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This research was intended to explore the degree to which leadership practices impacted Jamaican schools' mathematics achievement. More specifically, the researchers examined Jamaica's high school students' CSEC mathematics performance in relation to principals' instructional leadership behaviors as measured by teachers' perceptions, using Kouzes and Posner (2003) Leadership Practices Inventory (LPI). Data were gathered from 2-4 teachers from 42 high schools in Jamaica. The results indicated that those principals who had high LPI scores also lead schools with higher mathematics pass rates than those principals who had low LPI scores. More specifically, "enabling others to act" was established as the leadership practice most associated with high mathematics performance. Finally, we discovered that the traditional Jamaican high schools were more likely to experience satisfactory mathematics pass rates.

Keywords: *leadership practices, academic performance, mathematics pass rate*

In both developed and developing countries there is still a steadfast effort to address the problem of student mathematics performance in the high school system. The National Mathematics Advisory Panel (2008), supported by the Programme for International Student Assessment (PISA, 2012), and Darling-Hammond (2012), in redefining schools' mission, implied that student achievement in mathematics is one marker of a country's broader intellectual capacity and a key indicator of a country's long-term economic potential. In this regard, mathematics achievement in high schools has moved from the fringe to the core of policy debates on national education in both developed and developing countries.

A widely held view is that students' performance in mathematics is critical to a nation's competitive viability for the future (PISA, 2012; Slavin, Lake & Groff, 2009). PISA (2012) reported that of 516,000 students from 65 countries that participated in the 2012 international mathematics assessment, 55% did not achieve the baseline Level 2 Mathematics. At that level, students (15-year olds) are expected to strategically use broad, well developed thinking and reasoning skills to mine information from a single source and use basic algorithms, formulae, and/or procedures to solve problems involving whole numbers (PISA, 2012).

One country that is no exception to the struggle with high school mathematics is Jamaica. It is the third largest island in the Caribbean, located 90 miles south of Cuba and 560 miles southeast of Florida. The population of Jamaica is about 2.7 million. The main ethnicity is 90% African descendants, while Whites, East Indians, Chinese, Mixed race, and others make up about 10%. Jamaica is a legally constitutional parliamentary British-style democracy and an affiliate of the Commonwealth of Nations. Jamaica, along with other countries of the Caribbean and Latin America, is a signatory to the Dakar Framework for Action 2000, which formulated action plans for each participating country to attain quality education by the year 2015.

The governance of education in Jamaica is under the auspices of the Ministry of Education (MOE). The secondary educational system serves over 200,000 students in 160 public high schools. The MOE has emphasised improving education quality to world class standards so that its students can compete in the global economy. Their aim is to transform learning accountability, develop school leadership capacity, and teach strategies for numeracy (MOE, 2013).

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The Problem

As with high school students from many English-speaking Caribbean countries, exit level high school students in Jamaica are expected to be successful in at least five core curricular subjects, including mathematics, in the Caribbean Secondary Education Certificate (CSEC) exams. Regrettably, the pass rates in CSEC mathematics exams for Jamaican high school students between 2001 and 2011 have not exceeded 40%. For example, the pass rate from 2009 to 2011 averaged just over 34%. This is evidence that CSEC candidates from Jamaica lack mathematical knowledge and skills. The problem of math achievement is exacerbated by factors such as the incapacity of instruction to meet the needs of all learners; weak mathematics foundation; and ineffective instructional leadership (National Education Inspectorate, 2013).

Mathematics achievement is being accepted as the rubric that measures the educational success of schools (Livingston, 2009). It is a strong predictor of both successful post-secondary education and expected future earnings. Proficiency in mathematics helps students to compete effectively in the global economy since success is no longer limited to national standards. The question becomes, are leaders of Jamaica's high schools providing the necessary impetus for students to succeed in mathematics? Given the challenges as stated, research indicates that instructional leadership can have a major impact on student learning. Teachers' perception of instructional leadership appears to best explore this issue (Hallinger 2011; Seashore-Louis, Leithwood, Wahlstrom, & Anderson, 2010; Turner, 2008). Several eminent theorists agreed with Kouzes and Posner (2007) that one way instructional leaders can impact student learning is to model the way, inspire a shared vision, enable others to act, challenge the process, and encourage the heart. Using this premise, three research questions were designed to explore the degree to which leadership practices impact Jamaican school's mathematics achievement:

1. What is the relationship between principal instructional leadership as perceived by teachers and the quality of student performance as measured by the mathematics test of the CSEC?
2. What are the dimensions in the Kouzes and Posner model that correlate most strongly with student achievement in mathematics as measured by the mathematics test of the CSEC?
3. What variations are evident in the schools' CSEC pass rate, based on type of high school (traditional or non-traditional) when teachers' perceptions of instructional leadership is considered (traditional referring to pre-1960 schools and nontraditional referring to post-1960 schools)?

Purpose of the Study

In essence, the purpose of the study was to examine Jamaica's high school students' CSEC mathematics performance in relation to principals' instructional leadership behaviors as measured by teachers' perceptions, using Kouzes and Posner (2003) Leadership Practices Inventory. Our intent was to quantify the degree of instructional leadership in order to amplify awareness about whether instructional leadership can create change in students' academic performance.

LITERATURE REVIEW

Since the 1980s, the principal has been recognized chiefly as instructional leader (Hallinger, 2011; Houchens & Keedy, 2009). In this context, we define instructional leadership as the principal's specific guiding interactions with teachers that enable the teachers to apply the knowledge and skill meant to promote higher levels of student achievement. Essentially, there are substantive principal behaviors that lead a school to educate all students by guiding the actions intended to develop proficiency in learners (Argyris & Schón, 1974; Corey, Peterson, Lewis, & Bukarau, 2009; Kouzes & Posner, 2007). Implicit in this assertion is that schools are not likely to be effective if there are obtrusive inadequacies in instructional leadership.

The germane findings on the instructional leadership / student success relationship reveal that instructional leadership is notable by the actions that a principal takes to guarantee student success; it emphasizes that principals act to ensure that the learning needs of students are met. The instructional leader's expertise and knowledge are key mediating factors between principals' practice, teachers' capacity, and student success (Hoy & Hoy, 2009). Knowing this, principals need to articulate best practices more judiciously and in a way that is "far more cognitively tractable and growth-enabling" (Cameron, Quinn, DeGraff, & Thakor, 2006, p. 6). The implication is to make instructional quality

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the top priority of the school, which involves translating the school's vision into student success.

Conceptual Framework - Exemplary Leadership as Theory of Practice

The underpinnings of exemplary leadership, those actions that principals take that are tantamount to academic success as Kouzes and Posner (2003) identified are modeling the way, inspiring a shared vision, challenging the process, enabling others to act, and encouraging the heart. These actions are congruent with the theory of practice assumptions of school leadership, as discovered by Argyris and Schón (1974). Theory of practice primarily focuses on accountability for student learning, supported by constructive relationships. This assumption is supported by Kline and Saunders (1998), Corey, Peterson, Lewis and Bukarau (2009), and Hallinger (2011), who all have implied that a principal's guiding and creative interaction with teachers as a function of exemplary instructional leadership is an authentic source of instructional efficacy and is the substance of higher levels of student achievement.

Creative or transformational leadership theory is a parallel strand of leadership thought. Creative leaders address problems through transformational practices, undergirded by lateral (holistic), rational, intuitive, and vertical (sequential) thinking. As such, transformational leadership is a conceptually viable model (Hermond, 2000) that aids the principal in building the individual and collective competence of teachers. The principal works concomitantly at transformational and instructional responsibilities in harnessing teachers' capacity to accelerate student improvement. In this regard, transformational leadership and exemplary leadership are mirror images of each other.

The five tenets of exemplary leadership. According to Kouzes and Posner (2008), to *model the way* is to make clear one's values, affirm shared values, and be an example by aligning actions with ideals. The second tenet, *inspiring a shared vision,* means to excite and enroll everyone in visualizing the future by appealing to shared aspirations and a picture of ennobling potential. Third, to *challenge the process* is to think beyond prevailing paradigms, seize initiatives and search for novel ways to enhance and celebrate students' and teachers' success (Fullan, 2010; Kouzes & Posner, 2007). The implication for educators is that they should challenge any process that relegates any student as unpromising as a result of their diversity; in essence, no number of educational causalities is tolerable and therefore is a not viable option. *Enabling others to act*, the fourth exemplary leadership tenet, involves building trust and positive interactions, reinforcing self-determination, maintaining self-efficacy and competence through recurrent professional development, and reflecting on ones actions. Finally, to *encourage the heart*, the fifth tenet, is to recognize individual excellence and acknowledge those victories by enlivening a celebratory spirit of unity and purpose (Kouzes & Posner, 2007).

A reason for low mathematics achievement as documented by Hill, Rowan, and Ball (2005) is the inadequacy of mathematics teaching to meet the diverse needs of every child. Our position is that exemplary leaders, by demonstrating the five sets of behaviors we just described, can reverse this trend. In essence, changing teacher orientations towards their curricula in ways that address how they choose cognitively challenging instructional tasks is another opportunity for leadership to defy the status quo. As principals lead, they should promote curriculum review, new teaching strategies, and new assessment models to meet the diverse needs of all students. These actions are meant to transform values and attitudes, craft innovations, produce synergy, and change risks into rewards. These features have been positively articulated across business and education to develop standards that better define effective leadership (Fullan, 2010).

The theory of practice. The theory of practice is a cognitive blueprint of deeply held assumptions and strategies (from training and experience) for professional problem solving (Houchens & Keedy, 2009). The link between mental processes and practices is very important to understanding what principals do. As such, Argyris and Schón's (1974) framework for theory of practice holds potential for providing a deeper understanding of school leadership and how principals can improve instructional leadership. The notable effects of leadership, as implied by Hoy and Hoy (2009), are the result of the interface of knowledge, expertise, competence, and intellectual qualities. Leadership then, beyond being a practice and set of actions, is a process that can develop into a reproducible, valid, proficient technique. Thus, an inherent assumption of all instructional leadership theories of practice is that correct transformational action strategies will result in higher student pass rates (Houchens & Keedy, 2009). This justifies integrating transformational leadership as an instructional leadership theory into our conceptual framework.

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The learning organization context. There is a powerful association between leadership and organizational learning and change. Action strategies must be aligned to standard organizational learning processes for best results. Robinson, Lloyd, and Rowe (2008) found that desirable learning outcomes are achieved through key organizational processes, the effects of which are indirect.

According to Senge (2006), a school must function as an organic whole in order to grow and have collaborative work cultures. It needs emphasis on interpersonal learning, collaborative enquiry, diversity, and professional development. This organic approach, he added, maximizes interactions and information flow, which promote better leadership practice. Leithwood and Sun (2012) agree that transformational leadership and organizational performance ensure better organizational efficacy, team commitment, and overall performance.

Transformational Leadership - Choice of Action as a Realistic Phenomenon

Principals need to be strong and value their role as instructional leaders. One theory of transformation signifies that knowledge and deep commitment play a role in deciding on a course of action to produce deep change that creates something new. As such, leadership involves grasping how principals interact with others, since transformation begins with trust and is reinforced by commitment to the school goals (Argyris & Schón, 1974; Kouzes & Posner, 2007). Transformation requires strength of commitment to change and the courage to seize innovative and boundless opportunities to ensure that collective teacher efficacy as a whole has a positive effect on students' success (Bandura, 1997).

Transformational leaders empower staff by being strong role models who listen well to all viewpoints, develop a spirit of collaboration, create a shared vision, act as change agents and help to inspire others to contribute to the organization (Northouse, 2012). In emphasizing attention to needed change, Burns (1978) stated that "the ultimate test of practical leadership is the realization of intended, real change that meets people's enduring needs" (p. 461). Although real change involves risks, it is a vital process of innovation that brings new ideas and methods that changes people, hence its usefulness in schools (Fullan, 2010).

According to Palmer (2012), principals should collectively mobilize staff to adjust to the institution's values with fixity of purpose in order that schools may fully realize their mission with all children. Further, such contingent mobilization fosters a shared commitment to achieve the unique image of the future they envision. School leaders must therefore grasp the most serious implications of complex problems (such as low student math achievement), translate these implications into purpose and vision, and then clearly communicate the process of change to others in a bid to secure their commitment (Fullan, 2010). Implicitly, principals should mobilize others to produce major changes in form, nature, and function, which enable teachers to act rather than wait for the principal to prescribe what they do.

Principal's Instructional Leadership

Instructional leadership has changed focus from inspector of teacher competency to an enabler by building teachers' capacity through development and growth. Thus, principal's instructional leadership task has been seen as communicating high expectations, monitoring instruction and student progress while promoting a climate for learning through a supportive work environment (Reitzug, West, & Angel, 2008). Principals need strong interpersonal and planning skills, instructional observation skills, pedagogy corrective expertise, and data analysis abilities to effectively guide instructional improvement. The instructional leader must reinforce rigorous, exacting standards and professional learning organized around data and the full input of teachers (Glickman, Gordon, & Ross-Gordon, 2010). In developing teachers' capacity for these, teachers are enabled in reorienting their lessons to focus on learning goals planned around learning theory, learning styles, and best practice teaching models. The actions should be curriculum-specific, pedagogy focused, and foster corrective reflection on quality instruction leading to rigor and conceptual thinking (Hill, Rowan, & Ball, 2005).

Instructional leaders should model good teaching techniques and positive interactions. Principals should be accomplished teachers, capable of demonstrating expertise with teachers, students, and the curriculum. According to Blasé and Blasé (1999), such modeling yields positive impact on teacher motivation and reflection, creating pathways of excellence with the principal as examples for teachers and students to follow. For instructional leaders to realize the benefits of transformational change with mathematics, they must recognize (a) the effect of the deepening global

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consensus concerning the deficit of high school mathematics education; (b) the failure of existing practices to meet enduring mathematics needs; and (c) bring new real meaning, change, continuity and practice into productive and quality sustainable approaches. In doing so, they accept the instructional accountability of the teaching profession as the most important professional experience (Bukor, 2011).

Fenstermacher and Richardson (2005) stated that

> Quality teaching is about more than whether something is taught. It is also about how it is taught…the content must be appropriate, proper, and aimed at some worthy purpose; the method [must] be morally defensible and reasonable and comports [sic] with rationally sound principles of instructional practice … and in the end must yield the intended learning. (p. 189)

This implies that, to be accountable for successful teaching, the teacher must ensure that the learner actually acquires some reasonable and acceptable level of proficiency. A central question for teachers then is, What is the most excellent way that students learn? No solitary theory will answer this question. However, Palmer (2012) suggested three approaches. The first, Banks' (2004) social justice approach to teaching, by all accounts, produces equitable empowerment, critical thinking, resilience, and responsibility in the learner. The second, Gagne's Learning Theory (1985), emphasizes the relevance of instructional technology to heighten cognitive strategies. And the third, the Theory of Direct Instruction (Engelmann, 1980), indicates that learning will be better if instructional presentations are clear, there are minimal misinterpretations, and the presentations show practical utility.

Successful classroom pedagogy enables learning and growth of students rather than treating them as objects of curriculum implementation. Teachers must understand how students learn and be empowered to design, teach, implement, and assess in novel ways that meet the needs of all students. The role of principal in this regard delineates empowering teachers to exercise accountability and credible knowledge of the teaching learning process. The inference is that professional learning must produce a repertoire of instructional approaches. It must include all teachers and help them value more earnestly their content, their delivery style, and feedback as elemental aspects of effective professional growth (Yoon et al., 2007).

Feedback (and follow-up) to teachers (formative, functional, precise and/or general) on classroom delivery provides teachers valid functional guidance about their instructional technique (Houchens & Keedy, 2009). Effective principals give teachers feedback like an important friend providing a thoughtful constructive discourse. Feedback must have a problem-solving orientation based on observed classroom management and student apprehensions. Further, it must articulate care and concerns, provide commendations, and plans for follow-up dialogue. Feedback is congruent to intellectual stimulation. It can enhance teacher confidence, motivation and reflection, instructional competence, and sense of self and efficacy as a professional, as well as improve cultural fluency (Blasé & Blasé, 1999).

Instructional Leadership and Student Mathematics Achievement

Mathematics is a discipline, a broad, deep interdisciplinary language and tool, the study of the abstract science of numbers, quantity, space, structure, relationship and change. Given its doorway function to many careers, mathematics' utility changes as the needs and interests of society progresses (Lappan & Even, 1989). Students' mathematics success is a measure of school effectiveness with learning (Hasselbring, Lott, & Zydney, 2006), so a major goal of schooling ought to be the development of students' critical thinking, reasoning, and computing skills to use mathematical concepts—basic algorithms, formulae, and procedures to solve problems. As a norm, needs that are congruent with academic success demand actions and practices that are decisive (Seashore-Louis, et al., 2010). An implicit assumption of instructional leadership theories of practice is that the actions will produce higher student achievement through strategies and assumptions that impact teachers' feelings, attitudes, and behaviors (Houchens & Keedy, 2009).

In terms of instructional leadership with regard to mathematics, the principal must be a key resource in exciting teachers to use current teaching and learning theories to narrow learning gaps. Research shows there is a correlation between teachers' mathematical knowledge and student achievement in mathematics (Hill, Rowan, & Ball, 2005). Chinnappan (2008) argues that the learners' ability to appreciate the worth of mathematics (formal and informal) is a function of the awareness they have experienced in their mathematics class setting. As a result, learners investigate,

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rationalize and argue assumptions, and question concepts.

In whatever way learners approach mathematics, the concept of inter-connectedness provides useful insight for teachers as to how learners perceive the way their own formal knowledge is developed (Chinnappan, 2008). Principals must warm up to the necessity for monitoring instruction, notwithstanding the resource difficulties that may be a challenge in cementing the value of high quality classroom instruction. As such, instructional leadership can still bring vision to reality by making instructional quality the focal priority of the school.

The literature has thus assured us that transformational leaders harness teachers' ability to improve student performance. More specifically, exemplary leadership models, as defined by Kouzes and Posner, provide a deeper understanding of how school leaders can impact teachers. Given the weaknesses apparent in the mathematics performance of high school students in Jamaica, it seems justified to determine the degree to which principals' instructional leadership behaviors impact Jamaica's high school students' CSEC mathematics performance.

METHODS

Sample

Our approach was intended to determine if the level of principals' exemplary leadership behavior impacted student pass rate in mathematics. Thus we employed a causal comparative design in which we targeted the 160 high schools in Jamaica. We quickly discovered that about 50% of schools had the same principal throughout the three-year period for which data were gathered, leading us to focus on those 80 high schools. Due to varying constraints (e.g. school breaks, access to teachers, and willingness to participate) distribution was limited to 2-4 teachers from 70 schools. It was obviously important that each school in the sample had documented results with CSEC for mathematics exam over the period 2009-2011. Ultimately, 101 teachers from 42 high schools participated in the study, leaving us with a 60% response rate.

Instrumentation

In this study, teachers completed Kouzes and Posner's Leadership Practice Inventory (LPI-Observer, 2003). We relied on teachers' perceptions of principals' leadership behaviors because, according to Hallinger (2011), two years of interface between principal and teacher can provide reliable data in a perception analysis study. The LPI-Observer inventory was chosen because it was aligned with the research questions that were the impetus for this investigation in that it contains five subscales that represent the broad theme of exemplary leadership.

The LPI-Observer was subjected to rigorous psychometric testing that resulted in six action statements per subscale of leadership practice (Kouzes & Posner, 2003). Each statement was scored using a 10-point Likert type scale ranging from (1) almost never does, to (10) almost always does what is depicted in the statement(Kouzes & Posner, 2003). As demonstrated in Table 1, the LPI-Observer subscales possess admirable reliability coefficients, with Cronbach's alpha ranging between .88 and .92 (Posner, 2010). These coefficients have been found to be consistent across demographically unique factors, occupations, nationality, gender, and level of education. The creators of the LPI assert that the LPI has been utilized by different researchers and their studies yielded consistent results.

Table 1

Internal Reliability (Cronbach's Alpha) Coefficients for the LPI – Observer

Leadership Practice	Cronbach Alpha Coefficient
Challenging the Process	0.89
Inspiring a Shared Vision	0.92
Enabling Others to Act	0.88
Modeling the Way	0.88
Encouraging the Heart	0.92

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With regards to LPI validity, Kouzes and Posner (2007) stated, "Given that the items on the LPI are related to the statements that workshop participants generally make about their own and others' personal-best leadership experiences, respondents have found the LPI to have excellent face validity" (p. 14). Likewise, Huber et al. (2000), in a meta-review of 18 leadership instruments, concluded that the LPI singularly received the top score for psychometric validity and usability. This translates into it being a refined conceptual research design with psychometric hardiness because the test items show excellent face validity.

Along with these five subscales, this researcher generated five questions in section one of the survey to gather generic demographic information on teacher's age range, teacher's gender, principal's gender, and teacher's years of experience. Student achievement in mathematics, the outcome variable, was calculated as the percentage of students who passed the mathematics test of the Caribbean Secondary Examination Certificate (CSEC) for the 2009-2011 school years. We obtained these CSEC pass rates from the local CSEC agency.

Data Collection Procedures

We collected data during a 4-5 week period from a random sample of high school teachers from the 70 targeted high schools. There were two types of high schools, traditional and nontraditional, that we focused on in this study. Traditional high schools are those mainly of the pre-independence (1962) era, while nontraditional high schools were those secondary schools that were upgraded to high schools. The nontraditional high schools typically receive fewer resources and are considered to be less rigorous than traditional high schools. Together they make up more than 90% of the public high schools. Both types of schools exist in rural, deep rural, urban, and sub-urban areas.

The sample represented a cross-section of high schools across urban, suburban, and rural areas. The respondents for this study were 2-4 teachers per school from the 70 high schools. Thirty-one survey packages were distributed to teachers from traditional high schools, and 39 survey packets to teachers from nontraditional high schools. The rate of return for traditional schools was 58%, while the response rate from teachers in non-traditional high schools was 61%, totaling 101 respondents from 42 schools.

Research Design

In designing our study, we used the schools' CSEC pass rates as the dependent variable, while the LPI-Observer scores served as one of the independent variables. Additionally, as an important factor, we compared traditional and nontraditional high schools. These key variables were used in determining the strength of the impact that teachers' perception of instructional leadership practices had on student pass rates in mathematics.

Research question one. To expose the relationship between teachers' perception of principal instructional leadership and the school's CSEC pass rate, we generated a Pearson's Correlation coefficient. The five LPI-Observed subscale scores used to measure teachers' perception of principal instructional leadership were combined to get a single LPI-Observed overall score.

Research question two. Secondarily, we wanted to know which dimensions (or subscales) of the LPI-Observed most strongly correlated with student pass rate on the mathematics portion of the CSEC. In that regard we constructed the following linear regression model:

$$\hat{y} = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \varepsilon_1$$

where Y served as the predictor (CSEC pass rate), and the X1 through X5 represented the five LPI-Observed subscales (challenging the process, inspiring a shared vision, enabling others to act, modeling the way, and encouraging the heart). Here we looked at a forward stepwise regression to identify those subscales that contributed significantly to the model.

Research question three. For our third research question, we were curious about the variations evident in CSECS passrate based on type of high school, but controlling for teachers' perception of instructional leadership according to the LPI. The appropriate design that we applied here was the Analysis of Covariance (ANCOVA), with LPI-Observer scores serving as the covariate.

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RESULTS

As a reminder, the purpose of the study was to find correlates between teachers' perceptions of instructional leadership and mathematics pass-rate in Jamaica's high schools. The data we mined from the surveys were analyzed using the Statistical Package for Social Sciences Version 18.0.

Summary of School Characteristics

This study used perceptual data of teachers and a three-year (2009-2011) mathematics pass rate from 42 schools to answer questions that explored the relationship between leadership and school pass rate. Teachers' LPI scores from each school were averaged to give an index score for that school, and a three-year average mathematics pass rate from 2009 to 2011 was also calculated for each school. A yearly pass rate per school was the total number of students that passed divided by the total who sat the exam.

The mean pass rate for the schools sampled was 35.8%, with a standard deviation of 19, while the mean leadership score for the sample was 200, with a standard deviation of 49.74. For traditional high schools ($N = 18$), we calculated the average three-year pass to be 48.22%, with a mean LPI score of 232. For the nontraditional schools (N=24), the comparable descriptive statistics were 26.42% pass rate and a mean leadership score of 176. The mean LPI scores and pass rates are illustrated in Figure 1.

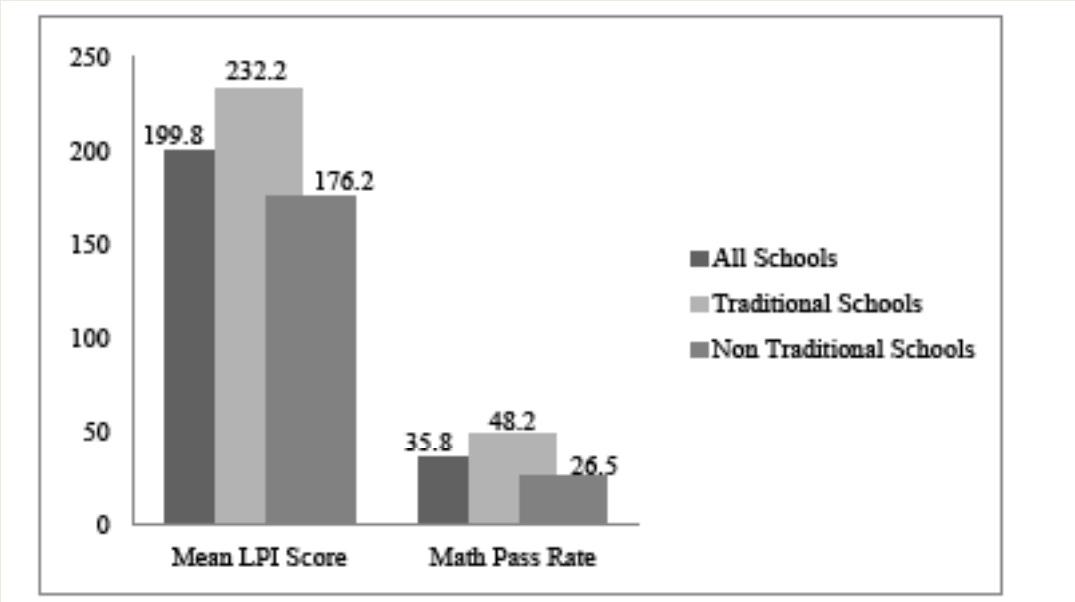

Figure 1. Mean LPI Scores and Pass Rates of Schools

We also divided the schools to look at those that fell below and those that equaled or exceeded the mean pass rate. There were 24 schools that fell below the mean pass rate (35.80%). Their mean LPI score was 175.93. For the 18 schools that enjoyed an above average pass rate, their LPI score was 231.31. The average pass rate for schools below the mean was 22.2 %, while for those above it was 53.95%.

Findings

The Analysis of Variance (ANOVA), Multiple Linear Regression, and Pearson's Correlation (r) was used to analyze the data. The standard alpha level of .05 was used to make judgments about the statistical significance of the findings.

Principal leadership and pass rate. In response to our first research question, whether there was a relationship between principal leadership and student pass rate, the Pearson's correlation revealed a strong positive correlation ($r = .610$), that was statistically significant ($p < 0.01$). In rejecting the attendant null hypothesis, we concluded that those high schools whose teachers rated the principal as having high LPI scores were more likely to have a substantially higher pass rate than those schools whose teachers rated the principals as having low LPI scores.

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LPI subscales and pass rate. To answer our second research question, we applied a stepwise linear regression, using the five LPI subscales as the independent variables and pass rate as the predictor. This was to explicitly modelled as

$$\hat{y} = \beta_0 + \beta_1 X_1 + \ldots \beta_5 X_5 + \varepsilon_1$$

where X1 thru X5 represented the fie LPI subscales of challenging the process, inspiring a shared vision, enabling others to act, modeling the way, and encouraging the heart; and ŷ was used to predict CSEC pass rate. We determined the best model fit via a stepwise regression.

The regression results indicated that the only subscale having a meaningful *R* value to enter the equation was- Enable others to act (see Table 2). As such we adjusted our model to be:

$$\hat{y} = -8.498 + 1.125\ X_1 + \varepsilon_1$$

Table 2

Regression Coefficients for LPI Scores against Pass Rate (%)

Measure	Unstandardized Coefficients		Standardized Coefficients	t-test		95.0% CI for B	
	B	Std. Error	*R*	*t*	*p*	Lower Bound	Upper Bound
(Constant)	-8.498	9.282		-0.916	0.365	-27.258	10.262
Enable others to act	1.125	0.228	0.615	4.934	0.000**	0.664	1.585

The *R* value was .615, a strong correlation that was significant ($p < 0.01$). The R^2 value of 0.378 asserts that 37.8% of the variation in schools' pass rate was explained by principal empowering teachers to act.

Pass rates for traditional and nontraditional schools. We utilized an Analysis of Covariance to test the similarity of the pass rates of traditional and nontraditional schools when we adjusted (controlled) for teachers' perception of leadership (LPI scores). The difference in mean between schools when controlling for leadership as covariate was 12.66 (traditional 43.04; non-traditional 30.37). So even though we adjusted for leadership, we still observed pass rate differences, with traditional schools being superior to non-traditional schools (see Table 3).

Table 3

ANCOVA Tests of Between-Subjects Effects

Source	Type III Sum of Squares	df	Mean Square	F	Sig. (*p*)	Partial Eta Squared
Corrected Model	6668.838[a]	2	3334.419	15.756	0	0.447
Intercept	30.67	1	30.67	0.145	0.705	0.004
Type of School	1124.261	1	1124.261	5.312	0.027	0.12
Leadership Score	1811.748	1	1811.748	8.561	0.006	0.18
Error	8253.541	39	211.629			
Total	68765.58	42				
Corrected Total	14922.38	41				

Note. (a) R Squared = .447 (Adjusted R Squared = .419); (b) Dependent Variable: Schools' three-year pass %

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In addition, the 95 % confidence interval was a strong indication that the findings reflect the population parameters. It is clear that, despite leadership differences, differences in Mathematics pass rates are still pronounced. This suggests that we need to make allowances for both leadership practices and the fact that these two types of schools are different in the first place. Our conjecture is that, along with leadership, the paucity of resources at the nontraditional schools, including those related to community resources and expectations, school resources, and student/teacher expectations, also need to be attended to.

CONCLUSION AND SIGNIFICANCE OF FINDINGS

This study recognizes the principal's role in instructional and transformational leadership and the effect that principals have on student mathematics achievement; that is, the potential of schools to enhance engagement is reconciled by the quality of instructional leadership exercised by the principal (Hallinger, 2011). While no study can account for all possible factors that impact data from human participants, the strength of the empirical findings in this study is sufficient reason to estimate that they are true for the larger population.

Given teachers' nearness to the principal, their perceptions provide the most consistent and accurate source of information on their leadership (Hallinger, 2011). One assertion being made here is that teachers are genuinely interested in improving the way they teach. Thus, teachers' perceptions reflect qualities in leadership that they desire which they find instrumental in helping them to improve the academic performance of their students (Elmore, 2002). The researchers concluded that teachers' opinions of leadership in this study are analogous to this position. Most schools for which pass rates were above the mean (35.8%) had corresponding leadership scores from 210 to 269. There was a difference of 69% between the highest and lowest pass rates and 188 points between the highest and lowest leadership scores. In the context of the leadership/pass rate correlation, these gaps were compelling variances.

In terms of the congruence between subscales of leadership, the subscale – Enable others to act – was the best predictor of achievement ($R = .615$) among the five subscales. This is consistent with research on the importance of developing teachers' capacity (Darling-Hammond, 2012; Elmore, 2002). To teach 'good mathematics' is evidently not enough: good mathematics has to be taught well (Lappan & Even, 1989); hence leadership is accountable for the directional guidance of instructional improvement in spite of contextual situations. These findings reinforce the idea that instructional leadership always plays a key role in improving school performance and as such has rightly assumed predominance among education policy agendas on many levels. Instructional leadership has become vital to school transformation because effective principals have realized the need to accept the ethic for sustained accountability and continuously focus on the quality of students' educational outcomes (Darling-Hammond, 2012).

The criterion referenced CSEC mathematics examinations is concerned with students' levels of mastery. As such, performance is evaluated against preset standards and grades are allocated based on competencies, abilities, and skills demonstrated in the work of the candidates. Based on the overall strength of the correlations, we deduced that, by and large, schools that were perceived to have higher quality leadership also had students with higher mathematics pass rates. So, higher instructional quality as a function of leadership appears to significantly correlate to higher pass rates, while lower instructional quality results in lower student mathematics performance. This study also acknowledges that even though leadership was statistically significant even when it was controlled as a covariate, there are other interacting antecedents that are holding back student achievement. Research suggests that equity is a common factor in this regard: the vast differences between schools in the extent to which socio-economic status and stratification influences learning outcomes imply that it is possible to combine high performance with reasonable levels of equity in education. Hence, in nurturing and supporting excellence, you challenge low performance and the two need not be mutually exclusive (PISA, 2012).

Although varied opinions exist about the potency of instructional leadership, this study is a germplasm for a strategic course-of-action-dialogue with, and between schools about the key determinants of educational success. The study can provide schools with a comprehensive picture of how to attain educational excellence in math and levels of holistic performance to which they can aspire. The study has reiterated that leadership is the guiding influence and direction of instructional improvement (Elmore 2002). In this regard, the efficacy of any leadership must and will be tied to the quality of the desired outcomes and the factors that will impact those outcomes (Palmer, 2012). Instructional

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leadership can enhance pass rate by enabling teachers to act. An example of enabling is moving teachers from seeing content as primary to seeing competence as primary; that is, learning mathematics to use it.

Even though principals' many roles are very important, enabling quality teaching and learning that meets the developmental, academic, and psychosocial needs of students remains primary (Darling-Hammond, 2012). It could be presumed that instructionally focused leadership that empowers teachers is a balancing approach for improving school pass rate. Leadership behaviors in that case have an effect on pass rate because they change teacher behavior.

Principals should model, inspire, enable, encourage, and challenge the status quo. Specifically, this study shows the leadership priority must be to enable teachers to improve mathematics students' pass rate. According to Ibrahim and Al-Taneiji (2013), some ways in which principals enable teachers is helping them to adopt a much broader, more systemic view of their work, use consistent and recursive cycles of inquiry for both teacher and student learning needs, and focus on the primacy of competence with rigorous content in tow.

The bottom line is that schools are centrally about teaching and learning, so only the types of leadership relations that appear to hold promise for the promotion of authentic pedagogy, pupil achievement, and inspiring the school's vision for high quality teaching and learning is useful. The educational theory that appears to be useful here is that the principal as instructional leader must recognize that cognitive reshaping, and innovative change must take place as part of the framework to underscore student improvement. In that regard, students' mathematical practices as well as teachers' instruction and assessment will not focus only on correct answers, but rather on more mathematical reasoning, modeling, higher-order thinking skills, communication and collaboration, critique, precision, and structure (Dean & Brookhart, 2013).

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