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Integrative Mixed Methods Data Analytic Strategies in Research on School Success in Challenging Circumstances

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There are both conceptual and practical challenges in dealing with data from mixed methods research studies. There is a need for discussion about various integrative strategies for mixed methods data analyses. This article illustrates integrative analytic strategies for a mixed methods study focusing on improving urban schools facing challenging circumstances. The research was conducted using a concurrent mixed methods approach. The qualitative and quantitative strands of data were analyzed independently through thematic analysis of qualitative data and factor analysis of survey data, followed by integrative data analytic procedures. The integrative data analytic approach included strategies such as parallel integration for member checking, data transformation for comparison, data consolidation for emergent themes, and case analysis for fine-grained descriptions of school profiles. The integrative data analysis process featured the iterative nature of mixing data sources at various points and allowed the researchers to pay attention to emergent insights made available through mixed methods research.

Keywords: *mixed methods research; mixed methods integrative data analytic strategies; school success in challenging circumstances; concurrent mixed method; data transformation; data consolidation; case analysis*

Mixed Methods Research

The purpose of this article is to contribute to the methodological discussion about mixed methods integration of the findings from qualitative and quantitative strands of data. To this end, we base our discussions on our research project that used concurrent mixed methods research (Teddlie & Tashakkori, 2006) to investigate school improvement

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processes in elementary schools facing various challenging circumstances (McDougall et al., 2006). In this article, in response to a call for more systemic research into mixed methods integration of findings (Bryman, 2007; Johnson, Onwuegbuzie, & Turner, 2007), we illustrate various integrative data analytic strategies such as parallel integration for member checking, data transformation, data consolidation, and case analysis.

Mixed methods research is increasingly being used as an alternative to the traditional mono-method ways of conceiving and implementing inquiries in education and social sciences (Brewer & Hunter, 2006; Creswell, 1994; Creswell & Plano Clark, 2007; Greene, Caracelli, & Graham, 1989; Howe, 1988; Reichardt & Rallis, 1994; Tashakkori & Teddlie, 1998, 2003). In conceptualizing mixed methods studies, various paradigmatic assumptions are still being debated. For example, paradigm purists argue that paradigmatic integrity should be maintained, as paradigms are fundamentally different and have incompatible assumptions about human nature and the world, and so knowledge claims cannot be mixed (Guba & Lincoln, 1989; Smith, 1983; Smith & Heshusius, 1986). However, many researchers have stated that the paradigmatic differences have been overdrawn (Brewer & Hunter, 2006) and that paradigmatic incompatibility makes dialogue among researchers less productive (Tashakkori & Teddlie, 1998).

Researchers further acknowledge that philosophical differences are reconcilable through new guiding paradigms that actively embrace and promote mixing methods. For example, the pragmatic stance (House & Howe, 1999; Johnson et al., 2007; Morgan, 2007; Patton, 1988; Tashakkori & Teddlie, 2003) rejects traditional dualism and prefers action to philosophizing by privileging inquiry questions over assumptive worlds. This stance endorses methodological pluralism because, in practice, most research questions cross paradigmatic boundaries. In other words, one should choose methods that are most likely to provide evidence useful for answering important research questions given the inquiry objectives, research context, and the available resources.

The dialectical stance (Greene & Caracelli, 1997) suggests that assumptive differences in paradigmatic views exist and that such differences are important and thus cannot be ignored and are unlikely to be reconciled. However, combining critical factors of knowledge claims from different paradigms or different values and interests from different methodological traditions can enhance mixed method practice. These pragmatic and dialectical stances regard tensions invoked by juxtaposing different paradigms as a potential way to gain more insightful evaluative understandings.

Recent mixed methods research practices have been strengthened thanks to various mixed methods design alternatives that allow researchers to link the purpose of the research to methodologies and integrate findings from mixed methods (see Caracelli & Greene, 1997; Creswell, 1994; Creswell & Plano Clark, 2007; Greene et al., 1989; Maxwell & Loomis, 2003; Tashakkori & Teddlie, 1998, 2003; Teddlie & Tashakkori, 2006). Caracelli and Greene (1997) proposed two broad categories of mixed methods research design alternatives: component designs and integrated designs. The component designs are distinguished from the integrated designs in that the different methods remain discrete through data collection and analysis and that mixing the methods takes place at the level of interpretation and inference. Examples of the component designs include triangulation, complementarity, and expansion designs. The classic view of a triangulation design is to seek convergence on a single perspective of a particular social phenomenon

and to strengthen validity by offsetting biases resulting from various sources such as substantive theories, researchers, and methods (Denzin, 1978; Mathison, 1988). However, many mixed methods methodologists acknowledge that mixed methods research can provide not only converging but also inconsistent and contradictory results (Caracelli & Greene, 1993; Mathison, 1988), which leads to in-depth analysis for substantiating such inconsistency.

A complementary mixed methods design aims for elaboration, clarification, and explanation by using different methods either within a single research paradigm or across different paradigms. An expansion design aims for the breadth of the inquiry by incorporating methods for different components of the inquiry in a parallel fashion. These complementary and expansion designs can be accomplished with an integrated analytic approach depending on the degree of heterogeneity of findings from the different methods (Caracelli & Greene, 1993). Such heterogeneity will naturally lead researchers to revisit the data across methods to substantiate the nature of the observed heterogeneity.

Integrated mixed methods designs differ from the component designs in that “mixing” takes place throughout the inquiry from data collection to analytic processes and to interpretation. Examples of the integrated designs include iterative (or developmental), nested (or embedded), holistic, and transformative designs. Iterative designs allow researchers to move back and forth between quantitative and qualitative methods. Embedded designs are often characterized by the priority given to quantitative and qualitative methods. An example of such a design is Maxwell, Bashbook, and Sandlow’s (1986) study, which integrated an ethnographic design into a quasi-experimental design. Transformative mixed methods designs aim to achieve political dimensions oriented toward actions through the mix of different methods from the different inquiry traditions.

Teddlie and Tashakkori (2006) also provide a comprehensive mixed methods research design framework using the methods–strands matrix and discuss four families of mixed methods designs: concurrent, sequential, conversion, and fully integrated. Concurrent designs are similar to Caracelli and Greene’s (1997) component designs in that qualitative and quantitative strands are implemented independently throughout data collection and analysis. An advantage of this design is that researchers can verify and generate theories by utilizing both qualitative and quantitative strands. Results from both strands are synthesized to make inferences about the inquiry problem. Similar to Greene and Caracelli’s developmental design, sequential designs utilize qualitative and quantitative strands chronologically. The preceding strand is used to formulate questions, develop instruments, or form hypotheses to be tested in the next strand. Major findings are synthesized based on the results of both strands.

Teddlie and Tashakkori’s (2006) conversion and fully integrated designs both feature a multistrand concurrent design where mixing occurs throughout all stages. In the conversion designs, either type of data (qualitative or quantitative) is collected and analyzed accordingly. Subsequently, the results are transformed for further analysis using the other methodological approach. For example, quantitative data are converted into narratives that can be analyzed qualitatively (qualitizing), and qualitative data are converted to numerical codes that can be statistically analyzed (quantizing). The fully integrated designs mix qualitative and quantitative approaches in an interactive and iterative manner throughout the

study. At each stage, the two approaches interact with each other by affecting the formation of the other.

While these mixed methods design alternatives are useful for clarifying the inquiry purpose and linking it to methodologies, in practice such design options are neither exclusive nor singular because actual mixed methods studies are often much more complex than any single-design alternative can adequately represent (Greene et al., 1989; Maxwell & Loomis, 2003; Teddlie & Tashakkori, 2006). In addition, the opportunistic design, the mix of different methods from different research traditions, may have the potential for creating a new component of the design in addition to a predetermined design (Teddlie & Tashakkori, 2006).

In recent years, researchers have welcomed new journals, articles, and books devoted to dealing with methodological reflections on the integration of mixed methods data and of findings (Brannen, 2005; Brewer & Hunter, 2006; Creswell & Plano Clark, 2007; Li, Marquart, & Zercher, 2000; Morgan, 2007; Weisner, 2005). Researchers have benefited from detailed illustrations and reflections that delineate the processes of mixed methods research work. Despite burgeoning proliferation of mixed methods research, many leading mixed methods researchers call for more systematic research into integrative mixed methods research practice (Johnson et al., 2007). This is not new, considering Greene et al.'s (1989) call for this almost two decades ago. We believe that our illustration of integrated analytic strategies used in this mixed methods research will serve other researchers and practitioners seeking practical guidance through examples of mixed methods study. Based on insights learned from the mixed methods study of urban schools facing challenging circumstances, we aim to illustrate the use of data analytic strategies, documenting the logic underlying rather messy data analytic processes from independent and parallel data analyses of qualitative and quantitative data to data transformation, data consolidation, and school case analysis.

Research on School Success in Challenging Circumstances

Canadian and British educational reform efforts have paid considerable attention to identifying the difficult and challenging circumstances that schools face and the pathways through which some of these schools attain improvement in spite of these challenging circumstances (Gore & Smith, 2001; Harris & Chapman, 2001; Maden, 2001; McDougall et al., 2006; Muijs, Harris, Chapman, Stoll, & Russ, 2004). These challenging circumstances are the result of various factors, such as (a) student risk factors, such as poor physical and mental health and low attention span; (b) family stressors, such as low socioeconomic status and high levels of parental unemployment; and (c) school and community risk factors, such as staff turnover, student mobility, and community violence (Alexander, Entwisle, & Kabbani, 2001; Ed, 2001; Levin, 2006; Morales & Guerra, 2006).

A number of studies of successful schools in challenging circumstances have provided empirical evidence of school improvement and effectiveness by addressing themes related to instructional practice (Hopkins, 2001; Reynolds, Hopkins, Potter, & Chapman, 2001), leadership (Hargreaves & Fink, 2006; Harris & Chapman, 2001; Leithwood & Steinbach, 2002; Murphy, 2002; Ryan, 2006; Spillane, 2006), use of data for school improvement

(Bernhardt, 2004; Bray, 2005; Connell, 1996; Earl & Katz, 2005; Hopkins, 2001), positive school culture (Joyce, Calhoun, & Hopkins, 1999), learning community (Louis & Kruse, 1995), professional development (Freeman, 1997; Guskey, 2000; Randi & Zeichner, 2004; Van Horn, 2006), parent involvement (Henderson & Berla, 1994), and resources (Muijs et al., 2004). Although all students face probabilities of risk, the disparity in academic attainment among students from different home backgrounds continues to be a serious concern for educators (Gore & Smith, 2001). It is of interest then how these factors found in successful schools in challenging circumstances mediate the student, family, school, and community risk factors in bridging this attainment gap.

Of particular interest are the challenges faced by recent immigrant families to Canada as they seek school success for their children. These immigrants face a number of challenges related to settlement, language, and employment. A critical component to immigrant families' successful settlement within a school and school community is the ability to communicate with other school participants. Although some schools are able to provide translation services to these families, other schools do not have the funds or resources needed for this critical service (McDougall et al., 2006). As a result, some immigrant parents may feel disconnected from their children's new school and the surrounding school community (Ed, 2001; Rimm-Kaufman, Pianta, Cox, & Bradley, 2003). In addition, their children's experiences may be further complicated as many of the students are caught between the two worlds of trying to integrate into the school system and returning home at the end of the day to the cultural values and traditions of their parents.

Despite these challenging circumstances, there are schools that have demonstrated success in fostering the development of students who are from immigrant families and are learning English as a second language (ESL) and who come from low socioeconomic family backgrounds. Regardless of the social and community challenges these schools face, they have exhibited improved learning outcomes (Barth et al., 1999). Schools that demonstrate success while taking into account social equity issues are of particular interest in Ontario given the multicultural values that are honored as a means to ensuring educational excellence.

There is an emerging voice that research on school improvement needs to be grounded in specific school contexts and to be sensitive to the unique challenging circumstances faced by each school—so that the inherent social inequities in these school contexts can be appropriately acknowledged and addressed (Thrupp & Lupton, 2006). The methodologies employed by research into school improvement and success have ranged from case studies, which conduct rich descriptions of individual schools and their dynamics, to large multilevel or nested-design studies, which examine patterns (Teddlie, Reynolds, & Sammons, 2000). In this article, we draw on qualitative and quantitative methodologies to provide context-rich understandings of a multidimensional construct of school improvement over multiple challenging circumstances. With this expanded methodology, we provide evidence-based accounts of factors associated with school improvement in Ontario schools.

The Schools With Challenging Circumstances (SCC) research project was initiated and implemented through collaborative partnerships between two urban school districts in Canada, the Ontario Ministry of Education, and a team of researchers at the Ontario Institute for Studies in Education of the University of Toronto. The purpose of the project was

to contribute to the knowledge base regarding student success in schools facing challenging circumstances, with a particular emphasis on innovative leadership practices. Given the need for richer descriptions of leadership practices within schools facing challenging circumstances, the primary aim of this project was to provide evidence-based accounts of factors associated with school improvement and student achievement and to further add to the understanding of factors and dynamics associated with sustained improvement in student learning.

Methods

Overview of the Study Design

The research team employed a concurrent mixed methods research design (Teddlie & Tashakkori, 2006) to gain insight into the factors associated with success in schools facing challenging circumstances and to gain an in-depth understanding of the dynamics associated with sustained improvement in student learning. Twenty elementary schools were purposefully selected based on criteria that included steady improvement in school academic attainment over the past 3 years and the degree of challenging circumstances, such as ESL and special education students, staff and family mobility, and socioeconomic family background. Each district selected 10 schools based on the criteria. Once the schools were selected, the research team implemented a concurrent mixed methods research design, composed of qualitative approaches using interviews with teachers and principals and focus groups with students and parents, and a quantitative survey of principals and teachers. This concurrent mixed methods design was to serve the complementarity function in that the general description of school improvement from the survey was enriched, elaborated, and clarified with contextually specific accounts of school success from interviews involving multiple perspectives. In the following sections, we describe the school selection procedure and the concurrent mixed methods data collection procedures.

Selection of Elementary Schools

Twenty elementary schools were invited to participate in this study. Based on a set of selection criteria, these schools were selected from two urban school districts in Canada. These schools were selected because they had been successful in improving students' academic achievement despite a variety of challenging circumstances that they faced, including high staff turnover rates, high numbers of ESL and special education students, and low socioeconomic family background. For example, 10 schools selected from one district showed a high mobility rate (8%), a number of special education students (11%), and high numbers of ESL students (29%). Another important selection criterion was that, despite such challenging circumstances, the sample schools have shown steady improvement in students' academic attainment from the provincial literacy and math assessments over the past 3 years, as shown in Figures 1 and 2. However, we understand that, by selecting only successful schools, we would be unable to describe the experiences of unsuccessful schools. Thus, we

Figure 1
Student Achievement From the Grade 3 EQAO (Education Quality and Accountability Office) Assessment in District A

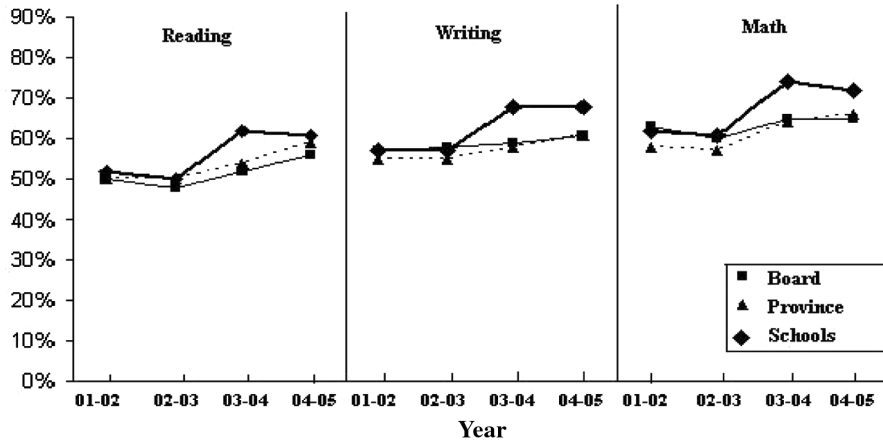
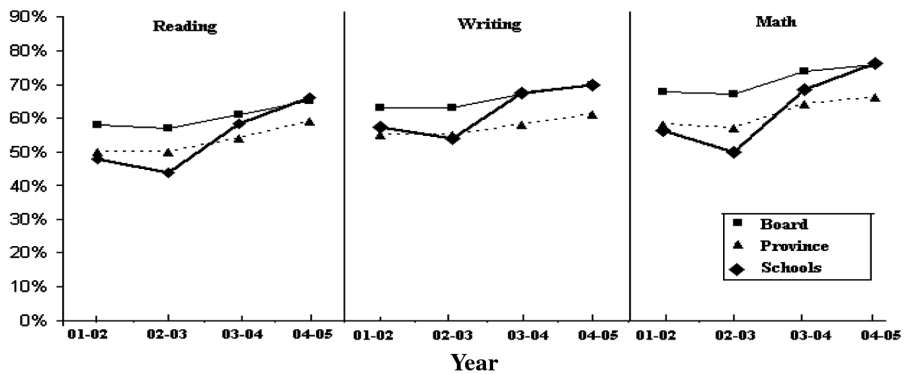


Figure 2
Student Achievement From the Grade 3 EQAO (Education Quality and Accountability Office) Assessment in District B



were interested in describing the characteristics of school success in schools that demonstrated steady academic improvement despite various challenges.

Figures 1 and 2 compare percentages of Grade 3 students who have met or scored beyond the provincial standard (Levels 3 and 4) with those from the district and provincial populations over 4 years.

In Figure 1, the 10 schools in District A outperformed both the district and provincial populations. In Figure 2, the 10 schools in District B exceeded only the provincial population and

got closer to the district average in the 4th year. The figures clearly show academic improvement over time, especially since the academic year 2003-2004, in all tested subject matters. Although the schools in the two districts showed slightly different trends, all 20 schools showed similar overall performance levels.

Data Collection Procedures

School Life Survey

To learn more about the school culture and leadership practices, we used the School Life Survey (J. Ross, Hannay, & Brydges, 1998). This survey was developed to track school improvement in elementary and secondary schools. The authors found that the scales were internally consistent and sensitive to district-level interventions (J. Ross et al., 1998). The survey contains 75 items on a six-point Likert-type scale ranging from *strongly disagree* to *strongly agree*. The survey data were collected from 440 participants, including 20 principals and 420 teachers, to gather information about school staff members' perspectives on school life related to school improvement. The 420 teachers represented more than 95% of the teachers in the 20 sample schools.

Interviews and Focus Groups

SCC research team members conducted 80 individual interviews and 40 focus group interviews over several months in 2006. The interview participants were 20 principals and 60 teachers. Three teachers were randomly selected from each of the 20 schools and were invited to individual interviews. Each interview took approximately 40 minutes and was audiotaped. The interviews were semistructured and probed such issues as, "What counts as success for students in this school?" "How does school administration work collaboratively with staff to put into place both processes and programs that are effective?" "How do you create an environment which supports success?" and "What challenges have you faced in trying to create a culture that supports student achievement in literacy and numeracy?"

The focus group interviews included 20 groups of Grade 5 and 6 students and 20 groups of parents, with two focus groups per school. Participation was invitational and voluntary. Each group consisted of 4 to 6 participants. The main themes explored in the focus groups were the participants' perspectives about the meaning of school success, the characteristics of school culture, the challenges they face, and their educational goals. Each focus group session took approximately 40 minutes and was audiotaped.

Mixed Methods Data Analytic Strategies

Overview of the Data Analyses

At the outset, qualitative interview and focus group data and quantitative survey strands of data that were collected concurrently were analyzed independently. The qualitative data

from 80 interviews with principals and teachers and 40 focus groups with students and parents were analyzed inductively. The results of the qualitative data analysis resulted in 11 themes associated with school improvement. The surveys of 440 teachers and principals were factor analyzed to reduce the observed variables into a smaller number of factors underlying the school participants' perspectives about school improvement. The statistical analysis resulted in nine factors with reliable internal consistency (all exceeding the criterion of $\alpha = .75$).

The research team provided the participating schools with a progress report containing a four-page summary of the descriptive statistics from the survey and a narrative of the school context and key characteristics from the qualitative data analysis. The participants offered their feedback about the progress report. Most of the feedback was factual, for example, the number of students in the school and the number of ESL students. These corrections were made in the reports and the data files. No changes were necessary in the themes or the findings based on this review.

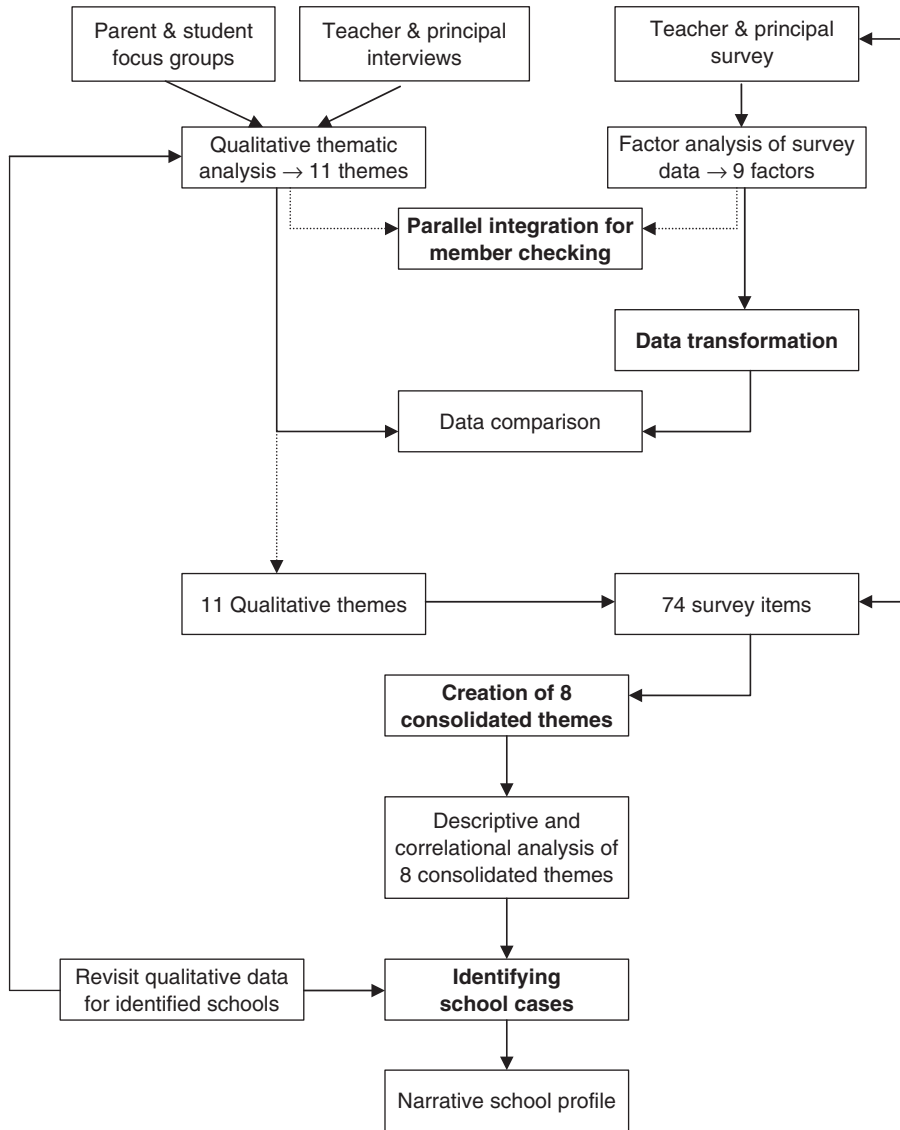
The results from the parallel analyses of the qualitative and quantitative data were compared together for synthesis through data transformation. The results from the survey data were transformed into narrative descriptions of the nine factors. Although both strands captured some overlapping aspects of school improvement, the results from the qualitative data provided additional information about the characteristics of school improvement. Furthermore, inconsistencies were also observed. Whereas the qualitative data indicated variability in school practice among the schools, the survey data did not show much difference in school staff members' perspectives about school improvement. Therefore, we took integrative analytic approaches using data consolidation and case analytic strategies to gain an in-depth understanding of the causes of these inconsistencies. Figure 3 summarizes the mixed methods data analysis procedure employed in this study. In the following section, we describe the data analytic strategies in detail along with a synopsis of the study results.

Parallel Analyses of Quantitative and Qualitative Data

Analysis of Quantitative Survey Data

The School Life Survey instrument has been validated by the instrument developers (J. Ross et al., 1998). The survey data ($N = 440$) with 75 items were analyzed by employing exploratory factor analysis to ensure the internal reliability of the factor structure given the observed data. One item performed poorly and was excluded from the analysis. Principal component analysis using the eigenvalue-one criterion resulted in nine factors that seemed to provide a parsimonious description of the data. These nine factors were labeled school goals, shared decision making, school change history, school culture, professional learning, school and community, school leadership, collective teacher efficacy, and data-based decision making. These factors exhibited reliable internal consistency (Cronbach's alpha ranging from .77 to .90). The means and standard deviations for these factors (see Table 1) were examined for individual schools and for the entire sample of schools.

Figure 3
Mixed Methods Data Analytic Procedures



Analysis of Qualitative Interview and Focus Group Data

The transcripts from the 80 interviews and 40 focus groups were analyzed inductively. First, the qualitative data were reorganized according to background categories such as schools, participant types, districts, and topics, which served as a bin for further analysis. The research team read through the transcripts and coded the data independently. We compared our coding using memos, and we identified 16 core categories. In the second

Table 1
Descriptive Statistics for the Nine Factors From the Survey Data ($N = 440$)

Factor	Number of Items	<i>M</i>	<i>SD</i>	Cronbach's α
School goals (Hopkins, Ainscow, & West, 1994; Rosenholtz, 1989)	7	4.90	0.28	.81
Shared decision making (Heller & Firestone, 1995; Louis & Smith, 1990; D. Ross & Webb, 1995)	7	4.20	0.29	.82
School change history (Darling-Hammond, 1995)	7	4.66	0.39	.83
School culture (Cousins, Ross, & Maynes, 1994; McCartney & Schrag, 1990)	6	4.79	0.28	.76
Professional learning (Fullan, 1993)	7	4.67	0.30	.78
School and community (Epstein, 1991; Fullan, 1990)	7	4.47	0.33	.77
Distributed leadership (Leithwood, Jantzi, & Steinbach, 1999)	12	4.83	0.29	.90
Collective teacher efficacy (Goddard, Hoy, & Woolfolk Hoy, 2004)	12	4.34	0.42	.85
Data-based decision making (Rosenholtz, 1989)	7	4.62	0.27	.77

round of analysis, we drew our attention to a lack of clarity and redundancy inherent in some of the 16 themes. We compared examples of text coded by themes and explored the links among the themes. Through the iterative analysis process, we concluded that some of the themes overlapped. Accordingly, some themes were combined, resulting in 11 major themes: distributed leadership; professional learning; communication; access to programs and resources; school culture; diversity in learning; child's social, emotional, and behavioral (SEB) development; building literacy and numeracy; data-based decision making; parental involvement; and community outreach. We reached high interrater consistency when we recoded the data using the 11 themes. The resulting themes were examined across participant types (i.e., principals, teachers, parents, and students) to identify commonalities and discrepancies within and across the themes. Brief descriptions of the 11 themes are presented in Table 2.

Integrative Data Analytic Strategies

Parallel Integration for Member Checking

The research team provided the participating principals with a report containing the preliminary results from the data analyses. Each school report contained a four-page summary with (a) a description of the school context, (b) key characteristics of school success

Table 2
Descriptions of the 11 Themes Based on the Interview and Focus Group Data

Theme	Description
Distributed leadership	This suggests that many school participants, rather than just the principal, are involved in leadership activity. The expertise is considered to be distributed across many people, and this allows the potential leadership group to develop initiatives from across the school to be adopted, adapted, and improved by others. This is a group activity rather than an individual action.
Professional learning	This is defined as the processes and activities designed to increase the knowledge, skills, and attitudes of educators.
Communication	A key element is that teachers are learners and must be supported as they increase their professional knowledge. This is defined as providing opportunities for open dialogue between people or groups. This theme focuses on the availability of stakeholders to talk to other stakeholders.
Access to programs and resources	This is defined as the ability to get funding and external resources to support school initiatives. These programs also include extracurricular activities and socioemotional programs for families and communities.
School culture	This is the atmosphere in the school. A positive school culture focuses on the friendliness of the staff and gives a sense of being welcome, has an attitude that learning is a goal, and has a focus on student achievement.
Diversity in learning	This consists of four subcategories: socioeconomic diversity, cultural diversity, diversity of instructional practices, and celebrations of achievement and diversity. The theme refers to the ability to show awareness and sensitivity to the variables of diversity within the school communities.
Child's social, emotional, and behavioral (SEB) development	This refers to the issues of SEB that affect a student's ability to achieve academic success. They range from children receiving proper nutrition to the school promoting a feeling of safety and offering programs that address the SEB aspects of a child's development.
Building literacy and numeracy	This refers to the cognitive development of literacy and numeracy in schools. This theme includes literacy and numeracy programs, diversity and English as a second language, and professional learning.
Data-based decision making	This refers to how educators use data to make decisions about programming, professional learning, and school planning.
Parental involvement	Embedded in this theme are the roles of assessment, evaluation, and accountability in relationship to successful schools. This refers to the role parents play in school life. This involvement ranges from participation in their children's education at school and at home, participation in decision making at the school level, and providing assistance at school programs and activities.
Community outreach	This refers to the contributions made by the community to the school and the degree to which school personnel reach out into the community. These community connections exist beyond the formalized educational settings.

from the qualitative data analysis, and (c) results from the survey with graphic displays. The purpose of engaging the participants at this stage was to ensure that our interpretations accurately reflected the participants' perspectives and experiences and the school contexts. We asked for their critical comments on the preliminary findings, and the participants' feedback was addressed in the subsequent data analysis. Integration of the results from the mixed methods data in these interim reports for member checking was rather limited because the results were presented in parallel without their integrated interpretations.

Data Transformation for Comparison

We agreed that the results from the independent analyses of the qualitative and quantitative data provided both overlapping and different aspects of the characteristics of school improvement. For example, five themes associated with distributed leadership—professional learning, positive school culture, data-based decision making process, and community outreach—were supported by both the interview and survey data. General descriptions of these factors from the generic survey data were enriched by contextually rich accounts of the themes from the interviews. The results from the interview data also provided new insights into the characteristics of school improvement. To make data comparison more transparent, we transformed the results from the quantitative data by creating narrative descriptions of the nine factors based on the graphs and descriptive tables. The transformed data were compared with the qualitative themes in a matrix, as shown in Table 3.

As shown in Table 3, themes from the interviews, associated with parental involvement, communication capacity, access to extracurricular programs and resources, diversity in learning, building literacy and numeracy skills, and child's SEB development, were not clearly present in the survey results. These characteristics seemed unique and context-specific to schools facing challenging circumstances. For example, the theme of child's SEB development reflected on the common perspective that ensuring students' social, emotional, and behavioral stability was viewed as a significant factor leading to academic success in schools with challenging circumstances. Schools whose students and student families face challenging social and emotional difficulties clearly articulated that there is little or no prospect of academic success if there is no social and emotional support in place to help the students. Similarly, communication capacity and extracurricular resources were also important aspects of school improvement, especially because the schools had to work with immigrant families and families from low socioeconomic communities. The schools provided various nonacademic (i.e., breakfast clubs, hot-lunch programs) and extracurricular activities, such as antibullying programs or in-school daycare.

Although the results from the survey pointed to nine factors associated with school improvement, they were limited to the perspectives of the teaching staff. The results from the interviews allowed us to obtain an enriched understanding of the characteristics of school improvement from multiple perspectives. The comparison of the findings from the qualitative and quantitative data through data transformation brought forward not only overlapping but also nonoverlapping aspects of school improvement in these schools facing challenging circumstances. Interested in how these nonoverlapping aspects were perceived by school staff, we turned to the survey data. We sought further ways to substantiate the findings

Table 3
Comparison of the Results Through Data Transformation

Theme	Interviews and Focus Groups	Survey
Distributed leadership	Many school participants, rather than just the principal, are involved in leadership activities.	School leaders provide a supportive climate for the development of teacher capacity.
Professional learning	Teachers are learners and must be supported as they increase their professional knowledge.	Teachers have resources to change their practices.
School culture	A positive school culture has a sense of welcoming and an attitude that learning is a goal.	Teachers support collaborative inquiry and are dedicated to constant improvement.
Data-based decision making	Decisions on school improvement are made based on various sources of data. Imbedded in this theme are the roles of assessment and accountability in relationship to successful schools.	Empirical evidence is used to guide school decision making.
Community outreach	This concerns contributions made by the community to the school and the degree to which school personnel reach out to the community.	The school and community share a common purpose.
School goals		Teachers share consensus about directions and continuous improvement goals.
School change history		Past attempts to bring about change had beneficial outcomes.
Collective teacher efficacy		As part of an effective instructional team, teachers are capable of bringing about student learning.
Parental involvement	This concerns the role parents play in school life. Involvement ranges from parents' participation in their children's education at school and at home, participation in decision making at the school level, and providing assistance to school programs and activities.	
Communication capacity	This is defined as providing opportunities for open dialogue between people or groups. This theme focuses on the availability of stakeholders to talk to other stakeholders.	
Access to extracurricular programs and resources	This is defined as the ability to get funding and external resources to support school initiatives. These programs also include extracurricular activities and socioemotional programs for families and communities.	

(continued)

Table 3 (continued)

Theme	Interviews and Focus Groups	Survey
Diversity in learning	Awareness and sensitivity to the variables of diversity (i.e., socioeconomic, cultural, instructional) in the school communities.	
Building literacy and numeracy	This indicates the efforts made on cognitive development of literacy and numeracy in schools through academic programs and professional learning related to literacy and numeracy.	
Child's social, emotional, and behavioral development	Child's social, emotional, and behavioral development (i.e., feeling of safety, proper nutrition, management of behavioral issues) affects a student's ability to achieve academic success.	

Table 4
Descriptive Statistics for Consolidated Themes in Reconstructed Questionnaire

Consolidated Theme	Number of Items	<i>M</i>	<i>SD</i>	Cronbach's α
Distributed leadership (LEA)	11	4.91	0.73	.87
Professional learning (PLO)	32	4.72	0.67	.91
Diversity in learning (DIV)	2	4.97	1.28	.56
Communication (COM)	6	4.39	1.29	.61
Community outreach (COO)	5	2.82	2.82	.63
School and classroom culture (SCC)	2	4.81	0.94	.21
Child's social, emotional, and behavioral development (SEB)	3	3.40	1.47	.61
Parental involvement (PAR)	2	3.40	1.34	.56

from the mixed methods data analysis through creating blended thematic variables and case analysis.

Data Consolidation

To further our understanding of the characteristics of school improvement, we utilized an additional data consolidation analytic strategy (Bazeley, 2006; Caracelli & Greene, 1993) by combining the results from both qualitative and quantitative data to create blended data for further analysis. First, we jointly reviewed the results from the qualitative and quantitative data. We reviewed the 75 survey items to examine the extent to which the 11 themes that emerged from the qualitative data were present in the survey data. Out of 75 items, 63 were identified as addressing constructs similar to the 11 themes from the qualitative data analyses. We concluded that 3 themes, including access to programs and resources, building literacy and numeracy, and use of data for improvement, were not present in the survey instrument. The research team independently recoded the 63 items using the themes brought by the qualitative data. Then we met and shared our reassignments to the new 8 themes. Whenever we disagreed, we discussed the survey question and how it related to the theme. We continued to deliberate until we all agreed on the new allocation. In this way, we created a new set of thematic variables out of the joint use of both data types and quantified it by distributing the 63 items into 1 of the 8 themes.

This data consolidation approach was believed to better reflect accounts of school success from multiple perspectives. We used the reorganized variables to examine how a larger sample of school staff perceived school climate concerning school improvement and to compare it across the 20 schools in the study. Table 4 presents descriptive statistics and Cronbach's alphas for internal consistency for the newly blended themes. One challenge that we faced with the data consolidation approach was that the community outreach, diversity in learning, and parental involvement themes did not have sufficient numbers of items, and thus, their coefficients for internal consistency were rather low.

These consolidated themes shed light on the varying degrees of practices in the 20 schools, compared to the survey results from factor analysis that did not bear much difference across the factors. For example, as shown in Table 4, the schools were actively engaged in distributed leadership, professional learning, promoting diversity in learning,

Table 5
Correlations Between Consolidated Themes in the Reconstructed Questionnaire

Consolidated Theme	LEA	PLO	COO	SCC	COM	DIV	PAR	SEB
Distributed leadership (LEA)	–	.82	–.54	.59	.72	.62	.34	.36
Professional learning (PLO)		–	–.57	.65	.73	.59	.38	.42
Community outreach (COO)			–	–.55	–.42	–.36	–.29	–.34
School and classroom culture (SCC)				–	.54	.48	.23	.43
Communication (COM)					–	.56	.40	.29
Diversity in learning (DIV)						–	.24	.16
Parental involvement (PAR)							–	.19
Child’s social, emotional, and behavioral (SEB) development								–

and ensuring communication, but they were perceived to be relatively less active in ensuring community outreach, child’s SEB development, and parent involvement. Furthermore, these themes exhibited more variations across schools, as reflected in relatively larger standard deviations associated with the aforementioned themes in Table 2.

This new insight was important for our understanding of the data in that the themes associated with parental involvement, community outreach, and child’s SEB development appeared to be more sensitive to schools’ sociodemographic circumstances and tended to vary a great deal across schools. In contrast, themes such as distributed leadership and professional learning opportunity were well perceived by the school staff. The interview participants confirmed this by sharing various strategic plans and activities for them taking place at their schools.

We examined the relationships among these consolidated themes using correlational analysis, as shown in Table 5. The distributed leadership theme was moderately or strongly associated with professional learning, communication, diversity, and school and classroom culture, whereas it showed moderate relationships with parental involvement and child’s SEB development. The reconstructed community outreach theme was negatively correlated with the rest of the themes. The negative correlational relationships drew our attention. The community outreach theme, reconstructed through the lens of the qualitative data, refers to contributions made by the community to the school and the degree to which school personnel reach out and bring community resources into the school. When we examined the individual questionnaire items that constituted the community outreach theme, most teachers agreed with statements such as “Our school rarely works directly with parents to improve the educational climate in students’ homes” and “Our school has difficulty maintaining clear two-way communication between school and parents/community.” Most teachers disagreed with the statement, “The community served by this school is very supportive of our school.”

When we revisited the qualitative data for a more in-depth understanding of the themes associated with community outreach and parental involvement, we learned that these schools have difficulty with general community outreach initiatives due to a large immigration population. These parents want their children to receive excellent education, but their cultural beliefs appear to prevent them from actively engaging in their children’s schooling. Therefore, we concluded that the weak and negative correlational relationships

indeed reflect a lack of resources to building the partnerships among parents, community, and schools.

This additional integrative mixed methods data analytic approach deepened our understanding of the dynamic interplay among the themes. The consolidated themes allowed us to examine the interrelationships among the themes, using the large-sample survey data. The result of this analysis revealed varying levels of school improvement practices. The survey data alone would not have been sufficient to effectively capture the interplay of the unique sociodemographic circumstances of the schools with various factors associated with school success. The qualitative data would not have been sufficient to systematically examine such dynamics based on the data from a large sample. Using the consolidated themes, we identified schools for further case analysis to provide context-rich accounts of school dynamics and participants' perspectives.

Case Analysis

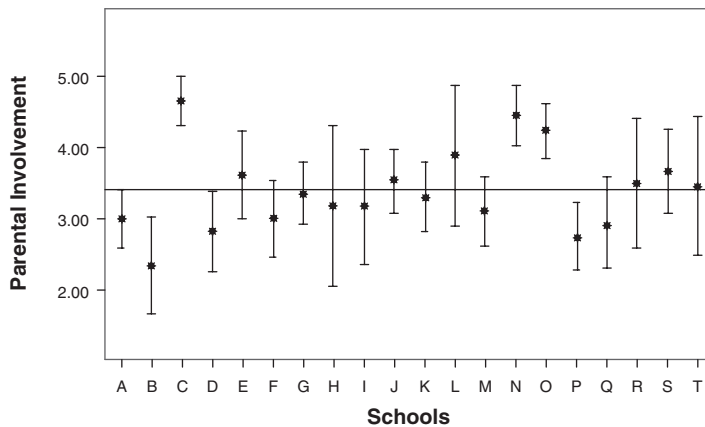
Another integrative mixed methods data analytic approach we used is case analysis (Caracelli & Greene, 1993). Although all the 20 schools were successful in improving students' academic achievement, the results from the integrative data analyses indicated different strengths and strategies in dealing with issues arising from challenging circumstances. Therefore, we wanted to closely examine how the integrated themes constructed through the data consolidation approach were characterized at the individual school level.

The integrated mixed methods case analysis approach took place in two steps. We first identified school cases that showed a statistically significant difference from the overall mean of the 20 schools. We repeated this procedure for each of the eight consolidated themes. Next, we revisited the qualitative interview and focus group data for identified schools. We reread the portion of the data related to themes that identified the schools. The results were integrated into a narrative school case profile.

For each theme, we created bar charts that graph the mean and 95% confidence interval for the mean of each school. We compared the mean score of each school on each of the eight consolidated themes to the scores for all 20 schools in the project. We identified schools that differed significantly from the average score of all of the 20 schools on the basis of the nonoverlapping confidence interval approach (Thompson, 2002). Figure 4 presents an example of a plot that contains the mean scores of the 20 individual schools on the theme of parental involvement. A vertical line indicates the 95% confidence interval that allows us to inspect visually which schools differ significantly from the overall average of the 20 schools, as expressed by a horizontal line.

The plot clearly shows that, whereas teachers and principals at schools such as C, N, and O reported high parental involvement, teachers and principals in schools B, D, and P reported a relatively low level of parental involvement in their schools. Once we identified schools that differed from other schools, we revisited the qualitative data from those schools to provide a contextually rich narrative of the nature of each theme and unique challenges. The following narrative describes parent involvement taking place at Schools O and B. These cases are used to illustrate one of the themes identified from the quantitative analysis.

Figure 4
Mean Scores of 20 Schools on Parental Involvement



Note: The horizontal line in the plot shows the overall mean of the 20 schools on the theme of parental involvement. The vertical line indicates the 95% confidence interval. The center dot indicates the mean for that individual school.

High parent involvement in successful schools. School O, located in a suburban area, is composed of 40 teachers, a principal, a vice-principal, 2 office administrators, 9 educational assistants, and 5 caretakers. The school has 24 classrooms, including a science lab, art room, and music room, and 6 portable classrooms on site. Approximately 25 different languages are spoken in the school community. Teachers and administrators state that some challenges to home support include a transient population, parent work schedules, and the large number of ESL students and parents, which is one of the greatest challenges they face.

To mitigate such challenges, the school employs numerous programs and initiatives, including many programs that involve parents. For example, the school has a parent literacy volunteer program that sees parent volunteers come into the school to read with children who need extra support. They also have an antibullying program for parents, such as Help Your Child Succeed and Healthy Living, Healthy Lifestyles.

The school principal created an opportunity for a teacher to act as a liaison with the parent community as a means to make the school feel more welcoming. The principal learned about the community by walking around the neighborhood, getting to know its members, and attending meetings and open forums:

I talk to them a lot. Before I came here, I walked around, went to where the kids were playing in the park. I had found out about the two big [apartment] complexes, I went and I met them at their board meetings. This was where I started liaising with them and I knew that there was a need for the homework club. So I had talked to them a lot.

She visits main apartment buildings to learn about the area and to speak to parents and students. To foster parent involvement, the principal telephones parents of at-risk students

and works with them personally to develop a “game plan” for their children. The Parent Council and monthly bulletins are means by which the principal works with parents to develop goals and visions for the school. The principal also makes effective use of a community coordinator who runs many of the parent and community programs.

Staff members felt that the community liaison was particularly effective in facilitating their learning about the community. Teachers reported learning about the community through discussions on customs and celebrations with both students and other members of the community in general. Teachers also reported that external agencies that work with the staff offer insights into new cultures. Teachers felt that using a half-time teacher to train parents on reading strategies that can be used at home was extremely successful.

Parents felt that this school was particularly effective at building parent and community relationships. When parents were asked about programs that were offered in the school, a number of initiatives were mentioned. Parents reported that the school provided funding for parents to attend an event called Reading With an Author Night, in addition to parent-training sessions that help parents understand what is academically required for students to achieve, homework tips, and workshops on how to read the report card and how to read to a child. Parent sessions on bullying and cyber safety were also provided, as was the opportunity to liaise with the public health nurse to discuss issues such as nutrition and discipline. Parents reported that the school communicates in languages other than English and that the school attempts to acknowledge the traditions and celebrations of its culturally diverse population. Parents expressed the belief that the administration has an open-door policy and that they are confident that they will hear from the school if there are any issues regarding their children.

Low parent involvement in successful schools. School B is an inner-city school located in the northeastern part of the city. Built in the mid-1960s, the school presently has approximately 225 students from junior kindergarten to Grade 6. Over the past few years, the school has garnered consistent improvement in students’ academic achievement. Recently, the school initiated the Early Years Literacy Project, which has made positive impacts on the school’s leadership, literacy capacity, and teacher professional learning.

Because of the school location, administration and staff have focused on creating a warm, welcoming, and above all, safe school culture. Many of the school participants interviewed stated the importance of maintaining a safe school atmosphere so that students feel secure and are able to concentrate on academic tasks. However, both the principal and the teachers recognized that parental involvement is an issue that they need to enhance to build strong school identity and capacity. The principal explained that many of these families have recently immigrated, and with parents working two jobs, there is literally no time for the parents to be active in the school community. He reported that the parents are not apathetic but that there are employment and cultural reasons why these parents are uninvolved:

As for parents, I don’t have a lot of parent involvement. My parents are not apathetic; if something upsets them, I get a phone call immediately. So [that’s how] I know they’re always in tune with what is going on. If they are happy, I don’t hear anything.

This outcome may be further compounded by cultural beliefs held by parents that it is the school's responsibility to manage the education of the child; it is not the role of the parents. During interviews with parents from this school, we noted that building parent–community relationships is one dimension where the school may target goals in future school plans. Although the parents who are actively involved in the school articulated their comfort in communicating with the school, they reported that they were not aware of any programs geared to parents and community members. As one parent noted, although there are opportunities to volunteer, there are no initiatives geared to draw parental and community involvement. All school participants agreed that developing the parent–community relationship is the area that the school needs to consider for school planning in the future.

Discussion

Although mixed methods research has been widely accepted as a legitimate research inquiry approach, leading mixed methods scholars pinpoint a lack of integration of the findings from qualitative and quantitative strands of data as a significant deficiency in mixed methods research practice (Bazeley, 2006; Bryman, 2006; Greene et al., 1989; Johnson et al., 2007). The purpose of this article was to illustrate mixed methods data analytic strategies that purposefully integrate the findings from qualitative and quantitative strands of data from the research on school improvement in schools facing challenging circumstances.

The results from the interview and focus group data provided both overlapping and different characteristics of school improvement from multiple perspectives. School reports based on parallel integration of the findings from independent mixed methods data analyses provided an opportunity to engage study participants in the study, which enhanced the descriptive and interpretive validity of the study findings (Maxwell, 1992). Although the degree of integration in the reports was rather minimal, the reports encouraged mixing at different points of time with participants.

Data transformation through qualitzing the results from the quantitative questionnaire data enabled a more direct comparison of the results from the qualitative and quantitative data. Such data transformation highlighted both overlapping and nonoverlapping aspects of the phenomenon under investigation. Without mixing different data sources, we would not have gained this enriched understanding of the unique characteristics of school improvement in schools facing challenging circumstances.

The integrative data analytic procedures such as data consolidation and case analysis provided further information about how the themes associated with school improvement practice are interrelated to each other and how individual schools cope differently with them. The nature of the integration was iterative, moving back and forth between the qualitative and quantitative strands of data and allowing for the recognition of emergent themes and new insights.

The final synthesis in this study was drawn from the findings from both approaches collectively. For example, these schools demonstrate concerted efforts to (a) build distributed leadership shared among various school participants; (b) support professional learning and

development to strengthen the knowledge and skills needed to deal with diversity in learning; (c) create a welcoming school culture; and (d) foster students' academic development in literacy and numeracy through evidence-based decision-making processes. These schools also demonstrate different levels of sensitivity to issues related to the relationship between school and community, parental involvement, and students' noncognitive development. Because these challenging circumstances involve families and community, it is important for these schools to develop unique, yet successful, school improvement strategies to address these challenges in order to sustain school success.

In our use of the data consolidation analytic strategy, the results from the qualitative and quantitative data were jointly reviewed and merged into a new set of thematic variables for further analysis. We quantified the new thematic variables by matching them with the survey items and used the new variables to examine the interrelationships across the themes and individual schools. Although this integrative analytic approach allowed for the recognition of emergent issues related to the dynamic interplay of the studied themes with sociodemographic school circumstances, there was a problem with a lack of sufficient numbers of questionnaire items that constituted the family- and community-related themes. This problem points to a need to revise the survey instrument or develop a new instrument that accurately captures those themes for research on school success and effectiveness in schools facing challenging circumstances.

We also acknowledge that this analytic strategy required a great deal of knowledge about the data, and it required skills in both quantitative and qualitative approaches (Caracelli & Greene, 1993). Caracelli and Greene stated that this analytic approach emerged as a promising strategy for data integration, but it may be challenging to determine how different data types should be weighted when merging them into new variables:

How can contrasting epistemological assumptions and worldviews be integrated or reconciled within a mixed method framework? From the present work, the data consolidation and merging approach emerged as a promising strategy for data integration yet perhaps also the strategy most vulnerable to abuse from conceptualization and measurement perspectives. For example, how, if at all, should different data types be weighted when consolidating or merging them . . .? More examples of successful practice employing integrative data analysis strategies in mixed method contexts are also needed; this work, in particular, relies on an iterative interplay of theory and practice. (p. 205)

When we jointly reviewed the results from the interviews and survey data, we were interested in school staff members' perspectives about the additional aspects brought by the qualitative data. Therefore, the results from the qualitative data were weighted more than the survey data because the qualitative data revealed contextually sensitive information about the characteristics of school improvement from multiple perspectives. We were interested in exploring the potential for working back and forth between the information we gained from the separate analyses of qualitative and quantitative data.

In our debriefing of the data analysis procedures, the graduate assistants reflected on their experiences. They both believed that it was the qualitative data that provided the most comprehensive set of data. One student talked about the integrated data analysis and stated,

This part of the process was quite interesting to me as a quantitative researcher to [help me] understand and experience the painstaking process of paring down the data until we agreed upon the appropriate categories that emerged from the data.”

The graduate students’ participation in the project helped them to broaden their horizons and to look for deeper meaning in the data. One graduate researcher stated,

I was initially concerned that I would not be able to constructively contribute to the quantitative portion of the data analysis. To my surprise, the opposite occurred. For the first time, when I looked at the quantitative data, I felt a deep need to understand the statistical outcomes more fully. Upon reflection, I realized that this need was the result of my rich understanding of the qualitative data.

She went on to describe how the many statistical analyses and graphic representation were full of life. She knew the participants’ stories, but she saw a number of surprises in the quantitative analysis. She concluded,

My participation in a mixed methods project expanded my horizons from research methodology as a debate between paradigms that dealt with “people versus numbers” and from an understanding that abstract debates between “either/or” actually, and quite compellingly, dialectically resolve into an “and.”

Integrated data analyses requires a breadth of skills and “the capacity to imagine and envision what might be possible along with the logic required to bring that about” (Bazley, 2006, p. 65). Working as a team of faculty members and graduate students who brought multiple skills to the project, we all experienced the unique potential for enriching our understanding of schools facing challenging circumstances that integrative mixed methods data analysis holds.

There were a number of limitations and reflections that the research team shared after completing the study. At the mixed methods research design level, the research team was restricted by time limitations (i.e., 1-year time frame) and budget constraints imposed by the stakeholders. Thus, the concurrent mixed methods research design was necessary given the 1-year time constraint. We believe that a fully integrated mixed methods research design would have allowed us to examine this complex phenomenon more adequately. For example, instead of using an existing school improvement survey measure, an exploratory qualitative approach preceding the quantitative survey approach (Qual → Quan) would have allowed us to identify key factors that are more sensitive to schools in challenging circumstances.

Furthermore, instead of limiting the survey to school staff members, the use of multiple survey instruments modified for parents and students would have provided information about the characteristics of school improvement that could have been compared across participant types and to the qualitative interview and focus group data. Given the high immigrant family population in these schools, the language of the survey instrument should reflect the multiple languages found in the student populations. Again, this effort was discouraged by the limited budget.

There are other limitations to the study. We selected exemplary schools to best describe processes and programs that they utilize in attaining student academic attainment, as a means to help other schools facing similar challenges to achieve greater success in student achievement in literacy and numeracy. By selecting these schools based on our criteria, we did not get access to the stories and experiences of other educators who have not been as successful but may have implemented programs that have helped students in different ways. We also did not give voice to the experiences and views of teachers, principals, and students in schools that do not face challenging circumstances but have also been successful.

Conclusion

This article illustrates analytic and integration strategies of mixed methods data using the SCC research project. Although the fields of education and evaluation have experienced increased productivity and popularity in mixed methods research, we believe that the integration of mixed methods data remains challenging to many researchers. In this article, we attempted to demonstrate the study's integrated analytic approaches that mixed qualitative interviews with a questionnaire. Although it featured the concurrent component design, rich data from mixed methods allowed for a more integrated analysis, which led us to gain a more comprehensive understanding of the varying levels of school engagement in aspects associated with school success.

We analyzed school interview and survey data to gain descriptive information about key aspects of school success in schools facing challenging circumstances. Initial comparison of the themes redirected us to consolidate the data by creating a new set of survey variables based on the qualitative data analysis. Our effort to integrate the data allowed us to examine the relationships among the themes through correlational analyses and to gain contextually rich descriptions through analysis of school cases. The data analysis involved the iterative process of constantly moving back and forth by revisiting both qualitative and quantitative data. It was also dialogic in that the team members with different expertise took the lead in discussing data analysis strategies. Comparative case analyses highlighted and contrasted strategies and processes that the schools employed to mitigate the challenges they face. We believe that our illustration of analytic strategies used in this mixed methods research will serve other researchers and practitioners seeking practical guidelines through examples of mixed methods work.

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