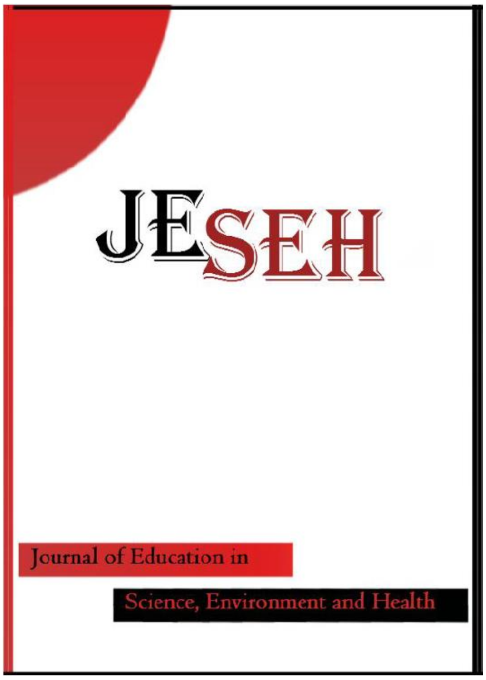

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Applying an Ecology Metaphor in a Mixed Methods Analysis of High School Science Program Infrastructure

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Applying an Ecology Metaphor in a Mixed Methods Analysis of High School Science Program Infrastructure

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Abstract

A sequential exploratory mixed methods approach guided research on the science program infrastructures (SPI) of a sample of 28 high schools representing 1,370 high schools in a large southwestern state. Comparisons of SPI were made between and among schools representing highly successful schools of low (n=9) and high diversity (n=10) with less successful, high-diversity high schools (n=9). Content analyses of interview data from science program teacher liaisons revealed the following characteristics for typical high school SPIs: (a) shared leadership within a diverse community of actors, including teachers, school principals, special education teachers, department heads, content-area leaders, curriculum directors, and district representatives; (b) supports for shared, balanced decision making, including frequent meetings, established communication channels, and explicit department head responsibilities; and (c) actions extending beyond general tasks of disseminating information to include resolution of issues regarding state-mandated test scores, curriculum-related tasks, and choice of professional development topics. We include a discussion of the implications for including SPI as an important mediating layer within the ecology of high schools. The science program layer links administration with classrooms by employing efficient, equitable, and effective practices to advance the goals of science achievement and college readiness established at national and state levels for all high school graduates.

Introduction

Effective science programs within high school learning ecologies provide the connection between state, district, and school policies and their consequent decisions to science teachers. Teachers are critical actors contributing within the infrastructures of districts, schools, and classrooms who enact policies and decisions to advance national and state goals for K-12 science education (National Research Council [NRC], 1996). The *National Science Education Standards* (NRC, 1996) argue that the most important resource for an effective science program is the professional teachers who serve the community's children. Chapter 7 of the Standards elaborates features of effective science programs, asserting that science teachers are best served by programs that continually work to replace the typical norms of isolation, conformity, and competition amongst high school teachers with new norms of community building, collegiality, openness, and trust. The Standards explain that replacement of typical norms occurs with realignment and readjustment:

> Schedules must be realigned, time provided, and human resources deployed regularly to discuss individual student learning needs and to reflect and conduct research on practice. In a community of learners, teacher work together to design the curriculum and assessment, … [taking] part in other professional growth activities. Time must be available for teachers to … hold meetings during the school day. (p. 223)

Not knowing what to expect in our exploration of science programs within the 1,370 high schools in the state of Texas, we chose an inductive, mixed methods approach to describe the infrastructures of science programs currently operating in the state. We developed an understanding of the complex relationships existing within the science program infrastructures (SPI) of 28 schools representing three types of schools (i.e., highly successful, highly diverse; highly successful, less diverse; less successful, highly diverse) through a constant comparison method to identify the salient components of each science program. The method required the identification of infrastructural features of each school, one by one, to constantly compare all features existing within the sample of 28 schools. Features were then clustered and named to represent a component. The diversity existing within the component was described by the frequencies of occurrence for each of the features within the component.

Expressed in the form of a rubric, features and components were then compared across the three school types, thus providing a snapshot for comparison on the basis of science program infrastructure.

This study extends work initiated by a project on policy research in science education funded by the National Science Foundation (NSF). This project was initiated to study the Teacher Professional Continuum (TPC) of high school science teachers in the state of Texas. In 2011, our research group was awarded an extension to investigate the features of "achievement gap schools" residing within the state. Only a few (i.e., 28 out of 1,370) of these notable, highly successful, highly diverse schools were found among the state-maintained database providing quantitative data describing each of the high schools in the state. In the final year of the project, these highly successful, highly diverse schools became the focus of policy research questions about the qualities of these unique schools.

Although several research projects have been designed to explore different categories and groups of programs within high schools (Giles & Hargreaves, 2006; Goodman, 1995; Irwin & Farr, 2004), none exist to compare the infrastructure of science programs in highly successful and less successful high schools varying in diversity status. In the extension study of our research group, researchers specifically investigated policies and practices of science programs within schools and asked questions about science programs, including comparisons with less successful and less diverse schools existing in the state. Ultimately, knowledge from the project has provided researchers and practitioners with a deeper understanding of the infrastructures of high schools' science programs as well as the unique characteristics of the unique subset of schools identified as both highly successful and highly diverse.

This research addressed questions of interest to mixed methods researchers, policy makers in science education, and science education practitioners in schools. We specifically looked for the most common infrastructural elements of high school science programs existing within a large, demographically complex southwestern state, paying special attention to the unique qualities of science programs in highly successful, highly diverse schools. Using a two-phase sequential exploratory secondary analysis mixed methods design (Figure 1), we were able to analyze both qualitative and quantitative phases to describe and compare the infrastructural components found within 28 high school science programs.

Research Background

Literature Review

Content analysis is the common methodology used to generate rubrics from interview data (Krippendorff, 2004). Rubrics have been used in qualitative research for the categorization of themes or ideas (Denzin & Lincoln, 2011). Additionally, rubrics also have been used in quantitative research for counting the occurrences of specific elements (Hsieh & Shannon, 2005). As a mixed methods tool for measurement, rubrics combine the process of creating general categories from themes and ideas with the identification of specific elements within those categories. In the social sciences, rubrics also provide a means for conducting comparative analysis across key demographic groups found within larger populations.

Scholars have yet to use rubrics to identify categories and elements within science program infrastructure. In fact, much of the literature related to infrastructure in education research focuses on actors and contextual factors found in a school but not within a specific content program (Englert & Tarrant, 1995). Consequently, science program infrastructure has yet to be defined in the literature. Instead, most of the sources informing our work on science programs typically focused on issues related to: (1) comprehensive school reform (Waldron & McLeskey, 2009), (2) teacher-researcher community (Englert & Tarrant, 1995), and (3) sustainability of innovative schools (Giles & Hargreaves, 2006). While literature specific to science program infrastructure is rare, some articles on infrastructure in high schools in general were found.

Infrastructure in high schools has been examined from various perspectives ranging from the broad perspective of comprehensive school reform to a narrower perspective focusing on sustainability of innovative schools (Erdogan & Stuessy, 2015a; Erdogan & Stuessy, 2015b; Erdogan, 2014; Navruz et al., 2014). An analysis of infrastructure within high schools has, on occasion, included a comparison across different school types. For example, MacNeil, Prater, and Busch (2009) used multivariate analysis of variance to assess differences in infrastructure between schools of varying success levels. As the literature on high school infrastructure was studied, several common categories emerged as important for consideration. These categories included collaboration among actors, communication and leadership, and diversity of school populations. As mentioned previously, none of the studies reviewed included discussions about the infrastructure of science programs specifically. Based on the preponderance of the literature, studies about infrastructure typically focused on one of two areas. Qualitative studies typically focused on the elements related to actors found within school infrastructure. For example, Englert and Tarrant (1995) identified three important characteristics of actors related to school infrastructure: (a) actors are the primary components in school infrastructure; (b) actors can be selfish learners within the infrastructure; and (c) actors can be drivers of change.

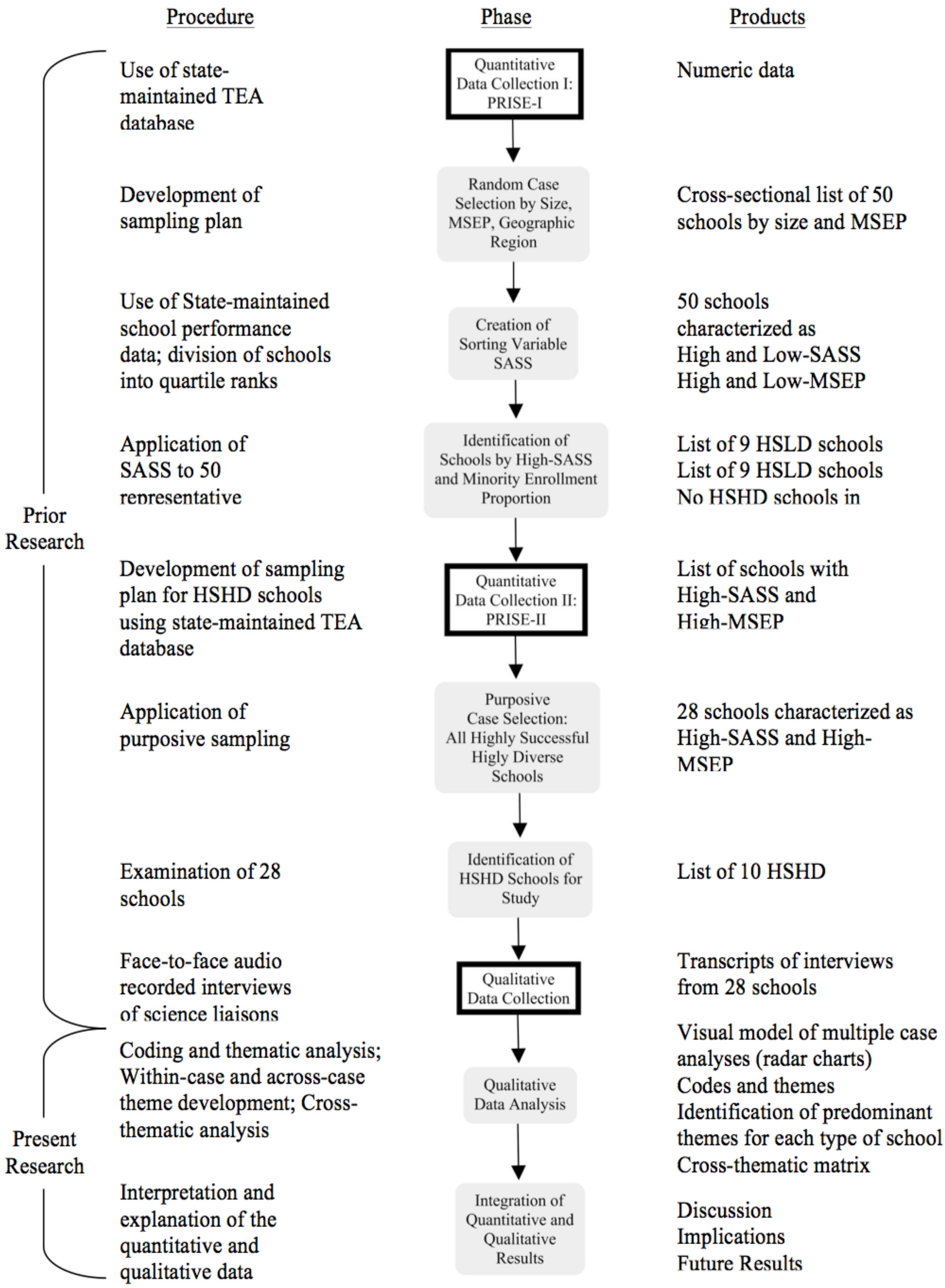

Figure 1. Research diagram.

Alternatively, quantitative studies in our review of literature usually focused on elements related to contextual factors within school infrastructure. MacNeil, Prater, and Busch (2009) in a quantitative analysis of 25,000 students and 1,700 teachers in 29 schools concluded that infrastructural features such as a school's success rating affected the student-learning environment. As a result of these findings, we chose a mixed methods design to blend the types of studies we reviewed in order to identify numerous types of factors that used to describe the science program infrastructures in high schools across Texas.

Conceptual Framework

An ecology metaphor proposed by Weaver-Hightower (2008) helped us conceptualize schools as complex, interdependent, and structural learning environments. As Weaver-Hightower (2008) presented in his metaphor, the ecology of schools consists of actors, actions, and contextual factors. For the purposes of our analysis, we identified actors, actions, and supports as the integral infrastructural components of the science program layer of the school ecology. Infrastructural components, even within a layer, cannot be viewed as deconstructed parts. Infrastructural components are viewed in terms of how they interact within and among the various organizational layers within the school ecology. Without an examination of connections between and among actors, actions, and supports at all layers, we would be unable to view school ecology as a whole, functioning system. An understanding of science program, therefore, is only one layer of the ecology, interconnected with other layers within the entire school system.

Actors in school ecologies interact in complex ways that parallel those found in ecosystems. Ecological terms describing relationships (e.g., competition, cooperation, predation, symbiosis) may be helpful in understanding relationships between and among actors within and among school layers. For example, actors (i.e., students, teachers, support staff, and administrators) may cooperate or even rely on one another to meet a common goal. How actors relate to one another is also affected by environmental boundaries and extant conditions. Schools differ in what these particular boundaries and extant conditions may be, but ultimately personal, support, and task factors intermix to affect how a given school approaches change (Weaver-Hightower, 2008). Taken together, the ecology metaphor provides a powerful conceptual model for understanding the complexity of schools.

Method

Mixed methods research is a pragmatic approach used to consider questions of interest through both qualitative and quantitative lenses. We conducted this sequential exploratory mixed methods secondary analysis of science program infrastructure in two phases. The initial qualitative phase using content analysis for rubric development was followed by a quantitative phase using comparative analysis. The following research questions were considered: (1) Regardless of schools' success and diversity, what elements exemplify science program infrastructure? (2) When comparing highly successful, highly diverse schools with two other types of schools (i.e., highly successful, less diverse schools and less successful, highly diverse high schools), what elements of science program infrastructure are unique to highly successful, highly diverse schools?

Sampling

Schools were identified as highly successful (HS) or less successful (LS) using the School Aggregate Science Score (SASS) created during prior research (Stuessy & Bozeman, 2011). Schools were identified as high diversity (HD) or low diversity (LD) using Minority Student Enrollment Proportion (MSEP) also created during prior research (Stuessy & Bozeman, 2011). Combining these two identifiers allowed us to describe each of 28 schools in our sample as HSHD, HSLD, or LSHD. This analysis used school and teacher level data to describe and model science program infrastructure within and across three high school types: HSHD (n=10), HSLD (n=9), and LSHD (n=9).

Sampling was conducted in two stages. In the first stage, sampling reflected the design used in the original study for which participating schools were selected. A stratified random sampling design was originally used to select the nine HSLD and nine LSHD schools in the current analysis. In contrast, a purposive sampling design was used to select the ten HSHD high schools. In this second stage of sampling, a purposive sampling design was used to ensure selection of representative highly successful and highly diverse high schools.

Phase I

The analysis for this study involved an examination of archived data from interviews with the science teacher leader from each science program within the selected 28 high schools. The first, qualitative, phase of analysis used content analysis of interview data to develop a coding rubric. During the content analysis, reliability was demonstrated when researchers working independently agreed on data elements to be coded, grouped, and categorized (Bogdan & Biklen, 1992). Initiative rubric development relied on a shared analysis of nine science program interviews to establish temporary codes, groups, and categories. Three interviews from each of the three school types (i.e., highly successful, high diversity, HSHD; highly successful, less diversity, HSLD; less successful, high diversity, LSHD) were analyzed. Over a three-week period of peer debriefing and refinement, we generated a rubric containing five major categories divided into 17 groups possessing 60 unique and mutually exclusive elements (see Appendix). Ultimately, this rubric was used to conduct content analyses for all 28 program interviews to enable the interpretation of differences in science program infrastructure across the three types of schools.

We used simple percent agreement to establish inter-coder reliability of the rubric, using methods described by Lombard, Snuder-Duch, & Bracken (2002). Specifically, each researcher used the final rubric to independently analyze program interviews of a subset of nine interviews. Upon completion of the independent analysis, we calculated percent agreement by dividing the total number of agreements for all three researchers by the total number of potential agreements. Using these percentages, final inter-coder reliability for the rubric was determined to be 87%, a value assessed as acceptable by most researchers when conducting exploratory research using content analysis (Lombard, Snyder-Duch, & Bracken, 2002).

Phase II

The second, quantitative, phase of our analysis used frequency and comparative analysis. During frequency analysis, measures of center, spread, and shape were determined by simple counts. We identified the most common elements of science program infrastructure, regardless of school success and diversity, which included information about categories within science program infrastructure identified through the rubric generated during Phase I. During the comparative analysis, differences in measures related to schools' success and diversity were identified and/or tested. We compared the frequency scores for science program infrastructure in the three types of schools (i.e., HSHD, HSLD, and LSHD). In our comparative analysis, we concurred that a higher percentage in HSHD schools was to be used in establishing the criterion of "most likely to occur."

Results and Discussion

The integration of multiple data forms (i.e., qualitative and quantitative data) is a key feature of analysis in mixed methods research. Integration of data provided a way to advance our understanding of the complex, interdependent, and structural elements occurring within high school science program infrastructures. In this section, a summary of results for our analysis is organized by the two research questions.

Elements Exemplifying Science Program

Regardless of schools' success and diversity, what elements exemplify science program infrastructure? The rubric in the Appendix consolidates qualitative elements emerging during the content analysis of interviews from teacher leaders representing 28 science programs. The rubric contains 60 elements within 14 groups and three components. In the content analysis, we achieved consensus that 59 of 60 elements occurred in at least one of the sampled science programs. These results suggest that elements emerging in our analysis would be likely to appear in analyses of infrastructures supporting other schools' science programs residing within the state of Texas. We organized the rubric to include Components (i.e., Actors, Supports, and Program Tasks), Groups (e.g., Teacher Numbers, Group Meetings, Other SP Members) and Elements within groups (e.g., within Teacher Numbers: Many, Several, Few). The frequencies of occurrence for elements are reported on the rubric for HSHD, HSLD, and LSHD schools. These numbers indicate the results of an analysis of interview transcripts in which we applied the rubric to confirm the existence of elements for each school within the sample, to identify the elements best exemplifying elements of science program infrastructures occurring within all three school types, to compare occurrences of elements within each of the school types, and to identify elements most frequently occurring in HSHD schools. We mention here that we report frequencies only to provide evidence of co-occurrence and not as evidence of causal proof that an increase in any of the occurrences of an element would lead to an increase in student success.

Table 1. Percentages of occurrence for 60 science program infrastructure elements in 28 science programs

Component	Element	n	%
	Actors		
Teacher Numbers	*Many (> 6)	**16**	**57**
	Few (1-3)	**8**	**29**
	Several (4-6)	3	11
Group Meetings	Whole group only	**13**	**46**
	*Whole group and subject-area	**7**	**25**
	Subject-area only	1	4
Other SP Members	School principal	**9**	32
	Special education	**8**	**29**
	In-school non science	6	21
	Central office	5	18
Department Head	Appointed	5	18
	Volunteered	**9**	**32**
Identified Leaders within the SP Community	*Department head	**23**	**82**
	*Content area leader	**11**	**39**
	District representative	**10**	**36**
	Curriculum director	**9**	**32**
	Instructional leader	6	21
	Veteran teacher	4	14
	Everyone a leader	3	11
	Supports		
Meeting Frequencies	As needed	**13**	**46**
	More than once a week	**8**	**29**
	Twice a month	4	14
	Once a month	4	14
	Once a week	2	7
Department head compensation	Stipend	**9**	**32**
	Flexibility /time off	4	14
	Reduced teaching load	3	11
Communication	Email, newsletter	**11**	**39**
	Use of opinion surveys	2	7
	With other programs	1	14
	With students	0	0
Decision Making	*Shared /balanced	**18**	**64**
	Top-down	5	21
	Bottom-up	2	7
Department Head Responsibilities	Budget	**12**	**43**
	*Provide professional development	**10**	**36**
	Paperwork	**9**	**32**
	Scheduling	**7**	**25**
	*Instructional coaching	5	18
Department Head Compensation	TAKS tasks	4	14
	Place substitute teachers	1	4
	Stipend	**9**	**32**
	Flexibility/time off	4	14
	Reduced teaching load	3	11
	Program Tasks		
General	*Disseminate information	**13**	**46**
	*Housekeeping	5	18
	*Participate in hiring/staffing	3	11
Assessment	Resolve TAKS issues	**11**	**39**
	*Develop common assessments	6	21
	Examine student work	6	21

Continued

	Program Tasks (continued)		
	Assess teaching with TAKS	4	14
Curriculum	*Plan/share lessons	**14**	**50**
	*Coordinate within content area	**9**	**32**
	*Share lab materials	**7**	**25**
	Align curriculum vertically	5	18
	Choose informal science opportunities	4	14
	*Work in interdisciplinary groups	2	7
	Design informal activities	0	0
	Develop tutorials	1	4
Professional Development	*Choose PD topics	**13**	**46**
	Read books together	4	14
	Conduct action research	2	7
	Adopt targeted strategies	2	7

*Note: *marks elements with highest frequencies and characteristic of HSHD schools*

Table 1 presents a summary of the content analyses of interview data from science program teacher liaisons. The following elements occurred in typical high school SPIs: (a) shared leadership within a diverse community of actors, including teachers, school principals, special education teachers, department heads, content-area leaders, curriculum directors, and district representatives; (b) supports for shared, balanced decision making, including frequent meetings, established communication channels, and explicit department head responsibilities; and (c) tasks extending beyond general actions of disseminating information to include more specific tasks of resolving issues regarding state-mandated test scores, performing curriculum-related tasks, and choosing professional development topics.

The most common elements were: (1) presence of a department head within the program leadership (n=23); (2) shared or balanced autonomy in decision making within the program (n=18); and (3) seven or more teachers within the science program (n=16). Less common, but still describing the typical science program infrastructure were four additional elements: (1) meeting frequencies as needed (n=15); (2) information dissemination as a program task (n=13); and (3) use of email and/or newsletter communication (n=11). Taken together, these nine elements exemplified typical high school science program infrastructure.

Elements of Science Program Infrastructure Most Frequently Occurring in HSHD Schools

When comparing highly successful, highly diverse schools with two other types of schools (i.e., highly successful, less diverse schools and less successful, highly diverse high schools), what elements of science program infrastructure are unique to highly successful, highly diverse schools? Table 1 also identifies the elements of science program infrastructure most frequently occurring in HSHD schools.

Actors within HSHD schools were most likely to have more than six members (57%); meet in both whole group and subject-area groups (25%); and share leadership responsibilities among department heads (82%), content-area leaders (39%) and/or curriculum directors (32%). Supports were most likely to include established communication channels by email and/or newsletters (39%), shared/balanced decision-making (64%), and department head responsibilities related to teacher learning, either by professional development (36%) and/or instructional coaching (18%). Program tasks were most likely to include general tasks of disseminating information (46%), housekeeping (18%), and hiring new science teachers (11%); and more specific curriculum tasks of planning/sharing lessons (50%), within-content area coordination (32%), sharing laboratory materials (25%), and working in interdisciplinary groups (7%).

In order to visually represent our findings, we created a spider diagram in which you can see the most common elements (Figure 2). As seen in the diagram, HSHD schools are more likely to have whole-group science program meetings, be involved in general tasks of information dissemination and curriculum tasks of lesson planning/sharing, have content area leaders, with department heads providing PD, and possessing shared/balanced decision making. (Also see the rubric in the Appendices displaying frequency counts for each of the characteristics displayed in Figure 2.).

Conclusion

The rubric designed in this study contained a large number of individual elements (n=60). However, only 20 elements of the 60 elements occurred at a frequency above 29%. (Refer to Table 1.) Most frequently (> 45%) identified elements included department heads as leaders (82%), shared/balanced decision making (64%), teacher numbers > 6 (57%), SP meetings occurring as needed (54%) in whole groups (46%), with program tasks including planning/sharing lessons (50%), information dissemination (46%), and choosing PD topics (46%). In reference to the ecology metaphor, Actors, Actions (SPI Tasks), and Supports are identified by these elements. In addition, our findings suggest that science program infrastructures in HSHD schools are different from the infrastructure of science programs in HSLD and LSHD schools. Specifically, infrastructure within HSHD schools differed in Actors (teacher numbers, both whole group and subject-area meetings), types of actor-leaders (principals and content-area leaders), shared decision making with department heads providing both professional development and instructional coaching, and SP tasks including more general and specific tasks, especially regarding curriculum, sharing materials, and working in interdisciplinary groups.

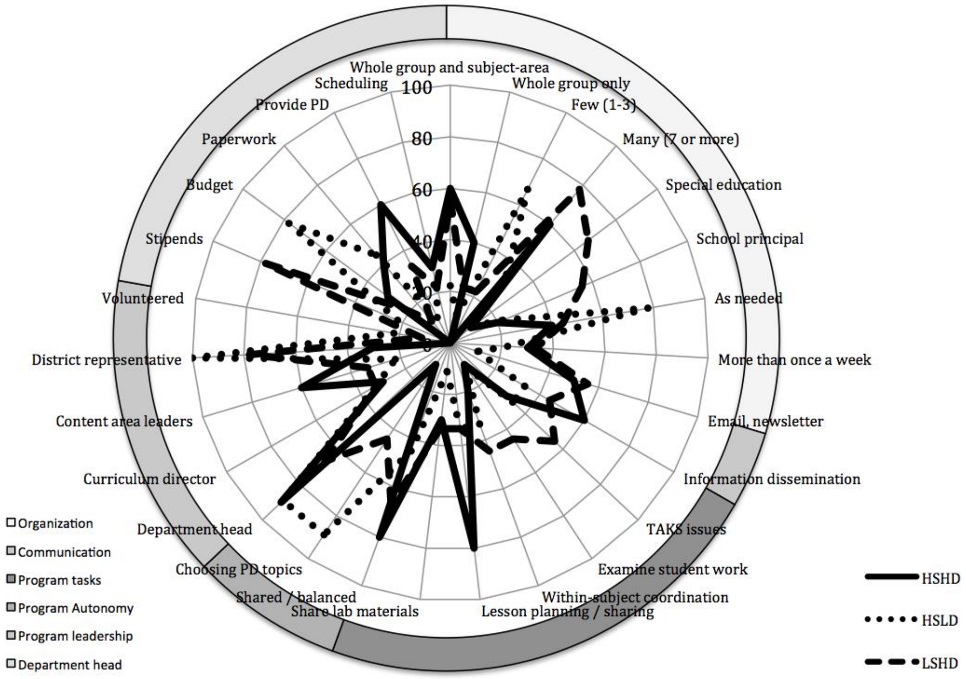

Figure 2. Most frequent elements of science program infrastructure occurring in HSHD schools.

Table 2 summarizes a qualitative cross-case comparison of the 16 elements identified from the analysis to most likely occur in HSHD schools. The cross-case comparison yielded two predominant categories of SP infrastructure elements most likely to occur in HSHD schools: Cross-Cutting School Community Structures (existing within the Whole SP, within Content-area Groups, and extending Outside the SP Community); and Shared Leadership (Distributed Leaders and Department Head Leadership in Professional Learning).

Cross-element comparisons revealed two infrastructural emphases for HSHD schools: Cross-Cutting Community Structures and Shared Leadership. These results suggest that the science program environment in HSHD schools, when compared to HSLD and LSHD schools, demonstrates differences in terms of their distributed leadership and professional learning roles of their science department heads.

Further evidence of exemplary practice is provided by the *National Science Education Standards* A and F, which explicitly describe the needs for effective science education in terms of community involvement and leadership. Standard A states the need for clearly defined leadership at the school and district levels "vested in a variety of people, including teachers, school administrators, and science coordinators" (p. 212) in order to provide opportunities to learn and teach science. Standard F identifies strong leadership as a quality of effective communities of learners, recommending a dramatic change from the "hierarchical and authoritarian leadership often in place in schools and in schools districts today," with a leadership structure "inevitably [requiring] that teachers and administrators rethink traditional roles and responsibilities and take on new ones" (p. 223). Such is the case with the SPI of HSHD schools. A shared leadership structure was identified more frequently in HSHD

(80%; 8 out of 10) schools than in their less diverse (49%; 4 out of 9) or less successful (67%; 6 out of 9) counterparts. Furthermore, department heads, curriculum directors, and content area leaders were most likely to be identified as leaders within HSHD schools. Furthermore, responsibilities for budget, scheduling, and paperwork for department heads were more likely to extend beyond these more traditional roles to include department heads as instructional coaches and professional development providers. (These frequencies of occurrence as evidence of diversified leadership roles can be reviewed in Table 2.)

Table 2. Elements of SP infrastructure most likely to occur in highly successful, highly diverse schools

	School Community Structures			Shared Leadership	
Elements	Whole SP	Content-area	Outside SP community Within- and outside-school	Distributed Leadership	Department Head Leads Professional Learning
Teacher numbers > 6	X				
Meetings	X	X			
Department head leaders	X			X	
Content-area leaders	X		X	X	
Curriculum director leaders	X		X	X	
Communication by email and newsletters	X		X	X	
Shared/balanced decision making	X			X	
Dept head responsibilities for professional development					X
Dept head responsibilities for instructional coaching					X
SP Task disseminate information	X			X	
SP Task housekeeping	X			X	
SP Task hiring new science teachers			X	X	
SP Task planning/ sharing lessons		X			
SP Task within-content area coordination		X			
Sharing laboratory materials	X	X			
Working in interdisciplinary groups		X	X		
Totals	10	4	4	8	2

The National Science Education Standard F also maintains that schools must work as communities "that encourage, support, and sustain teachers" (p. 222) as they implement an effective science program:

> Many previous reform efforts have failed because little attention was paid to the connection between teacher enhancement, curriculum development, and the school as a social and intellectual community. Teachers with new ideas, skills, and exemplary materials often worked in an environment where reform was not valued or supported. (p. 222)

Evidence of community structures such as those described in the Standards is provided in HSHD schools by the higher frequencies of occurrence for several SPI elements. HSHD schools were most likely to meet in whole groups and subject-area groups; these schools were also most likely to identify content-area leadership within the SPI. They identified shared/balanced decision making more frequently than the other two types of schools, and they identified general and specific tasks more frequently in terms of housekeeping, information dissemination, developing common assessments, planning/sharing lessons, and sharing laboratory materials. Overall, HSHD schools exhibited more of the Standards-based qualities of "community" and "leadership" than in the other two types of schools.

Recommendations

Our design of the rubric for identifying elements within SPI is a "first" in terms of identifying the elements of infrastructure currently existing within high school science programs. Development of the rubric allowed us to identify the most common elements composing science program infrastructures and to compare science program infrastructures across different school types. Random sampling led to our ability to generalize to all schools within the state of Texas, including the few HSHD schools purposively chosen to represent an important subgroup residing within the populations of all Texas high schools. We recommend that other schools desiring to strengthen their SPI use the rubric as a starting point to identify critical elements within their own infrastructures, particularly those involving community and leadership structures.

Our findings also support that identification of HSHD schools as potential leaders in developing stronger SPI for schools struggling with issues related to equitable and effective policies and practices supporting decision-making and task completion at the science program level. This study has also contributed to information for the previous research initiative striving to identify the unique qualities associated with the powerful group of "achievement gap" schools. As such, the findings of this study contribute to the much broader ecological perspective used by our research group to define an exemplary model for highly successful, highly diverse high schools in Texas.

Scientific Ethics Declaration

The authors declare that the scientific ethical and legal responsibility of this article published in JESEH journal belongs to the authors.

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Appendix

Overall Inter-Rater Agreement 87.0%	Organization 86.9															Communication 96.3			
	Groups and Subgroups 87.7			Teacher Numbers 100.0			Other SP Members 76.0				Meeting Frequency 83.7					Within SP 92.6		Outside SP 100.0	
	Whole group and Subject-area	Whole-group only	Content/subject only	Few (1-3)	Several (4-6)	Many (7 or more)	Special education	In-school non-science people	Central Office	School principal	As needed	Once a month	Twice per month	One a week	> Once a week	Email, newsletters	Opinion surveys	Students	Other programs
HSHD	6	4	1	0	3	6	1	2	1	2	4	2	2	1	3	5	1	0	0
HSLD	2	1	0	6	0	3	1	1	1	2	7	1	1	0	2	1	1	0	1
LSHD	5	2	0	2	0	7	6	3	3	5	4	1	1	1	3	5	0	0	0

SP Tasks 86.0																Leadership Within SP 80.9						
General 89.2		Review Student Progress 80.3			Curriculum 82.7						Program-Level PD and Improvement 95.6					School-Level 84.0						
Housekeeping	Information dissemination	TAKS Issues	Common assessments	Examine student work	Within-subject coordination	Vertical alignment	Lesson planning/sharing	Sharing lab materials	Developing tutorials	Interdisciplinary grouping	Reading books together	Design informal sci activities	Action research	Adopt targeted strategies	Assess teaching with TAKS	Department head	Curriculum director	Instructional leader	Content area leaders	Veteran teachers	Everyone a leader	District-level Representative 77.8
3	6	3	3	1	2	0	8	3	0	1	1	0	0	0	1	9	3	2	6	0	1	3
1	3	3	1	1	3	4	3	1	0	1	1	0	0	0	3	8	3	1	2	2	0	0
1	4	5	2	4	4	1	3	3	1	0	2	0	2	2	0	6	3	3	3	2	2	7

Department Head 85.3												SP Autonomy in Decision Making 86.4					
Assignment 77.8		Compensation 95.1			Duties 83.1							Overall 87.7			Operational Matters 85.2		
Appointed	Volunteer	Stipends	Reduced Teaching Load	Flexibility/Time Off	Budget	Scheduling	Paperwork	TAKS Tasks	Instructional Coaching	Provide PD	Place Substitute Teachers	Bottom-Up	Shared/Balanced	Top-Down	Hiring/Staffing Involvement	Choosing Topics for PD	Informal Sci Opportunities
1	0	0	0	0	3	3	4	0	3	6	0	0	8	2	3	1	2
1	2	2	0	1	7	2	4	2	0	1	0	2	4	2	0	8	0
3	1	7	3	3	2	2	1	2	2	3	1	0	6	2	3	4	2