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The Relationship Between Middle Level Grade Span Configuration, Professional Development, and Student Achievement

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Abstract

One goal of professional development is to improve student achievement through improved teacher practice. The middle school philosophy, which supports the rationale that student learning is inextricably interwoven into the fabric of an active learning environment, contains many promising practices that "mirror" what is often considered to be high quality professional development. However, researchers' efforts to identify and measure this relationship have proven difficult at best. In this study, levels of professional development as components of various school reform initiatives are identified, and their relationships to student learning are measured across various grade configurations, specifically, K-8, 6-8, and 7-12.

This study found a significant percent of 6-8 middle level schools to be more highly engaged in professional development activities than their K-8 and 7-12 counterparts. However, when taken together, professional development and grade configuration were not found to have a direct relationship to student achievement. Some variance in state assessment scores, albeit not statistically significant, was found to be marginally related to grade configuration, indicating the need for further study. This finding, coupled with other analyses of the data, suggest that relationships among professional development, grade configuration, and student achievement may exist but cannot be fully explained until researchers are able to identify and account for other variables that may be related to the unexplained variance. Until empirical evidence is produced, policymakers are encouraged to continue discussions regarding the most appropriate means of addressing young adolescents' academic needs regardless of other factors.

Background

The ultimate goal of much professional development is to improve student achievement by improving teacher practice. Therefore, it is critical that researchers study the effectiveness of professional development by measuring its implied, indirect, and direct impact on student learning. For years researchers have struggled with numerous methodological barricades to determining the direct impact professional development has on student outcomes. "Although it is generally assumed that there is a strong and direct relationship between staff development and the improvement in student learning, efforts to clarify that relationship have met with little success" (Guskey & Sparks, 1996, p. 1). However, some reports from the National Staff Development Council have claimed that evidence does exist to suggest a relationship between teacher professional development and student achievement (Sparks, 2001). In addition, clear goals should be established within a school system to guide professional development utilizing student data to inform decisions. According to many who have studied teacher professional development, little impact on student outcomes has been documented. This has led

some, Mizell (2001), for example, to recommend the development and implementation of professional development standards believed to influence the quality of staff development. While professional development can occur independently, it is important that common ground be met. Such common ground can provide a basis for addressing student achievement.

During a recent "study of studies" examining the existing body of middle school research conducted between 1991 and 2002, Hough and colleagues noted that key questions pertaining to the impact of middle level education on student outcomes, especially those focused on professional development and student achievement, have yet to be addressed. In addition, Hough (2003) noted that less than 4% of all research on middle level student achievement utilizes experimental or quasi-experimental designs. Seldom do educational researchers design scientifically randomized studies that include controls.

To examine more carefully the impact of middle school teacher professional development on student achievement, researchers should design experimental or quasi-experimental studies. Also, Hough (2003) advocates for matched pairs designs in which researchers compare middle level schools highly engaged in professional development to those not highly engaged. In so doing, differences in teacher beliefs and practices and their impact on student achievement should also be examined to address this important, yet methodologically problematic, issue.

Related Literature

Traditionally, professional development has consisted of so-called "one shot" workshops, seminars, or conferences. Research has found that successful implementation of concepts learned during these types of workshops is rare. A growing body of research in the area of professional development evaluation supports the contention that conventional workshops are not the most effective, efficient way to improve teaching and learning (Corcoran, 1995). Too often, little is taken into account regarding how professional development will fit into the current program or how it will continue (Sparks & Hirsh, 1997). Over the last decade, however, increasing concern has developed regarding the effect, if any, these types of professional development activities actually have on teaching and learning in classrooms, schools, and districts (Darling-Hammond, 1998a; Guskey, 1999; Guskey & Sparks, 1996). Evidence has shown that professional development can result in changes in teacher practice if the professional development activities are sustained over a period of time (Abdal-Haqq, 1996; Darling-Hammond, 1998). Common, successful procedural characteristics are found in schools that have high levels of involvement in professional development. The key to successful professional development programs appears to lie in an organizational system that provides ongoing, site-based, job-embedded, systemic, focused efforts to effect system-wide change, derived from client needs (Hirsh, 2000).

Growing opinion among some scholars suggests that, when implemented properly, professional development can benefit student learning. According to Darling-Hammond and McLaughlin (1995), successful professional development strategies are: experiential, grounded in participants' questions, collaborative among educators, connected to and derived from work with students, sustained and intensive, and linked to other school aspects. The effectiveness of professional development is measured by its implied impact on student learning. According to some educators, "most recognize that effectiveness in teaching is not defined by what they do as teachers but by what their students are able to do" (Guskey, 2001, p. 3). Unfortunately, there are numerous methodological barricades to determining the direct impact professional development has on student achievement.

In their book, *A New Vision for Staff Development*, Sparks and Hirsh (1997), discuss their contention that student learning cannot be linked exclusively to professional development. Other factors, such as school leadership, the application of academic standards, and the quality of curriculum all play a role in student achievement. As a result, the National Staff Development Council (NSDC) created professional development standards to provide a benchmark for program comparison and improvement (Sparks , 2001). According to the NSCD, high-quality professional development programs are essential to creating schools in which all students and staff members are learners who continually improve their performance. Clear objectives should be formu-

lated within a school system to guide professional development, utilizing student data to inform decisions. Professional development can occur independently; however, it is important that common ground be met. This common ground can provide a basis for successful goal achievement. It is important that objectives be clearly defined, have a school-wide focus, are limited in number, and are achievable (Sparks , 1999). A set plan should relate current practices and establish ongoing procedures that lead to improvements in student achievement. Continuous evaluation at various levels and intervals should also be considered when setting goals and procedures. Evaluating activities can provide important information to assist in making educated decisions regarding professional development processes and effects (Guskey, 1999).

School-based reform initiatives and staff involvement in professional development do not always guarantee that student learning will increase, however. While many experts believe professional development should focus on collaborative, active learning processes, noticeable increases in student learning are often found when students engage in integrated, creative problem solving processes. These aspects of learning are the same techniques teachers utilize to inspire their students to learn, engaging various types of learners. This type of active learning by teachers can "redefine their work in relation to the way the entire school works" (Lieberman, 1995). Individual teachers are afforded the opportunity to learn from fellow teachers in the same school, which encourages "constant learning" toward a larger goal (Lieberman, 1995). This type of "constant learning" can be fostered in various ways. Some schools develop teams to assess the degree to which professional development is meeting the needs of teachers and to discuss proposed changes. This also provides team members with the opportunity to discuss the impact this type of professional development has on addressing student needs and exchanging ideas, while building a sense of camaraderie within their school (Richardson, 2000).

Some scholars believe the team approach to whole-school reform undergirds many recommended middle school practices aimed a creating an environment supportive of the middle school philosophy and includes:

> curriculum that is challenging, integrative, and exploratory; assessment and evaluation that promote learning; varied teaching and learning approaches; flexible organizational structures; adult advocacy for every child; shared vision; high expectations for all; positive school climate; educators committed to young adolescents; programs and policies that foster health, wellness, and safety; family and community partnerships; and courageous leadership. (NMSA, 2003)

In recent years, there has been a growing appreciation for the role professional development plays and the potential impact it may have on overall school success. However, teachers, researchers, and policymakers tend to indicate that the greatest challenge to implementing effective professional development is "lack of time" (Abdal-Haqq, 1996). Cook (1997) also points out that, although time has emerged as the key issue in the analysis of school change, the challenge is not to find additional time within the school day; rather, a more efficient use of available time may be the key. Although many policymakers see professional development as inherently good, "more" doesn't necessarily equate with "better." Quality professional development should be implemented wisely, efficiently, and effectively (Guskey, 1999). Loucks-Horsley (1998) notes that the critical element to the success of change or reform efforts in schools relies on the people involved, the processes utilized, and the policies established. "Unlike most professional development strategies with their 'one size fits all' orientation, networks, coalitions, and partnerships provide opportunities to commit themselves to topics of intrinsic interest of that develop out of their work" (Lieberman, 1995, p.9).

To achieve high levels of student achievement, teachers must first be skillful and knowledgeable in their methods and schools must make the commitment to continuously support teachers' ongoing learning (Darling-Hammond, 1998b). Continued research and the gathering of additional evidence that links professional development and student achievement is needed. Perhaps equally important is evidence that reflects the impact professional development has on the practice of teaching and how such changes in teaching methods affect student learning.

Therefore, the promising practices consistent with middle school philosophy and the types of professional

development designed to help them become fully implemented are in need of careful study to determine their impact on teaching and learning. Middle level schools highly engaged in professional development and those not highly engaged can serve as starting places to study the extent to which such efforts do, in fact, impact student achievement.

Methods

Sample

The sample includes schools examined during a three-year longitudinal study of professional development (PD) centers in a Midwestern state. Descriptive data were used to examine the extent to which the PD centers were being accessed by teachers throughout the state, as well as to determine which characteristics could be used to identify "high" and "low" professional development sites as well as the relationship of these characteristics to teacher practice and student outcomes.

Researchers employed a quasi-experimental design using a split-half mean to categorize schools as either highly engaged professional development sites (high PD) or minimally engaged professional development sites (low PD). Of the 43 schools included in the sample used for this study, 22 schools were categorized as high PD sites, and 21 were categorized as low PD sites.

To achieve this sample, survey instruments were first mailed to principals at each of 500 schools within the state that contained a seventh grade; 255 principals returned useable questionnaires that were subsequently classified by the researchers as "elementary" (Pre K-6) and "secondary" (7-12) and rank ordered from highest to lowest based on the overall mean scores of questions concerning each school's level of involvement in professional development. One hundred schools with the highest grand means and 100 schools with the lowest grand means were labeled high PD and low PD professional development sites, respectively, and used for further analyses. Questionnaires were then mailed to teachers included in this sample. The final, usable sample (n=128) included only those schools from which a 40% or higher return rate from teachers was achieved. This produced 65 high PD (33 elementary and 32 secondary) and 63 low PD (30 elementary and 33 secondary) sites. From these original 128 sites, 43 middle level schools were identified, categorized, and examined (again, 22 high PD middle level school sites, 21 low PD middle level school sites).

Participants, Instrumentation, and Data Analyses

Participants included 292 middle level educators from 43 middle level school sites. Program evaluation data included teacher-level and school-level information from each of these middle level schools representing three common grade configurations: 6-8 (n=27), K-8 (n=8) and 7-12 (n=8).

The survey instrument included one set of nine questions pertaining to "Teacher-Related PD." This scale was found to be reliable, yielding a Cronbach alpha r=.93. The survey also included a second set of nine questions named, "School-Related PD." This second set of questions was also determined to be reliable, yielding a Cronbach alpha r=.96.

In addition, the state's school level demographic data were downloaded from the state department of education's website. These data include: student achievement scores, school demographics, and a measure of school "climate" based on parent, student, and teacher responses to their self study questionnaire. All data were entered into SPSS PC+ for analyses.

Data analysis included an examination of group differences with regard to teacher perceptions of their involvement in professional development activities. In addition, school level data were examined to determine if differences exist in student outcomes as a result of teachers' participation in professional development. Analysis of variance, factor analytic techniques, and regression were utilized to examine data addressing the research questions.

Findings

Of the 22 high PD middle level schools, a significant proportion (82%) were found to have a grade configuration containing grades 6-8. The remaining high PD middle level sites consisted of one 7-12 grade configuration school and three K-8 grade configuration schools. Of the 21 low PD middle level sties, 5 (24%) were K-8 schools, 9 (43%) were 6-8 schools and 7 (33%) were 7-12 schools.

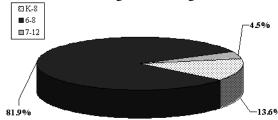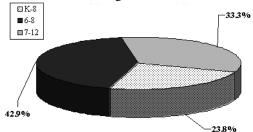**FIGURE A.** Grade configuration for middle level sites categorized as high PD schools

FIGURE B. Grade configuration for middle level sites categorized as low PD schools

Student Achievement
State assessment data were collected for the 2000-2001 and 2001-2002 academic school years. These data were used for comparisons within the same years across school grade configurations and levels of professional development.

Differences between high PD middle level sites and low PD middle level sites across the three different grade configurations were examined utilizing Analysis of Variance techniques. On average, high PD middle level sites scored consistently higher on the state's communication arts and mathematics assessments for both the 2000-2001 and 2001-2002 academic years. Table 1 displays these data and can be summarized as follows:

- Data indicate that, on average, a higher percentage of students (33.63%) attending high PD sites scored at the "Proficient" and "Advanced" levels on the 2001 communication arts tests than did students attending sites designated as low PD sites (30.83%). These differences were not found to be statistically significant [$F(1,41)$=.651; p=.424] and there was a small effect size estimate (d=.2459). However, during the 2002 school year the percent of students in high PD sites scoring at the "Proficient" and "Advanced" levels is about the same (29.57%) as students attending low PD sites (29.51%).
- On average, high PD sites were found to have a higher percentage of students (13.51%) scoring at these two upper levels on the 2001 mathematic tests compared to 11.57% of students attending low PD sites. This trend was also found when examining scores for the 2002 academic year, with the percent of students scoring at these same levels in high PD sites (12.48%) higher than the percent of students in low PD sites (10.32%). While these differences exist, neither was found to be statistically significant [2001: $F(1, 41)$=0.375; p=.544; 2002: $F(1, 41)$=1.009; p=.322] and only a moderate effect size estimate was found for the 2002 mathematics scores (d=.31626).

TABLE 1. Comparisons of average percent of students scoring "proficient" and "advanced" on the state communication arts and mathematics assessments for the 2001 and 2002 academic years by high/low involvement in professional development. (n=43 schools)

	Assessment Year	State Assessment Program Scores					
		Grade 7 Communication Arts	S.D.	(Minimum) (Maximum)	Grade 8 Mathematics	S.D.	(Minimum) (Maximum)
High PD Sites	2001	33.63%	10.88%	(13.20%) (51.70%)	13.51%	12.04%	(0.00%) (50.00%)
High PD Sites	2002	29.57%	12.15%	(10.20%) (50.70%)	12.48%	6.46%	(3.60%) (27.30%)
Low PD Sites	2001	30.83%	11.83%	(5.90%) (51.10%)	11.57%	7.46%	(0.00%) (25.40%)
Low PD Sites	2002	29.51%	13.42%	(5.90%) (66.00%)	10.32%	7.13%	(0.00%) (28.20%)

When data were disaggregated according to grade configuration, differences were noted but, again, none were found to be statistically significant. However, a linear regression model was also used to examine the variance in state assessment scores for the communication arts and mathematics scores based on grade configuration across both high PD and low PD middle level schools. While no significant relationships between professional development and student achievement were found for communication arts, a model producing a statistically significant relationship was found for mathematics scores. Table 2 displays the model's summary data for the latter. This regression model examining grade configuration accounts for 12.3% of the variance (R^2=.123), producing an omnibus $F(1,38)$=(p=.027).

TABLE 2. Linear Regression model examining grade configuration and the variance in student achievement scores in mathematics for the 2002 academic year.

		Sum of Squares	df	Mean Square	F	Sig.
Model	Regression	221.370	1	221.370	5.5315	.027
	Residual	1582.629	38	41.648		
	Total	1803.999	39	41.648		

a Predictors: (Constant), K-8 to all

e Dependent Variable: Math Assessment, Proficient and Advanced 2002

Variables	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
(Constant=K-8)	16.1000	2.282		7.056	.000
K-8 vs. 6-8 & 7-12 configurations	-5.881	2.551	-.350	-2.305	.027

a Dependent Variable: Math Assessment, Proficient, and Advanced

Grade configuration appears to explain some variance in math scores within this sample. However, other predictors may very well exist, but due to the small sample size these variables could not be examined in a robust way through regression techniques.

Administrator Questionnaire

Data from the administrator questionnaires for all 43 middle level schools indicate that the number of students per school ranged from 85 to 1,151, with an average of 404 students per site (SD = 251.84). Schools contained approximately 35 teachers per site, with the number of teachers ranging from 12 to 89. Twenty-three

percent of middle level school administrators surveyed reported their teachers were actively engaged in professional development. On average, administrators noted 64.71% of teachers actively engaged in PD. Eighteen percent of the middle level school administrator respondents indicated their schools participated in some type of school-wide reform initiative. The reform initiative noted most often by respondents was Accelerated Schools, which represented 11.6% (n=5) of the 43 schools examined.

Factor analytic techniques were used to examine the 18 questions pertaining to professional development on the administrator survey instrument. Maximum Likelihood extraction methods were employed, and two factors were retained after using Direct Oblimin rotation on the factor matrix. The nine variables loading on the first factor were termed "teacher-related PD" and the nine variables loading on factor two were termed "school-related PD." The scale produced from the nine questions pertaining to "staff-related professional development" was found to be reliable, yielding a Cronbach alpha r=.95. The second scale produced from the remaining nine questions, "school-related professional development" was also determined to be reliable, yielding a Cronbach alpha r=.93. (The Likert-type scale was: 1 = strongly disagree, 2, disagree, 3 = somewhat disagree, 4 = somewhat agree, 5 = agree, 6 = strongly agree).

When data were disaggregated to examine only those schools defined in this study as middle level sites, administrators rated the questions concerning increased use of performance assessments (M=5.16), enhanced techniques (M=5.12) and improved knowledge of current trends (M=5.12) highest among the second set of nine questions pertaining to staff-related PD. Motivating teachers to become involved in school-wide reform was rated lowest (M=4.67) by administrators. Middle level administrators rate support of innovative teaching (M=5.55), encouraging teachers to participate in systemic PD (M=5.51) and the alignment of school PD plans (M=5.43) highest among the nine questions pertaining to school-related PD; providing financial support opportunities for teachers working on PD plan goals was rated lowest by administrators (M=5.03).

During the larger study researchers rank-ordered schools based on the overall mean scores from administrator respondents on the first set of nine questions pertaining to staff-related PD and the second set of nine questions pertaining to school-related PD. Once schools were rank-ordered, the research team selected the highest 100 scores (elementary=50, secondary=50) and assigned those sites the label high PD sites. The lowest ranked 100 schools (elementary=50, secondary=50) were also selected and assigned the label low PD sites. These 200 school sites then became the sample for the teacher survey questionnaire.

TABLE 3. Total variance explained in Factor Analysis procedures on the administrator survey instrument

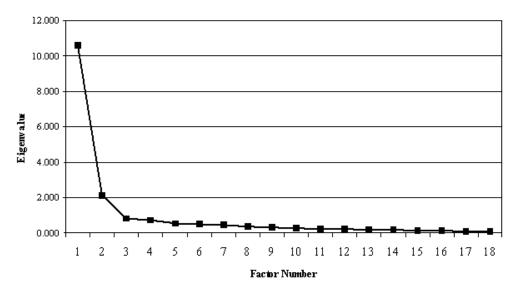| Factor	Initial Eigenvalue			Extraction Sums of Squared Loadings			Rotation
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total
1	10.582	58.790	58.790	10.262	57.011	57.011	9.052
2	2.153	11.961	70.752	1.833	10.181	67.191	8.710
3	0.796	4.420	75.172				
4	0.750	4.167	79.339				
5	0.559	3.103	82.443				
6	0.488	2.710	85.153				
7	0.436	2.420	87.573				
8	0.379	2.106	89.679				
9	0.308	1.709	91.387				
10	0.262	1.454	92.841				
11	0.233	1.292	94.134				
12	0.208	1.155	95.289				
13	0.186	1.032	96.321				
14	0.170	0.946	97.267				
15	0.157	0.874	98.141				
16	0.133	0.738	98.879				
17	0.103	0.574	99.454				
18	0.098	0.546	100.000				

Figure 1. Scree Plot of Eigenvalues for the Administrator Survey Instrument

TABLE 4. One-way ANOVAs for middle level administrators' responses to survey questions regarding school (n=9) and staff (n=9) professional development involvement.

	Survey Question	$\underline{M_1}$	$\underline{M_2}$	F	Significance
	MY SCHOOL...				
School - Related Professional Development	1 ...has a focused PD plan	5.86	4.76	26.210	.000
	2 ...aligns its PD plan to meet CSIP goals	5.90	4.95	22.727	.000
	3 ...supports development / achievement of teachers' PD plans	5.86	4.38	28.870	.000
	4 ...provides teachers w/PD opportunities to meet plan goals	5.86	4.38	25.794	.000
	5 ...provides administrative support for PD plan goals	5.86	4.48	28.428	.000
	6 ...provides financial support for PD plan goals	5.67	4.28	12.745	.001
	7 ...supports innovative teaching practices in the classroom	5.90	5.19	8.555	.006
	8 ...encourages continuous & systemic PD	5.95	5.05	20.234	.000
	9 ...supports student achievement through effective PD	5.82	4.90	19.261	.000
	MY STAFF'S PARTICIPATION IN PROFESSIONAL DEVELOPMENT ACTIVITIES HAS...				
Staff - Related Professional Development	1 ...enhanced techniques/practices in the classroom	5.64	4.57	35.098	.000
	2 ...improved knowledge of current trends in education	5.50	4.71	23.074	.000
	3 ...strengthened ability to meet student needs	5.55	4.48	34.279	.000
	4 ...increased use of performance assessment tasks	5.45	4.86	6.041	.018
	5 ...motivated teachers to become engaged in school-wide reform	5.32	4.14	22.254	.000
	6 ...improved students' classroom participation/interaction	5.41	4.52	16.795	.000
	7 ...motivated student enthusiasm in learning new concepts	5.29	4.05	30.314	.000
	8 ...increased academic performance of all students	5.27	4.15	15.129	.000
	9 ...developed student confidence in performance assessment	5.23	4.10	15.818	.000

Note: Significant differences are presented in **bold** face type. Significance based on $p < .05$.
($\underline{M_1}$ = High PD sites, $\underline{M_2}$ = Low PD sites)

Teacher Questionnaire

During this three-year statewide study, a total of 200 schools elementary (high PD=50, low PD=50); secondary (high PD=50, low PD=50) received a teacher survey instrument. For the purpose of this analysis, only those teachers associated with middle level sites with grade configurations of 6-8, K-8, and 7-12 were included in the following analyses. Data from 292 middle level educators (high PD schools=151; low PD schools=141) completing the survey questionnaires yielded the following:

Of the 292 teachers responding to the survey instrument, 151 (51.7%) were associated with high PD sites and

141 (48.3%) were associated with low PD sites. Data indicate that overall, 20.3% (n=55) of the teachers surveyed reported their school to be engaged in some type of school-wide reform initiative. On average, middle schools identified as high PD sites had a higher degree of involvement in school-wide reform (26.3%) than did middle schools identified as low PD sites (14.2%).

On average, middle level teacher respondents associated with high PD sites indicated their school sponsored approximately eight professional development activities during the 2001-2002 school year (M=8.06; SD=6.91), while teachers associated with low PD sites reported their school sponsored approximately seven professional development activities (M=6.76; SD=6.70). Overall, 120 (41.1%) of the 292 middle level educators responding had served on their school professional development committee. Of those serving, high PD sites (44.0%) had a higher percentage of teachers serving than did low PD sites (38.3%).

As with the administrator survey instrument, factor analytic techniques were utilized to examine the 18 questions pertaining to professional development contained in the teacher survey instrument. Maximum Likelihood extraction methods were employed, and two factors were retained after using Direct Oblimin rotation on the factor matrix. The nine variables loading on the first factor were termed "teacher-related PD" and the nine variables loading on factor two were termed "school-related PD." The scale produced from the nine questions pertaining to teacher-related PD were found to be reliable, yielding a Cronbach alpha r=.93. The second produced from the remaining nine questions, "school-related professional development" was also determined to be reliable, yielding a Cronbach alpha r=.96.

Middle level teachers rated improved knowledge of current trends (M=5.11) and increased use of performance assessments (M=5.03) highest among the nine questions loading on the first factor staff-related PD. Motivating teachers to become involved in school-wide reform was rated lowest (M=4.51) by teachers. Teachers rated aligning PD plans with school improvement goals (M=5.46), and their school's support of innovative teaching practices (M=5.33) highest among the nine questions loading on the second factor school-related PD. Providing financial support for teacher working on PD plans was rated lowest among teacher respondents (M=4.83).

Teachers associated with high PD sites rated both their school's PD and their own professional development higher on each of the 18 questions than did teachers associated with low PD sites.

TABLE 5. One-way ANOVAs for middle level teachers' responses to survey questions regarding school (n=9) and staff (n=9) professional development involvement.

	Survey Question	M₁	M₂	F	Significance
MY SCHOOL...					
School - Related Professional Development	1 ...has a focused PD plan	5.36	5.18	2.130	.146
	2 ...aligns its PD plan to meet CSIP goals	5.53	5.38	1.864	.173
	3 ...supports development / achievement of teachers' PD plans	5.25	5.14	.785	.376
	4 ...provides teachers w/PD opportunities to meet plan goals	5.36	5.16	2.670	.103
	5 ...provides administrative support for PD plan goals	**5.31**	**4.98**	**6.349**	**.012**
	6 ...provides financial support for PD plan goals	4.94	4.71	2.114	.147
	7 ...supports innovative teaching practices in the classroom	5.43	5.23	3.482	.063
	8 ...encourages continuous & systemic PD	5.39	5.18	3.051	.082
	9 ...supports student achievement through effective PD	**5.38**	**5.11**	**5.151**	**.024**
MY STAFF'S PARTICIPATION IN PROFESSIONAL DEVELOPMENT ACTIVITIES HAS...					
Staff - Related Professional Development	1 ...enhanced techniques/practices in the classroom	5.09	4.92	1.912	.168
	2 ...improved knowledge of current trends in education	5.17	5.04	1.198	.275
	3 ...strengthened ability to meet student needs	5.09	4.90	2.750	.098
	4 ...increased use of performance assessment tasks	5.10	4.95	1.582	.210
	5 ...motivated teachers to become engaged in school-wide reform	4.59	4.42	1.538	.216
	6 ...improved students' classroom participation/interaction	4.83	4.59	3.460	.064
	7 ...motivated student enthusiasm in learning new concepts	4.63	4.48	1.458	.228
	8 ...increased academic performance of all students	4.63	4.42	2.822	.094
	9 ...developed student confidence in performance assessment	4.74	4.51	3.225	.074

Note: Significant differences are presented in **boldface** type. Significance based on p < .05.
(M₁ = High PD sites, M₂ = Low PD sites)

TABLE 6. Pattern matrix from Exploratory Factor Analysis Maximum Likelihood extraction for the teacher survey instrument.

	Factor 1	Factor 2
	Teacher PD	School PD
PD Opportunities	-0.065	**0.907**
Continuous PD	-0.063	**0.870**
Administrator Support	-0.023	**0.861**
Supports Teacher PD	0.007	**0.842**
Effective PD Activities	0.050	**0.811**
Innovative Teaching	0.017	**0.743**
Alignment of PD Plan	0.044	**0.703**
Financial Support	0.000	**0.673**
Focused PD Plan	0.101	**0.673**
Student Participation	**0.938**	-0.045
Student Motivation	**0.928**	-0.047
Meeting Student Needs	**0.885**	0.028
Student Achievement	**0.878**	-0.035
Student Confidence	**0.859**	-0.040
Performance Assessment	**0.851**	-0.007
Classroom Techniques	**0.851**	0.033
Knowledge Base	**0.765**	0.093
Teacher Motivation	**0.706**	0.101

School Demographic Data

The average number of students in those schools categorized as high PD sites (n=22; M=467.77) was higher than the average number of students in low PD sites (n=21; M=313.71). Difference in school size within these high PD and low PD site designations was found to be statistically significant [F(1,41)=4.221; p=.046]. On average, students attending schools labeled high PD sites had a lower average daily attendance (92.88%) than did students attending low PD sites (94.321%). However, these differences were not found to be significant. The average percent of students' receiving free/reduced lunch is also lower for high PD sites (40.19%) than low PD sites (48.71%). Again, these differences were not found to be significant, which may be due to the low sample size. Differences with regard to student ethnicity were also found not to be statistically significant when comparing high PD sites with low PD sites.

TABLE 7. Average number, percent, and {standard deviation} of demographic characteristics collected per site as reported by the state Core Data for the 2001 academic school year by high/low involvement in professional development. (n=43)

School Type	Average Number of Students Per Site	Average % Attendance Per Site	Average % Free/Reduced Lunch Per Site	Average % Ethnicity Per Site				
				White	Black	Hispanic	Asian	American Indian
High PD Sites	467.77	92.88%	40.19%	84.30%	10.66%	2.22%	1.05%	1.79%
		{2.77%}	{24.11%}	{17.82%}	{15.62%}	{3.27%}	{1.42%}	{6.85%}
Low PD Sites	313.71	94.32%	48.71%	93.25%	5.56%	.73%	.32%	.16%
		{2.57%}	{29.01%}	{20.31%}	{20.00%}	{1.06%}	{1.01%}	{.374%}
Ave. % {SD}	390.74	93.60%	44.45%	88.78%	8.11%	1.48%	.69%	.98%
		{2.67%}	{26.56%}	{19.07%}	{17.81%}	{2.17%}	{1.22%}	{3.61%}
Sig. of Averages	F = 4.221 p = 0.046	F = 2.674 p = 0.111	F = 1.101 p = 0.300	F = 2.363 p = 0.359	F = 0.479 p = 0.356	F = 3.962 p = 0.053	F = 3.717 p = 0.061	F = 1.172 p = 0.285

Analysis of the Learning Environment

Among the 43 schools included in the analyses, parents of students attending high PD sites rate their schools, on average, higher than parents with children attending low PD sites in each of the categories listed: 1) Quality of the Learning Environment, 2) School Safety, and 3) Adequate Resources. These differences were not found to be significant. Faculty responses to the additive scales reference 1) Parent Involvement, 2) Instructional Leadership, 3) Teacher Commitment, and 4) Professional Development. Faculty in high professional development sites rate their schools higher on each of the categories listed than do faculty in low professional development sites. Again, differences were not statistically significant.

TABLE 8. Average mean scores and {standard deviations} for the parent and faculty portions of the state's school improvement program "Additive Scale" collected via the state department website (Jan-Feb 2002) by high/low involvement in professional development. (n=43)

School Type	Parents			Faculty				Other	
	Quality of Learning Environment	School Safety	Adequate Resources	Parent Involvement	Instructional Leadership	Teacher Commitment	Professional Development	Additive Scale School Mean	Overall Rank
High PD Sites	3.84	3.65	3.18	2.52	4.20	4.19	3.78	3.66	2.00
	(.196)	(.237)	(.349)	(.629)	(.381)	(.273)	(.494)	(.185)	(.324)
Low PD Sites	3.75	3.62	2.99	2.41	4.17	4.12	3.82	3.56	2.05
	(.185)	(.259)	(.256)	(.301)	(.399)	(.363)	(.527)	(.209)	(.384)
Ov. Aggr. {S.D.}	3.80	3.64	3.09	2.47	4.19	4.16	3.80	3.61	2.03
	{.191}	{.248}	{.303}	{.465}	{.390}	{.318}	{.511}	{.197}	{.354}

Note: Data Collected via DESE Core Data website 2002.

Policy Implications

In their efforts to improve student achievement, policymakers would be better advised to concentrate on fully implementing middle school programs and providing high quality professional development for teachers to improve student learning than to engage in abstract debates over other factors not supported by research. Grade configuration appears to be one of those factors currently being debated for which the research regarding student achievement is inconclusive. Improving student performance on state assessments can best be achieved when an entire school community focuses on common goals as part of a whole school reform initiative. Because the middle school philosophy is one that supports "promising practices" and because some middle level schools incorporate a team approach to teaching and are highly engaged in professional development, they may offer researchers "rich" fields for the study of these relationships and their impact on student outcomes, including but not limited to student academic achievement.

Research conducted over the last 10 years examining grade configuration and the implementation of middle level programs, policies, and practices has produced conflicting results. Additional research examining both grade configuration and the level of implementation of middle level practices needs to be conducted to address more fully the relationship (if any) of grade configuration and student achievement. Controlling for common factors such as average daily attendance, socio-economic status, school size, student to teacher ratios, per pupil expenditures, and ethnicity (to list just a few) should also be considered when studying relationships between grade configuration and student achievement.

While there appear to be relationships between levels of professional development and middle level grade configurations, the relationship between these variables and student achievement remains inconclusive. Future study in this area should address the degree to which high PD middle level schools and low PD middle level schools are implementing the middle school philosophy. These relationships should then be considered when attempting to examine each variable's impact on student achievement.

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