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Exploring Principal Leadership Roles within a Community of Practice to Promote Science Performance of English Language Learners

David Carrejo

Teresa Cortez

Judy Reinhartz

Academic Leadership Journal

Introduction

The world we live in continues to become more technologically advanced and educating youth to become productive citizens in an ever-changing global society is vital. The importance and necessity of educating an increasingly diverse student population has become a top priority for Pre-K-16 educators. To meet this challenge and set priorities for serving English Language Learners (ELLs), educators at all levels need to forge a clear vision and shared commitment for fostering "… a sense of belonging and community that inspires collaboration" among its members for the success of all students (Texas Association of School Administrators, 2008, p. 4).

It is with this sense of shared commitment that the current study was undertaken. It investigated the roles of principal leaders within their respective community of practice (COP) and within their respective year-long science professional development program (PDP). As Sergiovanni (2009) noted, "principals have a responsibility to help teachers improve their practice and to hold them accountable for meeting their commitments to teaching and learning" (p. 281). One common way this responsibility is carried out is through the process of supervision, which**,** if done well, will enhance teacher life-learning. Often, however, more is needed.

For this study, "more" meant going beyond supervisory leadership and establishing a learning community to implement best practices learned during a year-long science PDP (Printy, 2008; Reinhartz & Beach, 2004). According to Hord (2004), a professional learning community has five critical attributes which are: 1) supportive and shared leadership, 2) collective creativity, 3) shared values and vision, 4) supportive conditions, and 5) shared personal practice. For this study, the researchers focused on attributes one and five (supportive and shared leadership and shared personal practice). It is within a COP that principal leadership roles were explored to determine their impact on teacher development and ELL science learning outcomes (Hord, 2004; Hord & Sommers, 2008). The research study was guided by the following question: What roles did principals play within their COP and their respective PDP to promote success of ELLs in science?

The results from this study revealed that participation in a COP contributed to building leadership capacity in all stakeholders, especially principals, which enhanced the academic performance in science for English Language Learners. For improved student learning to occur, members of the entire community, principals, teachers, and university faculty became learners *and* leaders. During the PDP at each school site, COP members formed a cohesive, mutually supportive team to meet the challenge of promoting science academic performance of ELLs

Theoretical Framework

The theoretical undergirding for this current study included three components. The first component was the COP, which supported the notion that schools are learning organizations, in which group collaboration, thinking, and taking action occur. Transformational leadership represented the second component, which focused on principals as leaders. The final component, path-goal theory, is based on the principle that leaders influence those in an organization by providing incentives and removing barriers to achieve change.

Community of Practice

The concept of COP or professional learning community began in the business sector, which supported the belief that organizations can learn (Thompson, Gregg, & Niska, 2004**)**. Theoretical underpinnings for the idea of community of learners and leaders are based on the work of Follett (1924), which focused on human interactions leading to democratic practices in the workplace and Burns's (1978) transformational leadership (Walker, 2002).

For the purpose of this study, the phrase "community of practice" was selected to explore the principals' roles in implementing instructional changes to improve ELL science achievement. After all community members came together for PDP experiences, a COP was established at each of four school campuses, and each COP centered on the science PDP whose goal was to motivate principals and teachers to take action, to embark on a journey of professional reflective practice together so that their ELL students would benefit. Hord (2004) characterizes this journey within a COP as one of continuous inquiry and improvement.

When learning communities are mandated, it is not uncommon to hear teachers comment, "Our districts are requiring us to be a part of a professional learning community… but we don't know what to do" (Mundry & Stiles, 2009, Forward, np #). It was the researchers' assertion that if the year-long PDP centered on science content, a subject that principals were targeting in their curricula, then transformative learning and shared leadership roles could be transferred and cultivated at individual school sites as a part of a community of practice. The researchers agree with Mundry and Stiles (2009) that "[In order] for substantial changes in [science] teaching and learning to materialize and be sustained, changes must occur at the school level" (Forward, np #).

For school improvement to occur within the context of a COP, members must view themselves as leaders and hold themselves accountable for the academic success of all their students. By focusing on "learning" in the PDP more than on teaching, members of a community target *what* students should learn in science and *how* (Dufour & Eaker, 1998; Hord & Hirsh, 2009; Mundry & Stiles, 2009; Thompson, et al., 2004; Walker, 2002).

Transformational Leadership

In Burns' (1978) conceptualization of transformational theory, "… leaders and followers raise one another to higher levels of motivation and morality" to bring about organizational improvement (p. 20). Yukl (1998) defined transformational leadership as followers accomplishing agreed upon organizational goals. Leithwood, Jantzi, and Steinback (1999), Sergiovanni (1990; 2000), and Bass and Riggio (2006) took transformational leadership theory and applied it to school organizations with the goal of improving student performance and teacher learning. Transformative principals search for opportunities to improve their schools, even if they have to take risks. For Alger (2008), transformational leadership means raising "the level of awareness of workers so that they come to value organizational goals and strategies to achieve those objectives" (p. 1). In addition, transformational principals support their teachers and encourage them to engage in professional development activities. For these leaders to be successful, Alger (2008) recommends that they engage in frequent dialogues with their faculty about school improvement efforts. Transformative leadership theory provides a useful framework for looking at leadership roles within this study since it relates to ELL science performance and science teacher learning.

In this study, the COP created a safe and mutually supportive environment in which elementary and middle school principals and teachers worked in collaboration in a professional development setting at individual school sites with university faculty to implement best science teaching practices in ELL classrooms. The principals attended and actively participated in whole group and campus professional development experiences over the course of one year, working side-by-side with their teachers.

Path-Goal Leadership

Path-goal theory is the final component of the theoretical framework for this study. Based on the work of House (1996), path-goal theory explains how leader behavior impacts subordinates' attitudes about job performance, satisfaction, and motivation (House & Mitchell, 1974). Leaders following this model influence their followers' perception of work-goals and clear a path by removing identified barriers to achieve these goals that lead to job satisfaction. Path goal leaders offer incentives for achieving agreed upon goals, provide tools to achieve said goals, and remove obstacles. Path-goal theory is based on expectancy motivation theory with two basic theoretical constructs: relationship and work orientation. This theory provides a useful theoretical lens for this study for understanding how various leadership behaviors affect the satisfaction of employees and their work performance. Following this theory, leaders also must be flexible and willing to change their behavior to fit the situation (House & Mitchell, 1974).

The Study

Context

This study took place along a Texas-Mexico border region with a population of over two million people. The majority of the population is Hispanic (76.6%) followed by White Non-Hispanic (18.3%) and Other (5.1%). Approximately 24% of city of El Paso's total population is foreign born, primarily coming from Mexico, compared to 13.9% for the entire state of Texas (City-Data.com, 2008). Because of the fluidity of travel across the U.S./Mexico border, it is not uncommon for schools in El Paso County to be the primary educators of these students. Schools in El Paso County as well serve a large Hispanic student population whose families came from Mexico and Central America. In the 2006-2007 school year, the region enrolled 172,532 students of which 89.0% were Hispanic, 75.5% were identified as economically disadvantaged, 28.0% Limited English Proficient (LEP), and 23.0% enrolled in a bilingual/English as a second language (ESL) program (TEA, 2008). With such a large Hispanic student population, it is necessary for Pre-16 educators to better understand the needs of these learners so that they experience academic success in science.

English Language Learners. For students living in the US, many labels are used to identify those whose first language is Spanish, not English. For example, a Limited English Proficient (LEP) student's primary language is Spanish. They are described as having a limited ability to read, speak, write, or understand English within the school setting (Department of Justice, 2009). In Texas and in other states, LEP and ELL are used interchangeably to identify students who are limited English proficient (National Education Association, 2009). For the purpose of this study, the term English Language Learners is used.

According to the state education agency, students identified as ELLs continue to fall farther behind their peers in science (TEA, 2008). In El Paso County, fifth grade science scores have lagged behind the other core subjects and are much lower for students identified as ELLs. In Table 1, the results from the science mandated TAKS (Texas Assessment of Knowledge and Skills) for 2007 and 2008 for grades 5-11 are presented for all students in Region 19 (El Paso County) and with those who are identified by the State as LEP. In 2008, the gap in scores between the groups are great, ranging from -1 percentage point for fifth grade students testing in Spanish to +44 percentage points for 10th grade students (TEA, 2008).

Table 1

Texas Assessment of Knowledge and Skills – Region XIX comparison of All Students and LEP students

	2007					2008		
	State	*Region XIX (El Paso County) (All Students)*	*Region XIX (El Paso County) (LEP)*	*+ / -*		*State*	*Region XIX (El Paso County) (All Students)*	*Region XIX (El Paso County) (LEP)*
5th (Eng)	74	67	40	27		82	79	61
5th (Span)	35	37	37	0		37	41	42
8th	67	58	15	43		69	60	20
10th	57	47	9	38		65	56	12
11th	76	66	26	40		81	74	31

In 2007, 5th grade science scores for the county were 40% passing among LEP English test-takers. Among 5th grade students testing in Spanish, the passing rate was only 37% (TEA, 2008). Science passing rates for 8th grade LEP students in 2007 were 15%, 9% in 10th grade, and 26% in 11th grade

(TEA, 2008). In 2008, 5th grade science scores for the region increased to 61% among LEP test takers. Among 5th grade students testing in Spanish, the passing rate was at 42%. Among LEP test takers in 2008, science passing rates for 8th grade were 20%, 12% in 10th grade, and 31% in 11th grade (TEA, 2008).

Students identified as ELL may have very different backgrounds, skills, and past experiences. They face a special challenge when learning science. As a core academic subject, learning science is steeped in an extensive vocabulary with terms that are multi-syllabic. And, science textbooks cover an enormous amount of material using complex sentence structure and visuals that are often confusing. Finally, when conducting science labs, there is an expectation that students be able to read, comprehend, and follow multistep directions and procedures (Haynes, 2003). Since many ELLs come with limited formal science background and laboratory experiences, best practices in science means activating prior knowledge and experiences using inquiry/constructivist-based experiences (Dong, 2009). Therefore, a more individualized targeted approach is needed for ELLs to build their English oral, reading, and writing knowledge and skills to be academically successful.

It is with this sense of shared commitment of promoting academic success for all students that Pre-K-16 educational leaders came together to provide the best research-based set of science instructional practices and resources to ensure that ELLs succeed academically and become productive citizens. To meet their needs, it took leadership bringing together faculty and staff in a way that transformed schools into a COP that included principals, teachers, and university faculty. These stakeholders were catalysts that brought about instructional changes in science classrooms and enhanced ELL science performance at their respective school campuses.

Purpose

The purpose of the current research study was to explore principal leadership roles in (a) a year-long science PDP designed for elementary and middle school teachers and (b) an individual school community of practice to determine its effectiveness in increasing the science achievement of English Language Learners. The COP component within the PDP and at their respective school campuses provided principals with insight to better understand: 1) what teachers were learning in the science PDP, 2) best instructional practices in individual ELL classrooms as teachers implemented the science curriculum, and 3) ways to support systemic science reform for ELLs at each school campus.

Participants

The subjects of the study included four principals in El Paso County from two different districts. All four principals served in neighborhoods where the minority is the majority student population. Table 2 presents the demographics for each school campus. In addition, all four campuses are identified as Title I.

Table 2

Participating campuses with respective Hispanic and LEP populations

School	*Total Population*	*Total Hispanic*	*Total LEP*	

		(% of population)	(% of population)	
AMS	589	571 (97%)	177 (30%)	
ACE	742	704 (95%)	299 (40%)	
AE	482	477 (99%)	218 (45%)	
CHE	407	399 (98%)	225 (55%)	

Principals from these campuses attended the year-long science PDP with their teachers and became part of this community of practice. By working together as practitioners, they collaborated in designing a school science improvement plan based on what was learned during the PDP. In this context, the university faculty played an integral role in making presentations, facilitating academic conversations about what is involved in effective science teaching and learning, supporting both principals and teachers, and establishing a nurturing, caring, and productive community for all stakeholders. For this study, these three groups, principals, teachers, and university faculty, within the COP established a model that was replicated at their respective school campuses.

Professional development program

During the PDP, the 5E pedagogy, which includes five instructional phases: engage, explore, explain, elaborate, and evaluate, served as the delivery system for the curriculum focusing on big ideas in science along with complimentary math concepts. The researchers' 5E pedagogy is a modified version of Bybee's 5Es (1997) in which the "elaborate" phase provides opportunities for students to form relationships between ideas and/or variables in an experimental context to promote learner reflection on what has taken place. The scientific and mathematical constructs involved in this relationship become a learner's focus of study. Table 3 identifies the 5Es phases along with a description of student behavior relevant to that phase.

Table 3

The 5E pedagogy delivery system with student behaviors for each phase

The 5E Pedagogy	

Phases	*Student Behavior*
Engage	Students encounter or identify the phenomenon to spark their interest. They make connections between past and present learning experiences. They ask questions and identify the situation or problem.
Explore	Students interact with materials and resources and rely on these experience(s) to guide their exploration. They observe situations, collect data, dialogue with peers, and begin to analyze results.
Explain	Based on student experiences and discourse and data collected during ‘explore,’ the teacher introduces the appropriate academic language associated with the experiences. The teacher guides the students in developing and learning science and mathematics concepts, making connections between inscriptions, representations, and hands-on experiences, and provides a learning environment for understanding the difference between facts and concepts.
Elaborate	Students build relationships between variables identified during an experiment that relates to the topic being studied. Students use models (scientific and mathematical) to make connections between ideas and theories. Students also become aware of connections between their ideas and other ideas or concepts (sometimes involving correlation and/or causality).
Evaluate	Students are assessed in various ways about what they have learned. They are assessed on fundamental skills, academic language, science and mathematics concepts, and interpretations of visual representations and graphics through journal entries, oral and written exercises, and interactions with peers/their teacher.

Inquiry activities based on modeling, one of the major themes in science (Rutherford & Ahlgren, 1990), constitutes the heart of year-long PDP curriculum. For the study, the researchers’ accepted the definition of a scientific model as a testable idea (physical, mental (conceptual), and mathematical) created by the human mind, both individually and collaboratively, which tells a story and helps provide an explanation about something that happens and how it might “work” in nature. One overarching goal of the PDP curriculum was to provide participants with opportunities to approach teaching science less from a coverage perspective and more from a depth perspective.

By creating a curriculum that focuses on big ideas from science the PDP addressed the need for teachers to implement and meet essential knowledge and skills in science learning and to express this learning using English language skills and content-specific vocabulary. Research in literacy development clearly shows that learning is accelerated when all language skills are developed simultaneously (Collier, 1995; Collier & Thomas, 2006; Cummins & Miramontes, 2006; Estrada, Gomez, & Ruiz-Escalante, 2009). The natural approach (Krashen & Terrell, 1983) within a science classroom focuses on experiences that stimulate natural meaningful language use (see Table 4).

Table 4

Science literacy development through meaningful language use (at various stages of language development)

Stages of Language Acquisition	*Behaviors and Strategies to Promote Science Literacy*
Beginning New to English	Use visuals and real objects (e.g. rocks, soil, leaves) Take opportunities for active listening Use yes/no questions Use process skills of observing, exploring
Early intermediate Speaks in short phrases Writes for different purposes	p> Share family stories about home projects Focus on big ideas (e.g. cycles, systems, change) Model the language of science Involve students in what scientists do
Advanced intermediate Participates in group discussions Exhibits grammatical structures and vocabulary	Identify, explore, observe physical/chemical changes Assign roles and responsibilities Ask a variety of questions (data gathering/processing) Use graphic organizers and diagrams Provide a variety of print materials (non-fiction)
Advanced Reads/writes to acquire new information Demonstrates increased levels of accuracy	Experiment with variables (independent and dependent) Ask higher order thinking questions

	Teach through modeling (science reasoning) Write science stories (journals)

For example, the evaluate phase in the 5E pedagogy departed from the traditional paper and pencil mode to a more "game" oriented approach. One game was the "loop," whose "I have … Who has…" format provided participants opportunities to use their communication skills of reading, listening, and speaking as well as comprehending to build content knowledge in science.

Methodology

An explanatory mixed methods design was used to collect both quantitative and qualitative data. The first phase of the study collected and analyzed quantitative data using a one-tailed test to compare two proportions on state science data. The data reported percentages of both Hispanic and LEP students who met state science standards in 5^{th} and 8^{th} grades standards from 2007 to 2008. The one-tailed test calculated a z-score using the number of students in each sample and the number of students in each sample who met standard. With a final, calculated z-score of $\alpha = .10$, the next step was to determine whether or not the percent point changes between 2007 and 2008 were significant. The second, qualitative, phase examined responses to interview questions that were asked during the yearlong study related to principal leadership roles that they played in their respective COP and PDP. The results from analyzing both forms of data shed light on how principal leaders had an impact on the science performance of ELLs.

A qualitative interview process was used to explore specific topics and experiences in-depth (Kvale & Brinkmann, 2009). No pre-conceived notions were held of what would be found and no theoretical hypothesis was tested. Interviews were based on the assumption that knowledge was produced socially in the COP through the interaction of the researchers and the principal leaders (Kvale & Brinkmann, 2009). The interview protocol focused not only on gaining information (e.g. years of experience, school demographics), but also understanding the principals' experiences with their leadership roles and responsibilities. These roles and responsibilities included: 1) providing effective professional development, 2) understanding pedagogy and science content, 3) assessing and evaluating teachers, 4) assessing and evaluating students, and 5) promoting science and English language acquisition. All principals had substantive knowledge and insight about their positions and working with teachers and students. Interview sessions took place on campus sites twice a month over the period of one year. Interview transcriptions and interviewer notes were also used in the analysis.

Constructivist grounded theory (Charmaz, 2006), a more inductive and exploratory approach (Brenner, 2006; Kvale & Brinkmann, 2009), was used to analyze the interview response data. In coding the data, the researchers were conscious of the danger of applying personal interpretations of a principal's experience to what he/she might really be experiencing. Thoroughness was achieved and risks of creating a superficial analysis within the constructivist grounded theory framework was avoided by conducting several rounds of coding. A constant comparison method was utilized (Glaser & Strauss, 1967) to look for similarities and differences in perspectives within and between interview responses. This sub-category coding step provided more focus, i.e. going back to code the data using more significant and/or more frequent codes found in initial coding. The analysis of interview information provided common patterns and categories that were used to construct a theory grounded in the principal leaders’ experience within the COP.

Results

Quantitative Phase

ELL performance in science. Table 5 provides quantitative information for Hispanic and ELL student performance in science at participating schools. Using the one-tailed test for comparing two proportions, a z score must be lower than – 1.28 in order to reject the null hypothesis that the percent point change in scores happened by chance alone and that the success rate in 2008 is better when compared to the rate in 2007. Eighth grade students at two of the four campuses, AMS and ACE, showed a significant increase in Hispanic student performance (TEA, 2008) with z-scores of -3.64 and – 2.45, respectively. Fifth grade students at ACE show a z-score of -1.27. At ACE, 8th grade LEP students showed significant growth. Likewise, 5th grade LEP students showed significant gain. AMS 8th grade LEP students and ACE 5th grade LEP students showed small, positive growth in science performance.

Table 5

Hispanic and ELL student performance in science at participating schools

School	*Total Population*	*Total Hispanic*	*Total LEP*	*Grade*	*2007 met std %Hispanic (%LEP)*	*2008 met std %Hispanic (%LEP)*	*% cha*
AMS	589	571 (97%)	177 (30%)	8	35 (13)	52 (16)	17 (3
ACE	742	704 (95%)	299 (40%)	5	62 (61)	73 (63)	11 (2
				8	76 (5)	80 (20)	4 (15
AE	482	477 (99%)	218 (45%)	5	66 (47)	63 (44)	-3 (-3
CHE	407	399	225	5	57	72	15

		(98%)	(55%)		(50)	(67)	(1

Two principals (one elementary (AE) & one middle school (AMS) were new leaders at their campuses in 2005-2006. To account for the lack of student achievement at AE, the principal faced intense, multiple challenges during the first year as principal. During the first two years, this principal set priorities to address more immediate issues and concerns, and student science performance was not among them. It was not until the third year that science performance became a priority at that campus.

Qualitative Phase

Three types of incident-to-incident coding were used in analyzing the interview data: 1) initial coding (identifying patterns in principal leaders' interviews) 2) focused coding (using selected initial codes to revisit data — a constant-comparison approach that helps define attributes for initial categories and describe patterns in the data), and 3) theoretical coding (relying on theoretical sensitivity to stimulate reflection of the interview data and determine final attributes of initial categories, thereby constructing theoretical or core categories). Table 6 outlines two initial categories that developed through focused coding. Attributes of each initial category are also provided along with relevant initial codes.

Table 6

Initial categories from initial coding and their descriptions

Initial Category	*Initial category attributes w/applicable initial codes*
Need to know	*"Professional development"* - Shared belief that professional development is disconnected from realities of teaching *"Teaching science"* – Shared belief that individual teachers need to share successful methods of teaching science *"Teaching ELLs"* - Teachers do not know of any current methods for teaching ELLs
Need to support	*"ELL Performance"* - Shared resolve that improvement in standardized state mandated test scores for ELLs is a major school goal and measure of satisfactory job performance not just for teachers but also for leaders *"Carrots"* - Teachers need emotional and psychological incentives to continue working with ELLs

In the next phase of analysis, theoretical codes developed based on the initial codes and, through constant-comparison methods, theoretical categories were constructed. These along with their attributes are presented in Table 7.

Table 7

Theoretical categories from focused coding along with their attributes

Theoretical Category	*Theoretical category attributes*
Active participant	Belief that, regardless of the professional development model, the principal must participate with their teachers and have the experience as teacher learners.
Mentorship	Understanding how teachers learn is the only way that principal leaders can provide targeted support to their teachers in implementing science best practice Resolve that teachers and students must enjoy their accomplishments (success) in academic performance. The principal leader's role is to validate teacher work in motivating ELLs, thereby allowing for long-term change.

The major categories along with the sub-categories provide the context or "lens" for analyzing the notes and transcribed data from the interviews with principals. What follows is a sample of responses related to the sub-categories of the major categories from principal interviews.

Active participation in the PDP. Principals mentioned that targeted professional development in science was extremely important because it ensured that all teachers were galvanized in terms of focusing on the science curriculum. As one school principal noted, "the professional development was extremely important because everyone was on the same page, and I, therefore, can help teachers who might be having problems in achieving classroom goals and objectives." Principals felt like faculty members who received materials and learned within their group. Each principal was modeling active involvement, motivated by a desire to help ELLs learn science. Furthermore, as principals participated in the science professional development activities, they also took the time to strategize and plan for *ongoing* professional development for their teachers within the COP. Principals noted that they enjoyed interacting with university professors at both the leadership and content learning levels and discussing possible sustained professional development opportunities.

Supporting and validating the work of their teachers. One principal shared the following ways that she validated and supported her teachers. According to her, a successful school needs "… constant diligence, knowing the areas that need to be improved…." Mentoring teachers was extremely vital to another principal who stated that, "I had to hire half my staff as brand new teachers, and so I knew that it was going to be a very difficult situation … I needed to be part of the solution… I needed to walk the talk." Another principal mentioned, that "using the 5E inquiry strategy is very important because it makes sure that the [science] vocabulary is introduced … in a context of exploration providing ELLs with the same academic language without it being too watered down." Although these principals acknowledged that they were extremely busy, they recognized the importance of participating in PDP experiences and spending time in classrooms with the students and teachers, but with knowledge of best science practice. This allowed the principals to see that the investment of time in participating in the professional development for both their teachers and themselves was essential. Involvement in the year-long PDP provided them with ways to help their teachers who might be struggling to meet the needs of ELL students.

According to Hord (2004), for principals to be effective in school improvement and foster a sense of "ownership" of a successful change process, they must 1) become learners themselves, 2) support their teachers and believe that they are agents of change, 3) provide opportunities for continuous learning on and off the school campus, and 4) facilitate and engage in discussions that build ideas with faculty about learning and teaching science and what is needed to make both successful. Based on the results of the study, principals perceived themselves as learners, validating and supporting their teachers' efforts, held strong beliefs that they were instrumental in facilitating change, became aware of the importance of ongoing professional development based on best-practice in science education, and learned that leading means taking time to learn.

Discussion

While principal leadership is critical to sustaining a school learning community, creating and fostering leadership capacity among stakeholders is a challenging task given that there is little consensus on what constitutes effective principal leadership. Certain theories such as transformational theory have limitations and can only be acknowledged as a partial theory for creating successful leadership qualities among principals (Day & Harris, 2000; Gurr, 1997). For example, transformational theory places the goal of achieving school improvement solely on the principal. Indeed, the principal is the leader of the school campus, but one leader among many others. Likewise, path-goal theory alone cannot achieve school change. For some, this theory does not adequately explain the relationship between leadership behavior and worker motivation (Northouse, 2007).

This research study suggested that school improvement goes beyond the principal-it takes all members of the community to achieve change (Waters, Marzano, and McNulty, 2004; Verona & Young, 2001). Obtaining a more systemic view for school improvement, one that understands the context of learning and leading in schools, is imperative. It involves K-16 stakeholders to ensure that improvement in student science achievement takes place. Improvement that is "top-down" is often not sustainable and negatively impacts campus morale. As professional developers attempt to understand what holds partnerships together, they must acknowledge that, ultimately, systemic change must rely on capacity building of all its members with the principal as the key player. All members must have 1) a strong belief about learning and teaching as a shared responsibility, 2) a coherent vision for school improvement, and 3) a logistical understanding of implementing new ideas that form a cohesive instructional and curricular plan that contributes to ELL's success.

Doolittle, Sudek, and Rattigan (2008) offer, "critical elements for engaging in school improvement efforts" (p. 304). These elements are in the form of a series of questions that help guide members of the learning community in identifying barriers, setting priorities, and using tools to achieve goals. Members of the learning community should ask these following questions to ensure they are moving toward agreed upon campus goals.

1) Is there a shared belief about teaching and learning?

2) Is there a shared vision about learning outcomes & instructional priorities that will produce measurable desired outcomes?

3) How are decisions about both the type and quality of professional development made?

4) How are new innovations in teaching implemented?

5) How is the effectiveness of systemic change evaluated?

The two theoretical categories (active participation in the PD program and supporting and validating the work of their teachers) that emerged from the study demonstrated that principal leaders needed to live the vision of school change by becoming active members of the PDP. Their participation in the COP communicated to their teachers that they are not alone in improving ELL's science performance. Principal participation in the PDP helped to break the cycle of isolation that teachers often experience when they have to solve instructional problems on their own.

Teachers seemed to find solace in being a part of a larger community with members who share their goal of improving student science performance and trusting the professional development process, techniques, and resources shared. Principal involvement engendered confidence in what had been learned in the PDP, and teachers were willing to take the risk and make changes in their science classroom that were more in line with best practices. When the principal visits science classrooms they know what they are looking for and became partners in the instructional process, rather than mere bystanders who make demands to increase student science scores on mandated state tests. Leading is an important attribute of transformational leadership, but, when combined with collaborative learning, both lead to a vision of professional development within a COP model that can transform schools.

The researchers do not believe that COPs are the "fad du jour," but they are models that brought together educators who explored ways to meet the academic science needs of ELLs and their teachers. Each COP was subject-specific and offered teachers and their principals opportunities to work in collaborative settings with university faculty. The principal's role became one of facilitator who was responsible for carrying out the plan based on the agreed upon goals for science, removing obstacles that impeded teachers from being successful in their science classroom, and talking to teachers about science learning and teaching. This is path-goal theory in action. Principals set in motion a school-wide plan to increase science performance of ELLs and, in doing so, empowered themselves and their teachers.

Conclusion

The present study has highlighted the importance of answering the critical question, 'How do principals, through learning communities, create and foster improved ELLs science performance?' The study provided some evidence that a COP effectively addressed the challenges of meeting the needs of ELLs in science. The quantitative data provided key information on the measurable success of

Hispanic students and ELLs in science but was limited in the sense that it did not reveal clear answers regarding the leadership role the COP played in improving ELL's science achievement. The focus then turned to examining the roles of principals under the assumption that they have the most immediate influence on teacher learning and practice. The qualitative data supported the perspective that principal leaders were instrumental in shaping and sustaining professional development opportunities for their teachers.

The analysis of the interview data revealed that principals 1) were co-learners with their teachers who were members of the COP, 2) gleaned connections between the role of professional development and science improvement by participating in the community of practice, and 3) guided their teachers in unpacking science learning for ELLs in ways to build on their diverse backgrounds. This study attempted to transform principals into leaders who supported their teachers in ways that galvanized a vision of improving ELL science academic performance. These principals demonstrated leadership qualities as they took risks as learners in the PDP and within the COP to synthesize effort and people to achieve a culture of confidence among their teachers. By linking learning and leading to improve ELL science performance in a community of practice, elementary and middle school principals engaged in a mutual process of raising each to a new level.

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