim of the present study was to develop and examine the initial psychometrics of an instrument, the Charter School Teacher Development Inventory (CSTDI), designed to measure the professional learning opportunities available in U.S. charter schools. Items on the CSTDI were derived from a review of relevant literature and were intended to gather information on how frequently U.S. charter schools employ traditional professional development methods and the five areas of more effective professional development (content focus, active learning, collaboration, coherence, and duration). The final form of the CSTDI was sent electronically to 6322 charter school administrators and 2428 returned completed surveys. Exploratory factor analysis performed on a randomly assigned half of the sample (n =1214) suggested that the CSTDI was comprised of five factors: traditional, content, coherence, duration, and active learning/collaboration. Confirmatory factor analysis was performed on the second half of the sample and provided additional support for a five factor structure of the CSTDI. Reliability coefficients for each of the five factors were above .90. This study provides promising support for a five-factor instrument that assesses professional development practices in charter schools. While the CSTDI was developed for use with charter school administrators, further research is warranted to determine if it may be relevant for use with teachers and administrators in both traditional public schools and charter schools.*

Keywords *adult education, collaboration, factor analysis, charter schools, survey research, teacher preparation*

Introduction

As students are expected to learn more complex material and new analytical skills in preparation for further education and work in the age of information and globalization, teachers must learn to teach in ways that encourage higher level thinking and performance. A new kind of teaching is needed, conducted by teachers "who understand learning as well as teaching, who can address students' needs as well as the demands of their disciplines, and who can create bridges between students' experiences and curriculum goals" (Darling-Hammond, Wei, et al., 2009, p. 1).

There are many ways to improve the quality and performance of our nation's teachers and many are being examined. States and districts have restructured the staffs at many failing schools (Desimone & Garet, 2016). They are working to get better talent in classrooms by recruiting career changers and new graduates with deep content knowledge and a passion to teach (Bates & Morgan, 2018). They are changing their personnel departments, launching new teaching academies, and working to more carefully choose who will teach and in what schools (Bodil, 2020). However, these efforts, as important as they are, influence only a small portion of teachers and do not adequately provide what is needed. To bolster the educational workforce,

we must do more and better with the teachers currently in our schools. The success of current reform efforts is dependent upon creating opportunities for teachers' continual learning and providing sufficient professional development resources to support these opportunities (Buczynski & Hansen, 2009; Kennedy, 2019). This realization has led policymakers and educators to make high-quality professional development opportunities for teachers a priority.

Although improving professional development practices in traditional U.S. public schools has become a focus for policymakers, educators, and researchers, there has been no call from politicians and the public for improved professional learning opportunities for charter school teachers, and there has been no research on the professional learning opportunities available to charter school teachers. Nevertheless, charter schools are beginning to emphasize the need for improved professional learning opportunities for their teachers (Gawlik, 2015; Ni, 2012). Charter schools, which began in Minnesota in 1991, represent a relatively new but quickly growing segment of k-12 education in the U.S. and are a central tenant to many reform agendas. Charter schools are tuition-free public schools open to students from any zip code. The National Alliance for Public Charter Schools (2021) estimates there to currently be over 7,000 charter schools across 44 states serving over three million students. As are their traditional public school counterparts, charter school leaders are calling for high-quality professional learning experiences for teachers and are placing professional development at the center of efforts to improve the teaching and learning in their schools (Edwards & Hall, 2018).

Before U.S. charter schools can align their teacher learning opportunities with the new benchmarks for effective professional development, details about the current state of teacher learning opportunities in charter schools is needed. To address this problem, a national study was conducted to assess the extent to which professional development opportunities in charter schools are consistent with the new standards of effective professional development. This paper discusses the development and psychometric properties of the survey, The Charter School Teacher Development Inventory (CSTDI), used in that study.

Characteristics of Effective Professional Development

Unfortunately, professional learning as traditionally conceived by school leaders is deeply flawed. For years the only form of professional development available to teachers was staff development or in-service training, usually consisting of workshops, speakers, or short-term courses (Borg, 2018; Webster-Wright, 2009). Researchers have consistently demonstrated the ineffectiveness of conventional one-shot professional development approaches (Hill, 2010; Penuel, et al., 2007), concluding that they have little impact on teacher knowledge, instructional practice, or student achievement (Desimone & Garet, 2016). Desimone (2009) has commented that "it is a wonder that workshops and speakers have been the core of professional development programs for so long despite dozens of studies demonstrating their ineffectiveness" (p. 188).

Motivated by the clear ineffectiveness of conventional professional development methods, researchers have been working to determine the essential characteristics of professional development that are critical to increasing teacher knowledge and skills, and that can boost student achievement. This research has led to considerable agreement that the key characteristics of effective professional development include collaborative work groups, a focus on pedagogical

content knowledge, alignment with school improvement goals, implementation over time, and the use of active methods of teacher learning (Darling-Hammond, Hyler, et al., 2017; Sancar, et al., 2021).

Pedagogical Content Focus

Teachers with high pedagogical content knowledge "anticipate common misconceptions held by students, know how to lead them into different conceptual understandings, help students see and understand relationships between and among ideas and concepts, and encourage students to apply and transfer knowledge" (Stewart, 2014, p. 30). Multiple studies have found strong effects of professional development on teaching practices when focused on developing deep understanding of subject content matter, enhancing teachers' knowledge of how to engage in specific pedagogical skills, and how to teach specific kinds of content to learners (Buczynski & Hansen, 2009; Martin, et al., 2019; Yoon, et al., 2007).

Active Learning

A second core feature of effective professional development concerns the opportunities provided by the professional development activity for teachers to become actively engaged in meaningful discussion, planning, and practice (Bayar, 2014; Meirink & Meijer, 2007; Webster-Wright, 2009). Active learning, as opposed to the passive learning typical with traditional workshops and speakers, can take at least four distinct forms: (a) observation of the instructional practices of master teachers; (b) teachers practicing new approaches under simulated conditions; (c) teachers planning lessons and examining student work with colleagues; and (d) teachers developing presentations and essays on new approaches to teaching and learning. Researchers have found that professional development is most valuable and most effective when it actively engages teachers in learning and provides opportunities for hands-on work that builds their knowledge of academic content and how to teach it to their students (Blank, et al., 2008; Buczynski & Hansen, 2009; Kennedy, 2016).

Duration

There is growing consensus that to make the changes required by reforms, teachers need professional development that extends over time and is interactive with their classroom teaching, allowing for multiple cycles of practice, feedback, and reflection (Birman, et al., 2007; Wei, et al., 2010). Professional development that is of longer duration is more likely to contain the kinds of learning opportunities necessary for teachers to integrate new knowledge into practice (Sancar, et al., 2021; Yoon et al., 2007). For example, longer activities are more likely to provide an opportunity for in-depth discussion of content, student conceptions and misconceptions, and pedagogical strategies. In addition, activities that extend over time are more likely to allow teachers to try out new practices in the classroom and obtain feedback on their teaching. Many studies confirm that intellectual and pedagogical change requires professional development activities to be of significant duration, including both the span of time over which the activity is spread and the number of hours spent in the activity (Sisk-Hilton, 2011; Ungar, 2016; Yoon et al., 2007).

Coherence

A coherent professional development program is defined as one that "is connected to student needs, teacher needs, school goals, the curriculum of the school, and state standards" (McChesney & Aldridge, 2019, p. 841). If teachers perceive a disconnect between what they are urged to do in a professional development activity and what they are required to do according to school curriculum guides, texts, and assessment practices, then the professional development will have little impact. Researchers have found that for significant improvements to occur in teachers' practices and student learning, curriculum, assessment, standards, and professional learning activities must be closely linked to connect what teachers learn in professional development with what they are able to implement in their classrooms and schools (Hill et al., 2013; Johnson, 2007).

Collective Participation

Despite cultural norms of teacher isolation and frustrations associated with early attempts at teacher collaboration, interest is growing in professional development that is designed for groups of teachers from the same school, department, or grade level (Meirink & Meijer, 2007; Kennedy 2019). Research on effective professional development emphasizes the importance of collaborative learning environments in schools. Studies have found that when schools create productive working relationships within academic departments or grade levels, across them, or among teachers school-wide, the benefits can include improved classroom instruction, enhanced student learning, and transformed school cultures (Bayar, 2014; Bodil, 2020; Desimone & Garet, 2016).

Purpose

With a national focus on the necessity of teacher professional learning, and a substantial research base clarifying the key characteristics of effective professional learning programs, one would expect current professional learning opportunities in traditional U.S. public schools to be in line with these standards of effective professional development. However, several studies (Blank et al., 2008; Darling-Hammond, Hyler, et al., 2017; Patton et al., 2016; Yoon et al., 2007) of traditional U.S. public schools have found that traditional professional development practices remain the norm. These studies suggest that the types of job-embedded collaborative learning that is important in promoting instructional improvement and student achievement is not a common feature of professional development in the majority of traditional U.S. public schools. Given the findings showing that professional development in traditional U.S. public schools is typically of short duration, lacks focus on content knowledge, fails to actively engage teacher in activities, is often disconnected from teacher needs, and is rarely collaborative, it is not surprising that less than one third of teachers rate their professional development as useful (Green & Allen, 2015; Ungar, 2016). With the current status of professional learning opportunities in traditional U.S. public schools established, efforts are now turning to understanding why the gap between actual practices and research-based best practices exists and how this gap can be eliminated.

No national attention from politicians or the public has been given to the professional development practices of U.S. charter schools, and virtually no research exists on the learning opportunities available to U.S. charter school teachers. However, charter school leaders and researchers have begun to emphasize the need for greater attention to be given to professional learning in charter schools (Edwards & Hall, 2018; Gawlick, 2015). Roch and Sai (2018) argued that "times have changed and charter schools must acknowledge that workshops, speakers and conferences are not defensible approaches for facilitating the development of teachers" (p. 4), while Edwards and Hall (2018) stated that "for charter schools to prepare students for the 21st century they must devote greater energy to providing ongoing, engaging learning opportunities for their teachers" (p. 5).

For U.S. charter schools to establish professional development practices consistent with research-based principles of effective teacher learning, accurate information about the current status of teacher learning in charter schools must be obtained. A necessary first step in addressing this problem is to develop a survey instrument which can be used to gather information about the professional learning opportunities available in U.S. charter schools. Therefore, the aim of the present study was to develop and examine the initial validation of an instrument, the Charter School Teacher Development Inventory (CSTDI), designed to measure the professional learning opportunities available in U.S. charter schools. More specifically, the purposes of the present study were as follows: (a) to describe the development of the CSTDI, (b) assess psychometric characteristics of scores from the CSTDI, and (c) conduct both exploratory factor analysis (EFA) and confirmatory factor analysis (CFA) to determine the number and composition of factors comprising the CSTDI. Given the theoretical foundation of the CSTDI, three a priori hypotheses were developed:

1. EFA will result in a six factor solution (traditional, content, duration, coherence, collective participation, and active learning) consistent with the theoretical development of the instrument.
2. CFA will result in a model-to-data fit for the six factor solution, and
3. Consistent with the theoretical development of the instrument, EFA and CFA will show small or negative correlations between the traditional professional learning factor and the five effective professional learning factors, and will show moderate positive correlations among the five effective professional learning factors.

Method

Instrument Construction

I developed the CSTDI for use with charter school principals rather than charter school teachers because principals have greater knowledge about all of the professional development opportunities in a school than individual teachers and because targeting principals made it possible to gather information about professional development in a larger number of schools across the country. Survey items were primarily developed from significant themes identified in the review of literature. Messick (1995) emphasized that survey instruments must be designed from and aligned with research findings, stating that "the developer of a survey instrument must

defend the content of the instrument based on the questions of the research and previous trends identified in the literature" (p. 5).

More specifically, the six areas of the literature review (conventional professional development methods and the five principles of effective professional development: content focus, duration, coherence, collective participation, and active learning) served as the foundation for developing the survey items. Initial conventional professional development items included nine questions related to less effective workshops, speakers and short-term courses (Darling-Hammond, Wei, et al., 2009)). The five core characteristics of effective professional development (content focus, duration, coherence, collective participation, and active learning) served as the foundation for other preliminary items (Bodil, 2020; Desimone, 2009; Webster-Wright, 2009). I developed nine questions to collect information about the content focus of professional learning opportunities, 10 to collect information about the active learning emphasis of professional development activities, 10 to collect data about the coherence of professional learning activities, 11 to collect information about the extent to which professional development activities included opportunities for collective participation, and eight questions to collect data about the duration of professional learning activities.

Consistent with content validation procedures specified by Haynes et al. (1995), I established appropriateness of item content in four ways. First, 10 expert educational researchers in the field of teacher professional learning evaluated the preliminary items. All researchers evaluating the preliminary items had published at least three articles on teacher professional learning in peer-reviewed journals. Expert judgment and feedback related to the design and wording of instrument items is an essential part of establishing content validity (Messick, 1995). I sent the preliminary items and the specific objectives of the instrument (to gather information on traditional professional development opportunities and those focused on content, active learning, coherence, collaboration, and duration) to the 10 experts. The experts rated each item for clarity using a 5-point Likert-type format, with response options ranging from 1 (Not at all clear) to 5 (Extremely clear), and provided recommendations for removing items and adding items. Researcher feedback and recommendations on improving clarity resulted in the omission of 17 questions (four from the "active learning" domain; three each from the "coherence," "collective participation," and "content" domains; and two each from the "conventional" and "duration" domains), the addition of two new questions (both to the "active learning" domain), and the revision of eight questions to improve clarity.

The second method of documenting item appropriateness followed revisions made in response to expert researcher comments. Ten charter school educators, all having over 15 years of experience working in charter schools, rated each item for clarity and content and provided suggestions and recommendations for adding and removing items. The feedback from these educators resulted in the revision of six questions to improve clarity, the omission of four questions (two from the "collective participation" domain, and one each from the "conventional" and "duration" domains) and the addition of one question (to "collective participation").

As both a third indication of item appropriateness, and as a method of detecting errors in the survey's form and presentation, I pilot tested the survey with a group of 20 former charter school principals. I conducted pilot testing after revisions resulting from the feedback of both the expert

researchers and charter school educators. I excluded current principals from pilot testing because they were part of the target population for the actual study. I sent these 20 individuals the survey and asked them to provide feedback regarding the length of the survey, the design of the survey, and the clarity of the questions. Fifteen of the former principals provided feedback, resulting in confirmation of appropriate survey length (average completion time under 15 minutes), and modification of three questions to improve clarity.

Finally, I asked the 15 former principals that provided feedback to participate in cognitive interviews to detect unanticipated misinterpretations of the survey questions. Cognitive interviews involve interviewing potential respondents to "learn how specific questions are interpreted so that higher quality data can be gathered and the validity and reliability of surveys can be improved" (Haynes et al., 1995, p. 243). Twelve of the 15 former principals agreed to participate in the cognitive interviews, resulting in modification of four questions to improve clarity.

The Final Version of the Instrument

Section I of the CSTDI consisted of 39 Likert-type questions (See Appendix). I included six questions to collect information about conventional professional development methods (e.g., Items 3 and 6). I included the 33 remaining items to collect information about the five core characteristics of effective professional development with six items focused on content (e.g., Items 1 and 12), eight on active learning (e.g., Items 30 and 37), seven on coherence (e.g., Items 7 and 15), seven on collective participation (e.g., Items 21 and 25), and five on duration (e.g., Items 13 and 36). Respondents answered the questions using a five-point Likert-type scale, consisting of the following: (1) Never, (2) Seldom, (3) Sometimes, (4) Frequently, and (5) Always. No clear agreement has emerged on the optimal number of response categories for reliability and validity, with some researchers arguing for seven categories (Ammentorp, et al, 2007) and others preferring five categories (Neumann, 1992). During the initial test item development, respondents indicated their preference for discriminating among five categories over seven categories. Therefore, the five item scale was most appropriate for this study.

Section II of the survey collected demographic information about the principals and their schools such as type of principal, years of experience as a principal, type of school, size of school, and location of the school. The aim of this section was to collect information that would help the researcher understand connections between the principals and their schools and current opportunities for professional learning in charter schools.

Data Collection Procedures

I sent the CSTDI to over 6,000 charter school principals, 1364 of them being principals of high schools, 1849 principals of middle schools, and 3109 principals of elementary schools. I distributed the surveys electronically using QuestionPro, a commercial electronic survey service. I chose electronic distribution over traditional mail distribution for three reasons. First, studies have found that mail distribution no longer produces significantly higher response rates than electronic distribution (Ammentorp, et al, 2007). Second, the large number of surveys being distributed made electronic distribution more efficient in terms of time and finances. Finally,

charter school leaders provided feedback during survey development revealing a preference for electronic distribution over mail distribution.

In April 2021, I sent a letter via email to each of the charter school principals informing them that a link to a survey about professional development in charter schools would arrive by email the following week. I emailed cover letters, with links to the survey, which stated the objectives of the survey and emphasized that their participation would be anonymous. Because reminders have a powerful influence on response rates (Dixon & Turner, 2007), I sent two waves of reminder emails to the target population. These reminders were sent at one and three week intervals after the initial distribution, a schedule recommended by researchers (Schleyer & Forrest, 2000).

Participants

Participants were 2428 principals who completed and returned surveys, for a 38% response rate. Approximately 41% of the participants were elementary principals (n = 995), 27% of the participants were middle school principals (n = 656), and 32% of the participants were high school principals (n = 777). Importantly, the percentages of the different principal types in the sample population were similar to the percentages of principals in the target population: approximately 39% of the target population was elementary principals (n = 2465), 29 % was middle school principals (n = 1833), and 32% of the target population was high school principals (n = 2024). Approximately 61% (n= 1481) of the participants were male and 39 % (n= 947) were female, and these percentages were similar to those of the target population: approximately 65% of the target population (n= 4109) was male and 35% (n= 2213) was female.

Data Analysis Procedures

Because I based survey items on six characteristics of professional development identified in the research literature, I expected that survey items within each of the six areas would be positively correlated with one another, forming six dimensions or factors. For example, because I designed six items to collect information on traditional professional development practices, results were expected to show that scores on these six items would be strongly, positively correlated with one another. Similarly, I expected that scores on items within each of the five core areas of effective professional development would also be strongly, positively correlated with one another. To ascertain whether survey results would separate into these six areas or factors, I randomly split the data and planned an exploratory factor analysis on one half of the data, and a confirmatory factor analysis on the other half of the data. Exploratory factor analysis is concerned with investigating how many factors emerge among the items on an instrument and "is warranted even when theoretical explanations are present regarding the number of factors given that a priori expectations may in fact be incorrect" (Henson & Roberts, 2006, p. 407). Confirmatory factor analysis is concerned with testing a hypothesis about the specific number of factors making up an instrument "is often used to examine the stability of the factor structure emerging from an exploratory factor analysis" (Henson & Roberts, 2006, p. 295).

Step 1: Exploratory factor analysis.

Prior to conducting the EFA, I examined two indicators with the entire data set to determine whether the data was appropriate for such an analysis. The Kaiser-Meyer-Olkin measure of sampling adequacy was .934 which indicated that data were appropriate for factor analysis, and Bartlett's test of sphericity was significant, $\chi^2(741)= 64378.04$, $p < .001$, indicating that the sample and correlation matrix were suitable for factor analysis. I used exploratory factor analysis procedures was on a randomly assigned half of the data set henceforth referred to as the exploratory sample (n = 1214), to examine the factor structure of the instrument. I selected principal axis factoring as the factor extraction method because it partitions shared variance from error variance avoiding inflated measures of variance accounted for by the factors (Thompson, 2004). I then rotated the factors using the direct oblimin method because I expected several factors to correlate (Costello & Osborne, 2005)

Several criteria guided the determination of the number of factors to be retained, including the K1 rule, examination of the resulting scree plot, parallel analysis, Velicer's minimum average partial (MAP) test, and interpretability of the factor solution (Joliffe & Morgan, 1992; Stevens, 2002; Thompson, 2004). While researchers frequently use both the K1 rule and the scree test, parallel analysis and the MAP test are not as widely known but researchers recommend them when evaluating the number of factors to retain (Henson & Roberts, 2006; Thompson, 2004). Although all four procedures focus on the initial extraction eigenvalues, they do so in different manners. The K1 rule retains all factors with eigenvalues greater than 1.0 and is an acceptable criterion when the sample size exceeds 250 and communality values are above .60 (Henson & Roberts, 2006; Thompson, 2004). The scree test is used to visually examine the plotted eigenvalues for significant changes between adjacent pairs of plotted eigenvalues (Stevens, 2002). In parallel analysis the initial extraction eigenvalues are compared with random data sets that are of the same size as the data under study (O' Connor, 2000). When the eigenvalue for a factor in the random data exceeds the size of the factor in the true data set, only the preceding factors are retained for additional analysis (Kieffer & Reese, 2009; Thompson; 2004). Finally, the MAP test (O' Connor, 2000) uses the variable correlations matrix and, in multiple steps, removes variance associated with the factors until the step that results in the lowest squared partial correlation. At this point, only the preceding factors are retained for additional analysis (Garrido, et al, 2011; O'Connor, 2000).

Once an initial decision is made regarding the number of factors to retain, it is important to examine the factors to determine if they fit the theoretical foundation of the construct, and it is important to review the correlation of items within each factor. Items within a factor are expected to measure the same underlying dimension and should have correlations of .30 or higher with other items comprising the factor (Thompson, 2004).

Step 2: Confirmatory factor analysis.

I used confirmatory factor analysis procedures with the other half of the data set, henceforth referred to as the confirmatory sample (n = 1214), to confirm the models determined in EFA. Confirmatory factor analysis procedures were conducted with AMOS and, as recommended by Johnson and Stevens (2001) and Henson and Roberts (2006), absolute and incremental fit indices provided estimates of model "fit". The chi-square test of exact model fit is an absolute fit statistic, but it is not a good indicator of model fit when the sample size is large (Stevens, 2002).

Further, several researchers (Cheung & Rensvold, 2002; Thompson, 2004) have argued that the change in chi-square test is strongly influenced by large sample sizes. Therefore, considering the relatively large sample size of this study, the results of the chi-square test and change in chi-square test were not considered to be critical in evaluating model fit in this case. Instead, the following fit indices were considered more appropriate for this study: the Comparative Fit Index (CFI) and the Tucker-Lewis Index (TLI), which are less sensitive to sample size than the Chi-square index (Henson & Roberts, 2006), and the root mean square of approximation (RMSEA). The CFI and TLI are classified as incremental fit indices because they assess the amount of improvement in fit by comparing the target model to a more restricted baseline model (Aydin & Uzuntiryaki, 2009). The CFI and TLI range from 0 to 1 with values greater than .90 indicating an adequate model fit (McDonald & Ho, 2002), although values greater than .93 are preferable (Hu & Bentler, 1999). The RMSEA is an example of an absolute fit index, meaning it determines how well an a priori model fits the sample data (McDonald & Ho, 2002). MacCallum and Austin (2000) and Thompson (2004) strongly recommend reporting RMSEA because it is particularly sensitive to model misspecification and is much less sensitive to sample size than the chi-square statistic. With the RMSEA, values of less than .06 indicate a good fit, and values as high as .08 indicate a reasonable fit (Hu & Bentler, 1999).

Step 3: Reliability measures.

For the remaining analyses, the entire sample (n = 2428) was used. The Cronbach alpha coefficient provided a measure of internal consistency of the scores. It is important to note, however, that for an instrument consisting of multiple factors, it is more meaningful to assess internal consistency for each factor (Henson, 2001). Hence, I also calculated Cronbach's alpha for each factor separately. Alpha coefficients range in value from 0 to 1, with higher scores indicating greater reliability. Researchers (Ary, et al., 2002) generally regard reliability coefficients above 0.8 to be acceptable for factors and coefficients above .7 to be acceptable for an entire instrument.

Results

Exploratory Factor Analysis

Table 1 presents the factor pattern coefficients, factor structure coefficients, and communalities from the principal axis extraction and direct oblimin rotation of the exploratory sample. Five factors with eigenvalues greater than 1.0 were extracted, accounting for 68.7% of the variance of the original items. Communalities for the 40 items ranged between .63 and .88 with an average of .73, well above the accepted value of .60. The scree test (Figure 1) also suggested a five factor solution as there were five factors to the left of the major inflexion point. Finally, both the MAP test and parallel analysis further suggested the retention of five factors. All of these results, combined with the theoretical meaningfulness of a five-factor solution, led to the retention of five factors.

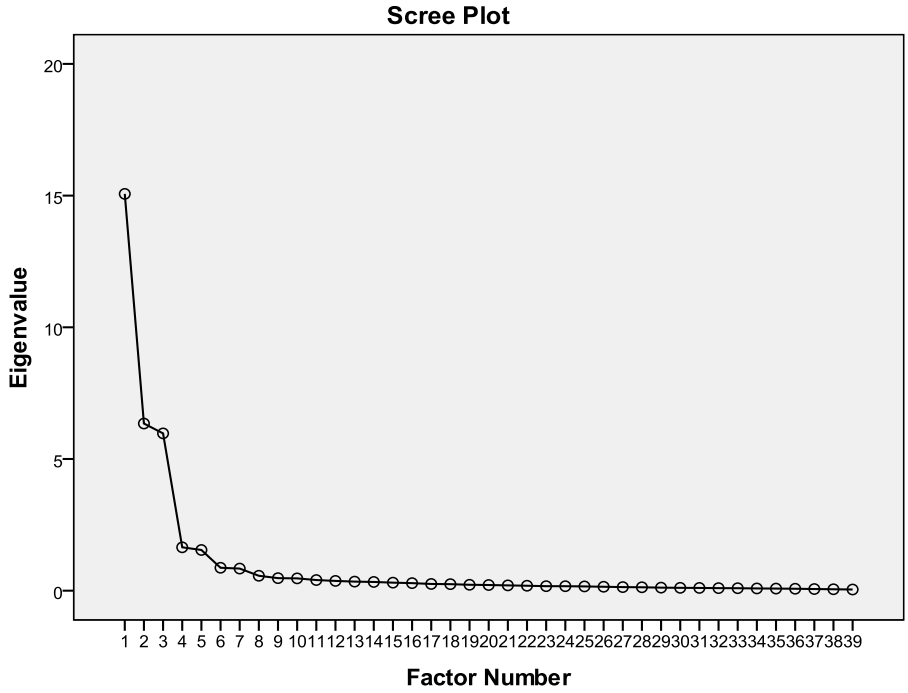

Figure 1. EFA Scree Plot

Factor one consisted of 15 items, each with a pattern coefficient greater than .70, and accounted for 33.62% of the variance. The items comprising this factor consisted of the seven items developed to collect information on the active learning aspect of effective professional development and the eight items developed to collect information on the collective participation aspect of effective professional development. Factor one was therefore named Active Learning/Collaboration. Although the review of literature supported the hypothesized separation of the active learning items and collective participation items, the fact that "activities involving active teacher learning often include teacher collaboration" (Darling-Hammond, Wei et al., 2009, p. 11) makes this result meaningful and consistent with the theoretical foundation of the instrument.

Items comprising factors two through five were consistent with expectations based on the theoretical foundation of the instrument. Factor two consisted of six items focused on professional development activities emphasizing the learning of specific content knowledge and, thus, was named Content. The Content factor accounted for 13.61% of the variance and all pattern coefficients were greater than .79. The third factor consisted of seven items, each with a pattern coefficient greater than .78, and accounted for 12.66% of the variance. This factor contained items examining the coherence of professional development programs and was therefore named Coherence. Factor four consisted of five items focused on traditional professional development activities and was therefore named Traditional. The Traditional factor accounted for 4.60% of the variance and all pattern coefficients were greater than .73. Finally, factor five was named Duration because all six of the items comprising this factor focused on the duration of professional development activities. The Duration factor accounted for 4.17% of the variance and all pattern coefficients were greater than .76.

Table 1
Rotated Factor Pattern and Structure Coefficients for the CSTDI

Item	Factor 1: Active Learning/ Collaboration P (S)	Factor 2: Content Focus P (S)	Factor 3: Coherence P (S)	Factor 4: Traditional P (S)	Factor 5: Duration P (S)	h^2
26. Professional development activities include opportunities to observe and critique other teachers.	**.84** (.87)	.09 (.06)	-.01 (.06)	-.04 (-.26)	.06 (.46)	.76
25. Professional development provides opportunities for teachers to collaboratively examine and discuss student work.	**.83** (.81)	-.06 (-.08)	.04 (.05)	-.09 (-.31)	-.10 (.39)	.67
40. Teachers have opportunities to apply and practice new skills and knowledge during professional development activities.	**.82** (.82)	-.11 (-.12)	.02 (.03)	-.04 (-.30)	-.03 (.43)	.69
22. Professional development activities include peer coaching.	**.82** (.82)	-.02 (.04)	.05 (.07)	.17 (-.13)	.09 (.44)	.70
33. Teachers have opportunities to practice skills gained during professional development with colleagues prior to integrating skills into the classroom.	**.81** (.79)	-.09 (-.07)	-.02 (-.01)	.07 (-.21)	-.02(.38)	.68
39. We provide formal training for teachers on how to effectively collaborate.	**.81** (.75)	-.05 (.04)	.06 (-.01)	.10 (-.09)	-.16 (.23)	.64
21. Soon after returning from offsite professional development teachers formally share their learning with their colleagues.	**.80** (.78)	-.01(-.04)	.03 (.04)	-.13 (-.31)	-.12 (.36)	.63
5. Research based best practices inform our professional development activities.	**.79** (.84)	-.02 (-.06)	-.01 (.07)	-.07 (-.35)	.08 (.51)	.74
17. Teachers plan instruction together.	**.77** (.83)	.10 (-.03)	-.06 (.06)	-.21 (-.43)	.06 (.52)	.79
8. We select/design professional development activities based on an analysis of student needs.	**.76** (.84)	.04 (-.02)	-.05 (.07)	-.03 (-.33)	.19 (.56)	.80
37. We provide structured support for teachers implementing new skills until they become a natural part of their classroom instruction.	**.75** (.80)	-.02 (-.02)	-.09 (-.03)	.15 (-.16)	.19 (.47)	.69
31. Our professional development activities take place on weekdays between 8:00am and 3:00pm.	**.73** (.79)	.11 (.10)	-.05 (.05)	.13 (-.13)	.21 (.48)	.68
2. Teachers participate in setting the goals of the professional development program.	**.72** (.82)	.13 (.02)	-.02 (.13)	-.19 (-.41)	.15 (.56)	.80
24. Beginning teachers have formal opportunities to work with mentor teachers.	**.71** (.81)	.12 (.02)	.01 (.15)	-.13 (-.40)	.18 (.60)	.79

(continued on next page)

Table 1 (continued)

Item	Factor 1: Active Learning/ Collaboration P (S)	Factor 2: Content Focus P (S)	Factor 3: Coherence P (S)	Factor 4: Traditional P (S)	Factor 5: Duration P (S)	h^2
10. Teachers meet by grade level to discuss instruction and student learning.	**.71** (.80)	.04 (-.12)	-.04 (.09)	-.20 (-.46)	.11 (.58)	.78
20. Teachers meet by content area to discuss instruction and student learning.	-.03 (-.02)	**.84** (.81)	-.03 (.10)	-.03 (.33)	.03 (-.17)	.66
29. We design professional development to help teachers integrate technology into their content.	.02 (-.02)	**.83** (.85)	.05 (.14)	-.02 (.37)	-.08 (-.23)	.73
12. Professional development activities focus on specific pedagogical skills.	.02 (.01)	**.82** (.81)	.04 (.15)	-.05 (.31)	-.04 (-.18)	.67
23. Professional development is focused on helping teachers understand how students learn best in specific content areas.	.03 (-.04)	**.81** (.86)	.03 (.11)	.08 (.45)	-.08 (-.27)	.77
32. We design professional development to help teachers learn instructional methods for their specific discipline.	.01 (-.06)	**.80** (.85)	.02 (.10)	.14 (.50)	-.02 (-.28)	.81
1. Professional development is focused on teachers understanding the content of their discipline.	-.03 (-.05)	**.80** (.83)	-.02 (.09)	.09 (.43)	.04 (-.22)	.71
14. Our personnel conduct our professional development activities.	-.05 (-.04)	.03 (.18)	**.86** (.86)	.10 (-.08)	.04 (.28)	.75
7. Professional development activities relate directly to our institutional goals.	.01 (.09)	.06 (.12)	**.86 (**.91)	-.07 (-.28)	.09 (.44)	.85
35. Teacher professional development is part of our school improvement plan.	.09 (.14)	.02 (.08)	**.85** (.88)	-.18 (-.35)	-.07 (.39)	.81
27. Professional development activities are aligned with the school curriculum.	.01 (.03)	-.01 (.13)	**.84** (.83)	.03 (-.15)	-.02 (.29)	.71
9. Professional development activities occur onsite at our school.	.03 (.09)	-.07 (.05)	**.83** (.86)	.02 (-.24)	.07 (.41)	.76
15. Specific teacher needs inform the design of our professional development activities.	-.05 (-.01)	.05 (.16)	**.82** (.85)	-.01 (-.15)	.02 (.30)	.73
38. We involve teachers in designing the activities of our professional development program.	-.02 (.01)	.01 (.13)	**.79** (.82)	.04 (-.14)	.03 (.31)	.68
6. Outside experts conduct our professional development activities.	-.03 (-.33)	.06 (.45)	-.01 (-.21)	**.86** (.91)	-.07 (-.54)	.88
11. Teachers attend conferences as part of the professional development program.	.01 (-.29)	.05 (.41)	-.03 (-.24)	**.80** (.87)	-.10 (-.53)	.79
34. Our school pays outside consultants to present professional development activities to our teachers.	-.06 (-.36)	.05 (.42)	-.02 (-.22)	**.80** (.86)	-.11 (-.57)	.83

(continued on next page)

Table 1 (continued)

Item	Factor 1: Active Learning/ Collaboration P (S)	Factor 2: Content Focus P (S)	Factor 3: Coherence P (S)	Factor 4: Traditional P (S)	Factor 5: Duration P (S)	h^2
3. Teachers participate in workshops as part of our professional development program.	.02 (-.22)	.09 (.43)	-.08 (-.24)	**.79** (.84)	-.01 (-.46)	.74
18. Teachers take courses as part of the professional development program.	-.07 (-.35)	.15 (.51)	.03 (-.16)	**.74** (.85)	-.12 (-.56)	.83
36. Over the course of the school year teachers are engaged in planned professional learning activities for more than 40 hours.	.03 (.48)	-.02 (-.22)	.05 (.38)	-.06 (-.52)	**.85** (.89)	.84
28. Time is scheduled each week for teachers to discuss what they learn from professional development activities with colleagues.	.02 (.44)	-.09 (-.25)	.07 (.37)	.05 (-.45)	**.84** (.88)	.78
19. Professional development activities occur every week.	.02 (.48)	.01 (-.23)	.06 (.41)	-.13 (-.58)	**.82** (.88)	.89
13. Teachers spend more than one hour each week engaged in professional development activities.	.05 (.48)	-.03 (-.24)	.04 (.35)	-.06 (-.52)	**.82** (.87)	.82
16. Teacher study groups meet each week as part of our professional development activities.	.06 (.47)	-.05 (-.25)	.06 (.37)	-.06 (-.50)	**.78 (**.84)	.76
4. Professional development activities are built into the regular work day of teachers.	.07 (.50)	-.07 (-.29)	.09 (.40)	-.13 (-.60)	**.77** (.86)	.88
Eigenvalues	12.04	6.09	5.72	1.67	1.54	
% of variance after rotation	33.62	13.61	12.66	4.60	4.17	
α	.95	.93	.94	.95	.93	

Note: P = pattern coefficients; S = structure coefficients; h^2= communalities; Pattern coefficients greater than .40 are in bold; these are used for interpretation of the factors. Percentage variance is post rotation. The eigenvalue for the sixth, unretained factor was .87.

When theoretically-based expectations of correlations between factors inform using oblique rotations, it is important to report both pattern and structure coefficients (Henson & Roberts, 2006). While the pattern coefficients are used for the interpretations of the factors, the structure coefficients provide an important indication of the correlations between factors. Large structure coefficients were obtained for more than one factor on many items, a result consistent with moderate to high correlations between some factors (Fletcher & Nusbaum, 2010). Seven bivariate correlations were found between factors and all were statistically significant at the $p < .01$ level (Table 2): r = .51 (the active learning/collaboration factor and duration factor), r = .43 (the content factor and traditional factor), r = .37 (the coherence factor and duration factor), r = -.52 (the traditional factor and duration factor), r = -.29 (the active learning/collaboration factor and traditional factor), r = -.23 (the content factor and duration factor), and r = -.21 (the coherence factor and traditional factor).

Confirmatory Factor Analysis

I used confirmatory factor analysis procedures with the confirmatory sample to test the five factor model revealed in the EFA. Following the recommendations of Thompson (2004), four competing models were tested. Each of the four models hypothesized a priori that (a) responses to the CSTDI could be explained by the five factors labeled "traditional", "content", "coherence", "duration" and "active learning"; (b) each item would have a moderate to high

Table 2
Bivariate Correlations between Factors

	Factor 1: Active Learning/ Collaboration	Factor 2: Content Focus	Factor 3: Coherence	Factor 4: Traditional	Factor 5: Duration
Factor 1: Active Learning/ Collaboration	1.00	-.08*	.04**	-.29**	.51**
Factor 2: Content Focus		1.00	.15*	.43**	-.23**
Factor 3: Coherence			1.00	-.21**	.37**
Factor 4: Traditional				1.00	-.52**
Factor 5: Duration					1.00

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

loading on one factor and low loadings on all other factors; and (c) the error-uniqueness terms associated with the item measurements were uncorrelated. The four models differed in their predictions of the correlations between the five factors, with Model 1 being most closely connected to the correlations between factors revealed in the EFA, and being most consistent with the theoretical foundation of the CSTDI. Model 1, based on all correlations above .20 between factors in the EFA, hypothesized that (a) the "traditional factor would be correlated with all other factors; (b) the "duration" factor would correlated with all other factors; (c) the "coherence" factor would be correlated with the "duration" factor and the "tradition" factor; (d) the "content" factor would be correlated with the "traditional" factor and "duration" factor; and (e) the "active learning" factor would be correlated with the "traditional" factor and the "duration " factor. Correlations between factors were excluded from Model 1 if their coefficients indicated no relationship, (r = -.08 for the content factor and active learning/collaboration factor, r = .04 for the coherence factor and active learning/collaboration factor) or a very small relationship (r = .13 for the coherence factor and content factor).

Models 2-4 served as comparison models and each contained elements inconsistent with the theoretical foundation of the instrument and inconsistent with correlations between factors revealed in the EFA. Model 2, based on all correlations above .35 between factors in the EFA, hypothesized that (a) the "traditional" factor would be correlated with the "content" factor" and the "duration" factor (b) the "duration" factor would be correlated with "tradition" factor, the "coherence" factor, and the "active learning" factor; (c) the "coherence" factor would be

correlated with the "duration" factor; (d) the "content" factor would be correlated with the "traditional" factor; and (e) the "active learning" factor would be correlated with the "duration" factor. Model 3, based on all correlations above .50 between factors in the EFA, hypothesized that (a) the "traditional" factor would be correlated with the "duration" factor and (b) that the "active learning factor would be correlated with the "duration" factor. Model 4 hypothesized that no correlations exist between the five factors.

Fit indices for the four models are presented in Table 3. Chi-square values for Model 1 (χ^2 = 5484.78, *df* = 695, $p < .001$), Model 2 (χ^2= 4731.18, *df* = 697, $p < .001$), Model 3 (χ^2= 3417.96, *df* = 699, $p < .001$), and Model 4 (χ^2 = 2780.04, *df* = 701, $p < .001$) were statistically significant, indicating that none of the four models fit the data exactly. However, with large samples this is common with the Chi-square statistic and is why additional indices are used here.

Results of the other three fit indices indicated that Model 4 was a poor fit with the data: CFI =.678, TLI = .661, and RMSEA = .142. Results indicated an improved fit for Model 3, but the values were still far removed from the range of acceptable fit values: CFI = .812, TLI = .794, RMSEA = .119. The values for Model 2 approached the range of acceptable fit (CFI = .912, TLI = .903, RMSEA = .091), but the indices for Model 1 were universally superior with all three fit

Table 3
Fit Statistics for Confirmatory Factor Analyses of the CSTDI (n=1214)

	Model 1	Model 2	Model 3	Model 4
χ^2	5484.78**	4731.18**	3417.96**	2780.04**
df	695	697	699	702
CFI	.953	.912	.812	.678
TLI	.945	.903	.794	.661
RMSEA	.057	.094	.119	.142
RMSEA 90% CI lower	.060	.091	.116	.138
RMSEA 90% CI upper	.065	.098	.122	.145

Note: CSTDI = Charter School Teacher Development Inventory; CFI= Comparative Fit Index; TLI= Tucker-Lewis Index; RMSEA= root mean square of approximation; CI= confidence interval. **p < .001.

indices reaching the rigorous criteria set by Hu and Bentler (1999) for an excellent fit with the data: CFI = .953, TLI = .945, RMSEA = .057. Taken together, the results of the confirmatory factor analysis provided additional support for the five factor structure of the CSTDI scores established in the EFA. Furthermore, it provided support for the between-factor correlations found in the EFA and specified in Model 1 of the CFA. Model 1 is presented in Figure 2 below.

Internal Consistency Reliability and Scale Properties

Alpha reliability coefficients provided measures of internal consistency. The alpha coefficient for scores for the entire instrument was .92, which is high (Henson & Roberts, 2006), and alpha coefficients for the five factors were also high, ranging from .93 to .95. All corrected item-to-total correlations for the items on the five factors were positive and in excess of .75, indicating that all items contributed to the consistency of scores (Henson & Roberts, 2006). I formed scale scores by averaging the items belonging to each factor. Table 4 presents the alpha coefficients for the five factors, as well as the means and standard deviations for the five scales.

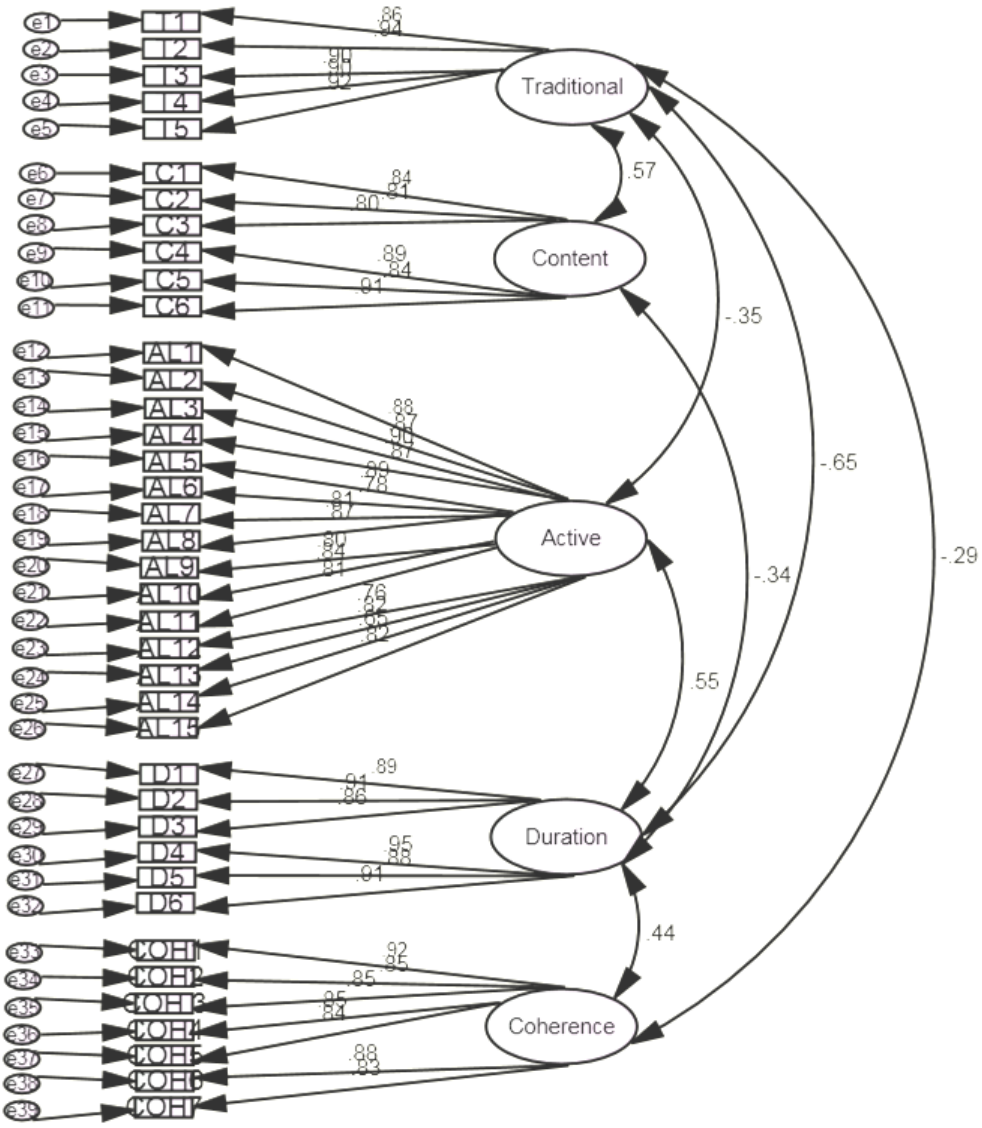

Figure 2. Path coefficients and correlations between factors for Model 1

Table 4
Factor Reliabilities and Scale Properties

Factor	Number of Items	α	M	SD
Factor 1: Active Learning/ Collaboration	15	.95	2.17	.76
Factor 2: Content Focus	6	.93	3.47	.71
Factor 3: Coherence	7	.94	2.92	.82
Factor 4: Traditional	5	.95	4.50	.68
Factor 5: Duration	6	.93	1.42	.81

Discussion

The purpose of the present study was to develop and examine the initial validation of an instrument, the Charter School Teacher Development Inventory (CSTDI), designed to measure the professional learning opportunities available in U.S. charter schools. After a thorough literature search, content examination by experts, a pilot study with experts, and cognitive interviews with experts, I sent the final form of the CSTDI electronically to 6332 charter school principals and 2428 (38%) completed the survey.

This study provides promising support for a five-factor instrument that assesses professional development practices in charter schools. Exploratory factor analysis on a randomly split half of the data revealed five factors, corresponding to traditional professional development practices and four types of effective professional development practices (content, duration, active learning/ collaboration, and coherence). Confirmatory factor analysis on the second half of the data supported a five-factor model. This section will explain these findings, suggest directions for future research, and discuss potential implications of these findings for charter school practitioners.

Because the research literature informed the CSTDI item development for the six characteristics of professional development, the original hypothesis predicted that exploratory factor analysis would reveal six factors (one corresponding to traditional professional development and five corresponding to different aspects of effective professional development). However, exploratory factor analysis results revealed that the CSTDI comprised five factors: traditional, content, duration, coherence, and active learning/collaboration. Statistical support for the five factor model was strong with all four criteria (K1 rule, scree plot, parallel analysis, and MAP test) supporting a five factor solution. Further, analyses of items comprising each of the five CSTDI factors revealed high pattern coefficients and little cross-loading, suggesting that each factor assessed unique variance attributed to a professional development subtype. In addition, all of the fit indices used in the confirmatory factor analysis supported the five-factor model and specific between-factor correlations identified in the exploratory factor analysis. Finally, internal consistency measures for the entire instrument and each of the five factors were excellent.

While results generally were consistent with the theoretical foundation of the CSTDI, there were several unexpected results. First, it was expected that the active learning items and collective participation items would form separate factors. However, the fact that active teacher learning often includes teacher collaboration makes this result understandable and consistent with the theoretical underpinnings of the instrument. Additional surprising results were found regarding the pattern of correlations among the five factors. It had been predicted that the factors related to effective professional development would be moderately positively correlated with one another but would be negatively correlated, or not correlated, with the factor corresponding to traditional professional development. Findings revealed, though, that while the traditional factor was negatively correlated with the duration, coherence, and active learning/collaboration factors, it was moderately positively correlated with the content factor ($r = .43$). This result may be due to the fact that traditional forms of professional development (workshops, speakers, conferences, and courses) have typically emphasized content over coherence, duration, active learning, and collaboration. In addition, it was found that the active learning/collaboration factor was not

correlated with the coherence factor (r = .04). One possible explanation is the "fragmentation of effective professional development practices" (Zepeda, 2008, p. 123), meaning that even when schools are using professional learning activities which involve active learning and teacher collaboration they may not be connecting them to student needs, teacher needs, or school goals. Finally, the content factor was not correlated with the active learning/collaboration factor (r = -.08), was not correlated with the coherence factor (r = .13), and had a negative correlation (r = -.23) with the duration factor. This is likely due to the fact that traditional forms of professional development have emphasized content while neglecting active learning/collaboration, coherence, and duration.

The CSTDI developed in this study may enable researchers and practitioners to not only assess the current status of professional learning opportunities in charter schools, but also determine the extent to which the gap between current practices and research-based best practices of effective professional development is closed in future years. Ultimately, the CSTDI developed in this study may not only be a useful tool in informing charter school leaders as they work to move towards the standards established for effective professional development, but also help improve teacher instruction and student outcomes.

Because any initial survey construction and validation is contingent on the sample from which the data are derived and the sample here was purposely restricted to charter schools, data obtained from traditional public schools across multiple environments are clearly necessary to provide further empirical support for the validity of the CSTDI, as well as the generalization of the current findings beyond charter schools. Further, previous efforts to measure professional development practices in schools have typically gathered data from teachers, rather than administrators. While the CSTDI was developed for use with school administrators, it may be relevant for use with teachers and data obtained from teachers in both charter and traditional public schools is needed to validate the CSTDI with this population and provide additional support for the current findings. In sum, more research on the CSTDI is warranted, given the promising results of the present study. Scores on the CSTDI were internally consistent and results supported the theoretical rationale undergirding the instrument. Much has been accomplished, yet much remains to fully make use of the potential of the CSTDI.

Author Notes

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Appendix
The Charter School Teacher Development Inventory

Charter School Teacher Development Inventory

Directions: Thank you for taking the time to complete this survey. The purpose of this survey is to obtain information about the teacher development practices of charter schools. The information you provide will be combined with the information provided by others in statistical reports. No personal or school-identifiable data will be included in the reports. It is best to complete this survey alone with no interruptions. Completing this survey will take about 10 minutes.

I. Please mark the responses that most accurately reflect your experiences at your school during the past school year.

Choose ONE for Each Question	***Never (1)***	***Seldom (2)***	***Sometimes (3)***	***Frequently (4)***	***Always (5)***
1. Professional development is focused on helping teachers better understand the content of their academic discipline.					
2. Teachers participate in setting the goals of the professional development program.					
3. Teachers participate in workshops as part of the professional development program.					
4. Professional development activities are built into the regular work day of teachers.					
5. Research-based best practices inform the professional development activities in our school.					
6. Outside experts conduct our professional development activities					
7. Professional development activities relate directly to our institutional goals.					
8. We select/design professional development activities based on an analysis of our students' needs.					
9. Professional development activities occur on-site at our school.					
10. Teachers meet by grade-level to discuss instruction and student learning.					
11. Teachers attend conferences as part of the professional development program.					
12. Professional development activities focus on specific pedagogical skills.					

Choose ONE for Each Question	***Never (1)***	***Seldom (2)***	***Sometimes (3)***	***Frequently (4)***	***Always (5)***
13. Teachers spend more than one hour each week engaged in professional development					
14. Our school personnel conduct our professional development activities.					
15. Specific teacher needs inform the selection/design of our professional development activities.					
16. Teacher study groups meet each week as part of our professional development activities.					
17. Teachers plan instruction together.					
18. Teachers take university courses as part of the professional development program.					
19. Professional development activities occur each week.					
20. Teachers meet by content area to discuss instruction and student learning.					
21. Soon after returning from off-site professional development experiences, teachers formally share their learning with their colleagues.					
22. Professional development activities include peer coaching.					
23. Professional development activities focus on helping teachers understand how students learn best in specific content areas.					
24. Beginning teachers have formal opportunities to work with mentor teachers.					
25. Professional development activities include opportunities for teachers to collaboratively examine and discuss student work.					
26. Professional development activities include opportunities for teachers to observe and critique each other.					
27. Professional development activities are aligned with the curriculum.					
28. Time is scheduled each week for teachers to discuss what they learn from professional development activities with other teachers					

29. We select/design professional development activities related to teachers integrating technology into their specific content areas					
30. Teachers have opportunities to apply and practice new skills and knowledge during professional development activities.					
31. Our professional development activities take place on weekdays between 8:00am and 3:00pm					
32. We design/select professional development activities to help teachers learn instructional methods for their specific academic discipline.					
33. Teachers have opportunities to practice skills gained during professional development with colleagues prior to integrating into classroom instruction.					
34. Our school pays outside consultants to present professional development activities to our teachers.					
35. Teacher professional development is part of our school improvement plan					
36. Over the course of the school year teachers are engaged in planned professional learning activities for more than 40 hours					
37. We provide structured support for teachers implementing new skills until they become a natural part of their classroom instruction					
38. We involve our teachers in selecting/ designing the specific activities of our professional development program.					
39. We provide formal training for our teachers on how to effectively collaborate with each other.					

II. Please mark the responses that best fit the characteristics of you and your school at the beginning of this academic year.

	Elementary	**Middle**	**High**
1. In which type of school are you a principal?			

	0-3 Years	**4-7 years**	**8-11 Years**	**12 or More Years**
2. How long have you been a principal?				

	Name of the State
3. In what state is your school located?	

	Under 100	**100-199**	**200-299**	**300-400**	**Over 400**
4. Which best describes the number of students in your division?					

Thank you very much for taking the time to complete this survey. A summary of the results will be sent to all participants.