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Contrasting effects of instructional leadership practices on student learning in a high accountability context

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Abstract

Purpose – The purpose of this paper is to examine the effects of different dimensions of instructional leadership on student learning in Hong Kong secondary schools, whose broader institutional contexts are critically characterized by high accountability policy environments.

Design/methodology/approach – This study utilizes standardized test scores collected from ($n = 2,037$) students in 42 secondary schools and data collected from key staff's perceptions of leadership practices, to investigate two dimensions of instructional leadership, which are conceptually interdependent but distinctive – i.e. instructional management and direct supervision of instruction. A cross-level interaction analysis of hierarchical linear modeling was employed to investigate the effects of the two dimensions of instructional leadership on student learning.

Findings – Leadership practices focused on instructional management were found to enhance student learning by boosting the positive effect of students' attachment to their school on academic achievement. In contrast, leadership practices related to direct supervision of instruction were found to undermine student learning by weakening the positive effect of student perceptions of school attachment on academic performance when other school- and student-level characteristics are held constant.

Originality/value – The paper reveals the contrasting effects of instructional leadership as a multi-dimensional construct which is central in the current education reform agenda, rooted in accountability-oriented policy of Hong Kong. It draws a number of implications for principal instructional leadership in Hong Kong Schools as they deal with demands for external accountability.

Keywords Hong Kong, Secondary schools, Leadership, Students, Academic staff,
Principal instructional leadership, Instructional management, Direct supervision of instruction,
Accountability, Student outcomes

Paper type Research paper

Investigation into the shape, place and effect of principal instructional leadership has followed numerous pathways. Among these is the role and impact of school leadership in a policy environment that demands increased school accountability for student outcomes (Cooley and Shen, 2003; Heck and Hallinger, 2009; Linn, 2003; Vanderhaar *et al.*, 2006). For example, centrally driven school accountability policies increasingly hold a prominent place in government education reform agendas internationally (Ingram *et al.*, 2004; Lee *et al.*, 2012a,b; Linn, 2003; O'Day, 2002). While these policies

differ in form and emphasis both across and within national boundaries, there is little doubt that they impact the context in which school leadership is exercised. Generally couched within the framework of a broader "quality education" agenda, these policies typically aim to devolve some decision-making power and educative responsibility for student outcomes to the school level (Carnoy and Loeb, 2002; Ng and Chan, 2008).

A consequence of this policy trend has been to return "instructional leadership" to a central position within reform discourse (Hallinger, 2005; Wiseman, 2004), often under the label "leadership for learning" (Hallinger, 2003, 2005). While scholarly interest in instructional leadership has endured since the early 1980s (e.g. Bossert *et al.*, 1982) it has returned to the limelight by virtue of an increasing global emphasis on school accountability measures linked directly at improving student learning (Hallinger, 2005). This has in turn been accompanied by substantial empirical evidence of the positive impact of instructional leadership on teacher practices and student outcomes (Blase and Blase, 1999; Hallinger and Heck, 1996; Leithwood *et al.*, 2004; Louis *et al.*, 2010; Marks and Printy, 2004; O'Donnell and White, 2005; Robinson *et al.*, 2008). Drawing on data from 23 countries involved in the Teaching and Learning International Survey (TALIS), a recent Organization for Economic Co-Operation and Development (OECD) report indicated that greater instructional leadership contributes significantly to a wide range of teacher and school outcomes (OECD, 2009). Similarly, a study on school leadership across eight different societies highlighted instructional leadership as a key characteristic of high-performing principals in those societies (Barber *et al.*, 2010).

This paper focusses on principal instructional leadership in Hong Kong within a high accountability environment. Stricter accountability mechanisms first appeared in Hong Kong during the early 1990s. The most pervasive of these were embedded in school-based management (SBM) reforms (Cheng, 2009; Walker, 2004). The often technocratic policy prescriptions adopted within SBM incorporated globally validated language such as "performance indicators" and "quality assurance." Taken together these gradually came to comprise a key foundation for the Hong Kong Government's ambitious accountability framework; a framework clearly aimed at the quality of student outcomes (Education Bureau (EDB), 2008).

Externally imposed accountability policy requires principals to simultaneously respond to the specific needs of their schools while adhering to common benchmarks and complying with new reporting mechanisms. Previous research suggests that these requirements have steered Hong Kong principals toward instructional leadership practices (Walker and Ko, 2011). However, empirical studies have not explicitly examine the link between principals focussing their instructional practices directly on student outcomes in direct response to externally imposed accountability policies in the context of Hong Kong.

This paper reports a study which investigated the impact of principal instructional leadership on student learning outcomes in Hong Kong secondary schools operating in a high accountability context. Given that principal instructional leadership is a multidimensional construct we investigated the effects of different dimensions on student achievement (Hallinger, 2005; Hallinger and Murphy, 1985; Heck *et al.*, 1990; OECD, 2009). Our assumption was that different dimensions of instructional leadership would have dissimilar impacts on student achievement within an accountability context (Cheng, 2009; Ho, 2005; Walker, 2004, 2006). Our study was driven by the following question: how do two different dimensions of principal leadership practices

(i.e. instructional management and direct supervision of instruction) impact student achievement?

In the following section we discuss instructional leadership as a multidimensional construct and its implications for accountability in the Hong Kong context.

Theoretical perspective

This section consists of three parts. First, we discuss the conceptual framework (i.e. the multidimensionality of instructional leadership) that guided data collection and analysis. Second, we discuss the implications of this multidimensionality in relation to the accountability policies facing Hong Kong school principals. Third, we justify the analytical model underpinning our investigation of the effects of instructional leadership on student learning.

Instructional leadership as a multidimensional construct

Research into instructional leadership began in earnest in the early 1980s as part of the school effectiveness movement (Hallinger, 2005). Bossert *et al.* (1982) argued for the importance of understanding the relationship between instructional leadership and principalship behaviors. As such, Bossert *et al.*'s research led to the emergence of empirical studies into the enactment of instructional leadership (Hallinger, 2005). Since then researchers have used multiple conceptual models and methodologies to investigate the concept. Regardless of the variety of models and subsequent debate in the area, at last two common agreements cut across studies. The first is the positive impact of instructional leadership on school improvement; and the second, that instructional leadership is a multifaceted construct.

Research has documented the indirect impact of instructional leadership on student learning through how it is applied to shape school learning environments and teacher practices (e.g. Hallinger and Heck, 1996; Leithwood *et al.*, 2004). The indirect impact of instructional leadership on student learning is especially salient in elementary schools (Heck and Hallinger, 2009; Louis *et al.*, 2010). Other empirical research suggests that the impact of transformational leadership on school performance can be enhanced by instructional leadership (Marks and Printy, 2004). A recent study conducted in Chicago public schools found that instructional leadership plays a key role as "the driver for change" (Bryk *et al.*, 2010, p. 61) for school improvement and student learning. Robinson *et al.* (2008) reaffirmed that, in general, instructional leadership practices have a greater impact on student learning than those associated with transformational, transactional or other types of leadership. In summary, the international literature provides general agreement of the contribution of instructional leadership to school improvement.

There is also agreement that instructional leadership is a multifaceted construct. Hallinger and Murphy's (1985) model (Principal Instructional Management Rating Scale (PIMRS)) presents instructional leadership as comprising multidimensional features. Their model has three dimensions: defining the school's mission, managing the instructional program and promoting a positive school learning climate (Hallinger, 2005; Hallinger and Murphy, 1985). Using a similar set of leadership practices to PIMRS, Robinson *et al.* (2011) categorized two broad dimensions of instructional leadership: direct instructional leadership (e.g. setting and ensuring goals, leading teacher teaching and instruction) and indirect instructional leadership (e.g. organizing instructional program, protecting instructional time) (cited in Louis and Robinson, 2012). Heck *et al.* (1990) suggested that instructional leadership consists

of leadership practices addressing high academic expectations, professional development, the use of data to monitor academic progress and strong emphasis on instruction.

Recent OECD research (2009) based on the TALIS data further affirms that instructional leadership is a multidimensional construct. Drawing on data from 23 countries the OECD report (2009) showed that effective instructional leaders tend to engage actively in three domains: management for school goals, instructional management and direct supervision of instruction. the first domain, management for school goals, is similar to the first dimension of PIMRS in that it highlights principals' explicit management of instruction through school goals. The second domain, instructional management, focusses on developing and improving curriculum, curriculum knowledge and pedagogy. This domain overlaps with the second dimension in the PIMRS. The final domain, direct supervision of instruction, refers to "actions to directly supervise teachers' instruction and learning outcomes" (OECD, 2009, p. 194) – thus it also partially overlaps with PIRMS's second dimension (see Hallinger and Murphy, 1985). In sum, OECD's conceptualization of instructional leadership is similar to the PIMRS, the most widely used instrument internationally for exploring instructional leadership. At the same time, however, the OECD framework further partitions the second dimension of the PIMRS by proposing instructional management and direct supervision of instruction.

In summary, there is a now tacit agreement that instructional leadership is a multidimensional construct. Despite such agreement there is relatively less consensus, or empirical work, about whether different dimensions of instructional leadership have different levels of impact on student learning. Little is known about which dimensions work better, or conversely, which have less impact (or even a negative effect) on student learning. Further investigation of this may shed greater light on the intricacies of effective instructional leadership.

In this study we adopted OECD's instructional leadership framework for a number of conceptual and practical reasons. First, the framework is conceptually consistent with previous research. Second, the framework is built on analysis of internationally validated data. The OECD study is widely regarded as the largest data set available on instructional leadership. Third, in practical terms, it is conceptually and analytically compatible with our dataset in terms of the composition of survey items.

Instructional leadership in a high accountability context
The introduction of SBM in Hong Kong in the early 1990s first focussed interest on the link between principal leadership and school effectiveness (e.g. Chan and Cheng, 1993; Cheng, 1994; Wong, 2003). However, research focussing explicitly on principal instructional leadership schools remains under researched. Only a handful of relevant "empirical" studies have been published (e.g. Chan and Cheng, 1993; Cheng, 1994; Lee and Dimmock, 1999; Lee *et al.*, 2009, 2012a,b; Wong, 2003).

Using OECD's conceptual framework, we noted two major findings relevant to instructional leadership research in Hong Kong. In terms of the first dimension, management for school goals, research has found that leadership practices around setting goals and building shared vision are significantly associated with school improvement. For example, Cheng (1994) found that principal leadership was critical to school performance through providing clear organizational goals which were used to hold staff accountable. Similarly, Wong (2003) found that leadership practices focussing on "vision, mission and goals" (p. 243) contributed to effective school

management. Chan and Cheng's (1993) research found that the instructional leadership practices of Hong Kong secondary principals focussed on providing incentives for learning, maintaining high visibility and enforcing academic standards. These practices connect with elements of OECD's second domain – instructional management.

No research has been conducted explicitly into direct supervision of instruction in Hong Kong. This is a somewhat surprising given the growing recognition of instructional leadership as a policy lever for accountability (Education Department, 2002)[1]. In other words, although leadership practices related to direct supervision of instruction appear to be more closely related to external accountability policy measures than the other two dimensions, there is no empirical research in this area. As such, it remains unclear how different dimensions of instructional leadership play out in terms of student learning outcomes in Hong Kong schools, especially when the broader institutional environments is largely defined by centrally directed accountability measures.

Given that imposed accountability is one of the most influential policy levers in Hong Kong, it is important to investigate the impact of direct supervision of instruction on instructional leadership in schools (e.g. Cheng, 2009; Linn, 2003). Cheng's (2009) review of education reform in Hong Kong showed that accountability policies are embedded in a range of regulatory mechanisms built upon a market orientation (e.g. School Places Allocation Scheme) and a commitment to decentralization (e.g. SBM). At the school level, accountability plays out managerially and professionally. These intersect to re-shape school cultures and operation. Walker and Ko (2011) explain:

> [T]he dominant approaches to accountability employed by policy makers fall predominantly into the managerial and professional categories. For example, in an attempt to more closely link school development and accountability policy makers introduced the Quality Assurance Framework in 2003. This policy made it compulsory for schools to prepare annual development plans, apply performance indicators, such as stakeholders' surveys, value-added information and norm-referenced outcome measures and implement internal and external school reviews. Schools were also placed under increased scrutiny through the territory-wide assessment system. At the same time the government introduced initiatives designed to enhance professionalism in schools. For example, they offered territory-wide information technology training, commissioned the development of a benchmark assessment instrument for language teachers and introducing formal accreditation and professional training for aspiring principals. The Quality Education Fund and the Chief Executive's Award for Teaching Excellence were launched as ways to encourage professionalization through funding school-initiated action research and to reward teachers (pp. 12-13).

In brief, demands for externally imposed accountability are seen as forming a key contextual influence on Hong Kong principals' work (Walker and Ko, 2011). As such, we suggest that principals' instructional leadership practices (e.g. direct supervision of instruction) which respond to accountability demands may not have a positive impact on student learning. Although viewing instructional leader practices as counterproductive runs counter to most research in the area in Hong Kong, it has a basis in local literature. Lee and Dimmock (1999) found that when principals focussed too strongly on implementing practices associated with accountability and quality assurance, this increased pressure on teachers. Almost a decade later Walker and Ko (2011) found that working in a demanding accountability environment had a negative impact on school conditions. Drawing on these perspectives we further assume, for the purposes of this study, that direct supervision of instruction, which fits neatly within

regulatory accountability environments, may generate a negative impact on teachers' work conditions and student learning.

Exploring the effects of instructional leadership on student learning through school attachment

In this paper we hold that student learning is influenced by student perceptions of school attachment, or how students view their school, and more specifically, the sense of belonging they feel to their school communities (Johnson *et al.*, 2001). Our assumption is that students are more likely to engage actively in learning if they feel a positive attachment to the school (e.g. sense of belonging, valuing teacher instruction, intriguing class lessons, etc.). Research supports this assumption. For example, studies have shown that student attachment to their school is associated with positive student outcomes and academic performance (e.g. Libbey, 2004; Marchant *et al.*, 2001). Blum (2005) concluded that a high level of school attachment promotes student "motivation, classroom engagement and improved school attendance" (p. 6), which in turn increases academic achievement.

School cultures are partly shaped through teachers influencing student perceptions of school attachment. This produces a social setting which includes regular interaction between students and teachers. Student learning in this milieu cultivates certain values, expectations and images about their schools. Given that research suggests that principal leadership behaviors around accountability generates negative pressure on teachers (Lee and Dimmock, 1999; Walker and Ko, 2011), it is reasonable to assume that this pressure will in turn influence student attachment to their schools through daily classroom interactions. We further hold that principal leadership practices such as regular inspections of student school work, observation of classroom activities and the use of student assessment data for monitoring teaching may generate additional pressure on teachers, and that this will play out in classrooms. We use these as measures of principal leadership practice related to direct supervision of instruction. Likewise, we assume that an unhealthy organization climate may result when instructional leadership behaviors driven by external accountability demands are limited to classroom inspection and bland judgments of teaching quality only. Therefore, in this study we investigate the effect of student attachment to their schools on student learning outcomes and how this is moderated by principal leadership practices such as direct supervision of instruction. Our interest in this angle was supported by preliminary hierarchical linear modeling (HLM) analysis that showed the school attachment slope differed significantly across schools, unlike other student-level variables. This suggests that the effect of school attachment is more likely to vary across the sample schools than do other student-level variables.

Methodology

This study employed cross-level interaction analysis of HLM to examine how the two leadership dimensions (i.e. instructional management and direct supervision of instruction) contribute to student achievement by decomposing variation in student achievement into within- and between-schools portions, when other important school and student characteristics are controlled for.

Data collection

All secondary schools in Hong Kong in 2009-2010 (498 secondary schools excluding English Schools Foundation and international schools (EDB, 2011)) were invited to

participate in the study. Of the 498 schools, 52 schools agreed to participate[2]. While a low participation rate is not unusual in leadership research in Hong Kong, further disaggregation of the data showed that schools using English as the medium of instruction (MOI) were overrepresented (see Appendix 1 for more details). Partly because of this overrepresentation, the average score of Hong Kong Certificate of Education Examination (HKCEE) of the students sampled from the 42 schools (61.6) was higher than that the estimated average of the entire population (50.0)[3]. In this regard, caution needs to be exercised in interpreting results.

We gathered survey data from 180 key staff working in the sample schools who were seen by the principal as playing an important role in schools improvement[4]. Approximately 74 percent held administrative positions such as vice-principals or department heads, the remainder were senior teachers. All had worked in the same school for at least three years prior to data collection (see Appendix 1). They were asked to rate their principals' leadership practices related to instructional management and direct supervision of instruction on a six-point Likert scale (see Table I).

Another survey dataset was gathered from 2,032 Secondary 7 students enrolled in the schools. On average, 48 students from each of the sampled school participated in the study. They were asked to indicate their perceptions of school attachment, peer academic orientation and parental involvement, also on a six-point Likert scale

Variables	Question items	α
Direct supervision of instruction	Regularly inspect student homework	
	Regularly observe classroom activities	
	After observing classroom activities, work with teachers to improve their teaching	0.817
Instructional management	Initiate school-based instructional projects	
	Articulate high expectations for student academic achievement	
	Design ways to improve student learning	
	Encourage staff to consider new ideas for their teaching	0.870
School attachment	I feel that I belong at this school.	
	Most of what I learn at school is interesting.	
	I think schoolwork is really important.	
	It is really important to me that I learn and develop my skills at school.	
	I really enjoy school most of the time.	
	I feel proud to be a student at this school.	
	I like most of the lessons in my school.	
	This school is a friendly place.	
	This school has a good reputation.	
	Students get good results at this school.	
	Students behave well at this school.	
	I feel confident that I will be successful in school	0.924
Peer academic orientation	Most students at this school are interested in learning.	
	Most students at this school want to continue their education after finishing secondary school.	
	Most students at this school want to do well in tests and exams	0.672
Perceived parental involvement	My parent(s)/guardians feel welcome in school and like to visit it.	
	My parents/guardians come to parents' evening/events.	
	I often discuss my schoolwork with my parents/guardians.	
	My parents/guardians are always willing to help me with my schoolwork	0.733

Table I.
Survey question items

(see Table I). Basic demographic information such as gender was collected (see also Appendix 1). Importantly, we gathered self-reported HKCEE scores from the students.

We also collected school demographic data such as MOI and school size from school archival data. School-level performance data were obtained from the EDB. The EDB's value-added data collected over a three-year period of time (i.e. 2006-2008) were released with the permission of the sample schools (see Measures for more details).

Finally, we note that our final analysis included 42 out of the 52 participating schools only. We excluded ten schools in the final analysis because the key staff survey had relatively lower rates of non-responses (e.g. >80 percent), and so could not be adequately handled, even with multiple imputation (MI) methods.

Measures
The study included two broad categories of independent variables: student-level characteristics and school-level characteristics, as the dataset incorporated a unit of analysis (i.e. students) that was nested within a larger unit (i.e. schools). The dependent variable focussed on standardized student achievement scores, we define these as follows.

Student-level variables (control variables): student-level characteristics were comprised of student perceptions of school attachment, peer academic orientation, parental involvement and demographic variables such as gender and number of years the students had attended the school. All the level-1 variables were used as control variables (see Appendix 2 for a correlation matrix among the control variables).

- Gender: since studies conducted in Hong Kong have reported mixed findings of gender differences in terms of educational outcomes (Wang, 2006; Wong *et al.*, 2002), we included the gender variable in our model to control for any gender effect on academic achievement. With this in mind, as a key demographic characteristic, female was coded as 1 and male coded as 0.

- Years of enrollment in the current school: we assumed a possible association between the number of years students had attended the school and student achievement. Our rationale was that longer student attendance meant greater exposure to different school-level factors related to achievement. We also included this variable because a number of students had transferred to the sample schools. Research has shown that when students' change schools for reasons other than grade promotion (e.g. primary to junior secondary) the effect is negatively associated with educational outcomes such as low school performance, higher dropout rates and more frequent absenteeism (e.g. Lee and Burkam, 1992; Rumberger and Larson, 1998; South *et al.*, 2007). Given this, length of attendance was used in the model; high values indicate that students have been enrolled in the school for a longer time.

- School attachment: students' perceptions of school attachment were included in the model. This variable was measured with 12 items ($\alpha = 0.924$) gauging students' agreement with items such as "I feel that I belong at this school" and "I like most of the lessons in my school" (see Table I for the all survey items). High values (on a six-point scale) indicate that students have a positive perception of school attachment.

- Peer academic orientation: we included students' perceptions of their peer group's academic orientation. This is an important factor influencing student achievement particularly in the Hong Kong context. Students who attend a high-performing school where average achievement is high are more competitive; this has been found to negatively influence academic outcomes (Marsh *et al.*, 2000). In addition, Salili *et al.*'s (2004) research as cited in Leung and Choi (2010) reported that Hong Kong teachers tended to show greater appreciation and pay more attention to academically able students. This often resulted in a negative classroom atmosphere. The peer academic orientation variable was therefore derived from three items ($\alpha = 0.672$) measuring student perceptions of the academic orientation of their peers (e.g. "Most students at this school want to do well in tests and exams" and "Most students at this school are interested in learning"). High values (on a six-point scale) indicate that peers are highly academically oriented.

- Parental involvement: the effect of parental involvement on academic achievement has been documented internationally. However, findings present a mixed picture. While a number of studies support the positive impact of parental involvement on different types of academic outcomes (e.g. Ho and Willms, 1996; Horvat *et al.*, 2003; Madyun and Lee, 2010; McNeal, 1999), other research suggests it has either an insignificant or a negative influence on student achievement. For example, Catsambis's (2001) study found that indicators of parental involvement were not associated with achievement growth between the 8th and 12th grades in US high schools. In the Hong Kong context, Chen (2008) reported that perceived parental support was negatively linked to academic achievement for Form 4 students. This suggests that the effect of parental involvement on academic achievement may either disappear or even morph into a negative in certain youth developmental contexts. We considered these contradictory findings when we set up our model by incorporating a parental involvement variable. The variable was based on four items ($\alpha = 0.733$) measuring students' perception of parent involvement, such as parent participation in school events and parent help with schoolwork[5]. High values (on a six-point scale) indicate strong parental involvement (see Table I for details).

School-level variables (control variables): key school characteristics were employed as control variables. Specifically, MOI and school size were considered important school-level conditions associated with student achievement (see Pong, 2009; Pong and Tsang, 2010). We also added school-level performance data and the value-added data offered by the EDB as a school-level control variable in order to further isolate the effect of school leadership on student achievement:

- MOI: the role of English language is crucial in Hong Kong. English competency is associated with increased career prospects. English medium instruction (EMI) schools are therefore preferred by most families (Pong, 2009). This trend has intensified since 1998 when the Education Department introduced a new language policy to encourage schools to adopt Chinese as the medium (CMI) of instruction. To use EMI schools had to meet three requirements: student ability, teacher capability and support measures. Consequently, the majority of secondary schools became CMI schools (Education Commission, 2005). This has

highlighted the value of attending an EMI school to improve career prospects. In other words, high-achieving students tend to select EMI schools because "English linguistic capital continues to be linked to cultural and economic capital and to reproduce the existing stratification of society and schooling" (Morrison and Lui, 2000, p. 482). This is supported by research that shows that EMI schools tend to perform better than CMI schools on standard achievement tests, particularly in Chinese, English and Mathematics (Salili and Lai, 2003). Within this context, we included the MOI variable in our model, CMI schools were coded as 0 and Chinese/English medium schools (mixed mode) 1 and EMI schools as 2.

- School size: a body of research indicates that school size plays an important role in improving student school life in general and student achievement in particular (Leithwood and Jantzi, 2009). School size research has overwhelmingly affirmed that small schools are more effective than larger schools in terms of educational outcomes, including academic achievement (e.g. Howley, 1994; Lee and Smith, 1995; Stiefel *et al.*, 2000), academic equity among different racial ethnic groups (Howley *et al.*, 2000; Lee and Friedrich, 2007; Stiefel *et al.*, 2000) and school safety (Cotton, 2001). At the same time, however, a number of studies support the finding of a positive relationship between large size and academic achievement (e.g. Barnett *et al.*, 2002; Sawkins, 2002, cited in Leithwood and Jantzi, 2009; Schreiber, 2002). These studies attribute this positive relationship to the fact that larger schools have a more diverse teacher population and can therefore offer greater instructional and curriculum specialization (Leithwood and Jantzi, 2009). Although these findings are inconsistent, the bottom line is that school size matters. We therefore added the variable of school size in our model. Small schools (<800 students) were coded as 0, mid-size schools (between 800 and 1,100 students) as 1 and large schools (>1,100 students) as 2.

- Student streaming: Hong Kong secondary students are "streamed" into schools under the Secondary School Place Allocation System in accordance with their academic achievement. Using the Pre-Secondary 1 Hong Kong Attainment Test primary school graduates are allocated to one of three equally sized secondary school bands – Band 1 (highest academic achievement), Band 2 and Band 3 (EDB, 2011). This cannot be ignored, but given that Band classifications are not publicly available we used the value-added data as a proxy measure. Value-added data is measured by using Stanines – normalized standard scores ranging from 1 to 9. Since Stanines have a mean of 5 and a SD of 2, we coded 0 for Stanines from 1 to 3 as low-performing schools (corresponding to Band 3), 1 for Stanines from 4 to 6 as mid-performing schools (corresponding to Band 2) and 2 for Stanines from 7 to 9 as high-performing schools (corresponding to Band 1), based on the average of value-added scores over three years (2006-2008).

School-level variables (key independent variables of interest): we used the two instructional leadership dimensions as school-level variables to examine how key staff saw their association with student achievement:

- Instructional management: measured by four items ($\alpha = 0.870$) comprising principals' practices focussed on teaching and instruction – encouraging new ideas about teaching, initiating instructional projects, designing measures for improving student learning and articulating high expectations for student

learning. The average score of the four items was used for the analysis; high values (on a six-point scale) indicate that the practices are important in the schools (see Table I for more details).

- Direct supervision of instruction: derived from three items ($\alpha = 0.817$) of key staff perceptions of principal' focus on direct supervision of instruction aligned to student learning: regular inspection of student homework; regular classroom observation; and post-observation classroom activities, work with teachers to improve their teaching. The average score of three items was used for the analysis; high values (on a six-point scale)[6] indicate that direct supervision of instruction and learning outcomes is emphasized in the schools (see Table I for more details).

It should be noted that the two instructional leadership variables had a moderately high correlation (0.625, $p < 0.001$). Conceptually, this interdependency is not surprising given that both represent the construct of instructional leadership. However, analytically this might cause collinearity between the two variables. Our preliminary analysis indicated that the variance inflation factor was not substantially >1 and thus we concluded that collinearity was not an issue. In addition, given the interdependency between the two constructs, we also conducted confirmatory factor analysis of the two constructs. Specifically, we compared a two-factor structure model, separating instructional management from direct supervision of instruction, with a single factor model as a competing model which combines items of both instructional management and direct supervision of instruction. Results indicated that the two-factor model showed a significantly better model fit ($X^2 = 23.7$, df $= 13$, CFI $= 0.983$, TLI $= 0.964$ and RMSEA $= 0.057$) than the single factor model ($X^2 = 76.3$, df $= 14$, CFI $= 0.902$, TLI $= 0.804$, RMSEA $= 0.132$). A model comparison confirmed that the two-factor model fit the data significantly better. In fact, the single factor model did not even meet standard cutoff recommendations for fit indices[7]. This suggests that while the two constructs are conceptually interdependent under the heading of instructional leadership they are also conceptually distinguishable in that they reflect different aspects of instructional leadership.

Dependent variable: mandated standardized test scores (i.e. HKCEE) were used as a dependent variable, based on students' self-reports. The original scale of HKCEE (i.e. 1 to 30) was transformed for easier interpretations of the analysis – i.e. ranging from 3.33 to 99.9 with a mean of 61.6 and SD of 14.0.

Analytical strategies
Because the dataset had a nested structure in terms of units of analysis (students within schools) we employed a two-level hierarchical linear model (Raudenbush and Bryk, 2002). As in many large datasets, there were missing values in both of the key staff and student surveys. These ranged from 0.4 percent (gender) to 2.4 percent (student perceptions of school attachment). To address missing values we conducted a single imputation of the school-level data[8]. For student-level data, we conducted a MI by using a custom imputation model with constraints on the variables to prevent imputed values from falling outside a reasonable range[9]. Consequently, five completed datasets representing simulated versions of the sample were created[10]. These complete datasets were analyzed using HLM 6.8 software. The estimated parameters for variables in the model from the five datasets were averaged to yield a single estimate[11].

By setting up a random effects ANOVA model (i.e. null model), we identified an intra-class correlation coefficient (ICC) for the dependent variable. We then built explanatory models by adding level-1 (student characteristics) and level-2 variables (school characteristics) in that order. The final HLM model was constructed using an intercepts- and slopes-as-outcomes model (Raudenbush and Bryk, 2002) in order to examine cross-level interactions.
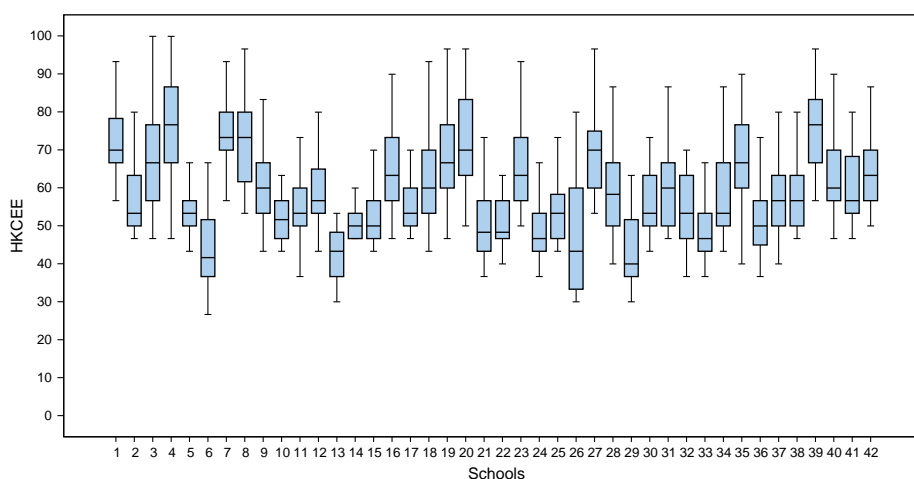
Results

Descriptive results

Figure 1 presents the variation in student achievement across the 42 schools. The median student achievement score across the schools was 59.9 (see the dotted line in the figure). The boxplots in the figure provide more detailed information regarding variation in student achievement by illustrating the distribution within and between schools. The slightly thicker horizontal lines in the tinted boxes indicate median student achievement in each school. The tinted boxes show the middle 50 percent of students' achievement scores. The distance between the top edges of the tinted boxes and the upper horizontal lines indicate the top 25 percent of students' achievement scores. Likewise, the distance between the bottom edges of the tinted boxes and the bottom horizontal lines indicate the bottom 25 percent of students' achievement scores. The wide range of medians in the boxplots highlights the striking variation in student achievement scores between and within the schools.

HLM on student achievement

Subsequent HLM analyses confirmed this impression of substantial between-school variance in student achievement. A random effects ANOVA model (null model) showed that average student achievement varied significantly across the 42 schools. Specifically, the associated ICC is 0.349. In other words approximately 35 percent of the total variance lies between the schools. This again supports the striking variation in student achievement scores between the schools shown in Figure 1. In all, 35 percent

Notes: The figure is constructed from the dataset before the multiple imputations ($N = 1,994$). Outliers are included in the figure, yet they are not visualized

Figure 1.
Within and between variation in HKCEE by schools

of the total variance in student achievement is related to school-level characteristics, including principal leadership practices.

Based on this dependency, we built explanatory models (see Table II) by adding level-1 student characteristics (Model 1), level-2 school characteristics (Model 2) and cross-level interactions (Model 3). In the explanatory models, we allowed the school attachment slope to vary across the schools, whereas we specified the other level-1 slopes as fixed. We used this approach for several reasons. First, the deviance statistic indicated a better model fit when the school attachment slope was allowed to vary across the schools[12]. Second, based on school attachment literature, we assumed that student perceptions of school attachment differ between schools in as much as they mold or sustain the different cultures that influence these perceptions. Preliminary analysis also indicated that, except for the school attachment slope, other level-1 slopes did not significantly vary across the schools as we built our explanatory models. Third, drawing on relevant research our process assumed that principal leadership practice moderates the effect of school attachment on student achievement. As such, we examined cross-level interactions through the school attachment slope. We added two level-2 predictors "instructional management" and "direct supervision of instruction" in the slope. Other school-level characteristics were not added for the parsimony of the final model[13]. The final results are presented in Table II.

Effects of individual characteristics: all the student-level characteristics, except the perception of parental involvement, had significant effects on student achievement. Notably, gender was a salient factor; males tended to outperform their female peers (2.86***) when the other predictors were held constant. Consistent with previous studies (e.g. Marsh *et al.*, 2000), students' perceptions of their peers' academic

Fixed effects	Model 1	Model 2	Model 3
For adjusted grand mean (β_{0j})			
Intercept γ_{00}	60.66 (1.34)***	54.50 (1.16)***	54.51 (1.14)***
Medium of instruction γ_{01}		5.16 (0.90)***	5.28 (0.88)***
School size γ_{02}		5.57 (1.24)***	5.48 (1.21)***
School performance γ_{03}		4.19 (1.18)**	4.25 (1.16)**
Direct supervision of instruction γ_{04}		−1.05 (1.66)	−0.63 (1.48)
Instructional management γ_{05}		2.57 (1.85)	2.14 (1.70)
For gender slope γ_{10}	−2.70 (0.63)***	2.81 (0.62)***	−2.86 (0.61)***
For years in school slope γ_{20}	−0.88 (0.43)*	−0.92 (0.43)*	−0.93 (0.43)*
For school attachment slope β_{3j}			
Intercept γ_{30}	1.00 (0.44)*	1.05 (0.44)*	1.12 (0.43)*
Direct supervision of instruction γ_{31}			−2.53 (0.95)*
Instructional management γ_{32}			2.26 (0.92)*
For image of peer academic orientation slope γ_{40}	−1.25 (0.44)**	−1.32 (0.43)**	−1.33 (0.43)**
For parental involvement slope γ_{50}	−0.01 (0.27)	−0.04 (0.27)	−0.02 (0.27)
Random effects	v.c. df p.v.	v.c. df p.v.	v.c. df p.v.
Level-1 effect γ_{ij}	130.1	130.0	130.0
Mean u_{0j}	75.5 41 0.000	22.8 36 0.000	21.6 36 0.000
School attachment u_{3j}	3.4 41 0.009	3.4 41 0.009	2.3 38 0.032
Intra-class correlation coefficient (ICC)		0.349	

Notes: v.c., variance component, df, degree of freedom, p.v., *p*-value; 2,037 students from 42 schools; *$p < 0.05$, **$p < 0.01$, ***$p < 0.001$

Table II.
Hierarchical linear models predicting student achievement

orientation were negatively associated with their academic achievement ($-1.33**$). There was also a negative association between the number of years students attended their current school and student achievement ($-0.93*$). When other student- and school-level variables were held constant, student attachment to their schools (at the student level) had a positive effect on student achievement ($1.12*$).

Effects of school contexts: results indicate that school contextual characteristics make a substantial difference in student achievement. More specifically, students from EMI schools were much more likely than their counterparts from CMI schools to have higher HKCEE scores – this was expected ($5.28***$). Students from high-performing schools were more likely than their counterparts to have higher HKCEE scores ($4.25**$). However, somewhat surprisingly, students from larger schools were more likely than their counterparts to have higher HKCEE scores, when other predictors were held constant ($5.48***$).

Effects of principal leadership: student perceptions of school attachment were positively associated with HKCEE scores. More interestingly, principal leadership practices which focussed on instructional management positively moderated the relationship between students' perceptions of school attachment and their HKCEE scores ($2.26*$). In other words, leadership practices centered on managing the instructional program further elevated the positive effect of school attachment on student achievement. Unlike the positive moderating effect of instructional leadership, leadership practices that emphasize direct supervision of instruction negatively moderated the relationship between students' perceptions of school attachment and their HKCEE scores ($-2.53*$). That is, the positive effect of school attachment on HKCEE scores were exacerbated by principal leadership practices related to direct supervision of teaching.

Discussion
Principal instructional leadership focussing on instructional management boosts the positive effect of school attachment on student learning. The moderating effect of principal instructional leadership suggests a linkage between key staff perceptions of leadership and students' perception of school attachment, an area relatively less charted in empirical research. In essence, this suggests that if key staff hold a positive view of their principal's focus on instructional management, students are likely to have a positive image of their schools. This connection seems reasonable given that key staff, including teachers, are best positioned through their daily interactions to influence student perceptions of the values, expectations and the images students hold about their school (see Stanton-Salazar, 1997; Stanton-Salazar and Spina, 2000). Lee and Dimmock (1999) found that when teachers and department heads in Hong Kong focus on improving teaching and learning, students follow, this becomes "a driving force for promoting academic achievement" (Lee and Dimmock, 1999, pp. 475-6). The bottom line of this finding is that if key staff have a positive perception of their principals' instructional management this seems to influence student achievement by heightening students' perception of school attachment.

This also suggests that principal leadership practices which focus on encouraging teachers to value new ideas and innovative instructional designs are seen as positive motivators by key staff (Elmore, 2003, 2005). When teachers and key staff perceive principal instructional leadership practices as promoting professional growth, they are motivated to reflect on their teaching routines and seek new pedagogical approaches (Blase and Blase, 1999; Blase and Kirby, 2000;

Robinson *et al.*, 2008). Within this process principal instructional leadership behaviors, such as initiating school-based instructional projects (e.g. implementing action research to inform instructional development), supporting new ideas or redesigning programs, all play a key role in changing teachers' behaviors around teaching (Blase and Blase, 1999). In other words, principals are viewed as facilitators of teacher professional growth rather than directive supervisors, especially when teachers see their principals as effective instructional leaders (Blase and Kirby, 2000; Poole, 1995).

In contrast to the positive effect of instructional management on student learning through school attachment, principals' practices closely intertwined with direct supervision of instruction undermined student achievement through school attachment. This negative moderating effect of direct supervision of instruction on student achievement can be explained by examining the following survey items:

- regular inspection of student homework;

- regular observation of classroom; and

- working with teacher based on classroom observation.

These practices seem to be perceived negatively by key staff because they create negative pressure on teachers. Lee and Dimmock (1999) found that "intangible pressure"(p. 470) was loaded on teachers' in two Hong Kong secondary schools when principals exercised curriculum leadership practices aligned to accountability and quality assurance as a the prime strategy for improving student learning. Similarly, Walker and Ko (2011) found that working in an accountability environment could undermine the school conditions supporting student learning.

The key question then is why principal leadership practices focussing on direct supervision of instruction and learning outcomes generate a negative school atmosphere for teachers? We propose three possible explanations. First, there seems to be an intellectual disconnection – i.e. inconsistency in the uniformity of the messages about a particular type of leadership behavior (Walker, 2006; Walker and Qian, forthcoming) – between principals and key staff. In practice this might be issues around how teachers decode the intentions embedded in principals' direct supervision of instruction. For example principals may see direct supervision of instruction as a means of authentic, technocratic control, which is welcomed by parents from a consumerist stance. Conversely, within a highly regulated accountability context, principals may be pushed to define instructional leadership simply as direct supervision. They may also be attracted to direct supervision as an easier, more efficient pathway to increase standardized test scores. In either case, instructional leadership practices are geared primarily around inspection and a one-dimensional judgment of classroom instruction.

Such complex situations facing principals as instructional leaders seem interwoven with high accountability policy environments. In other words, while instructional leadership is a critical leadership construct, and related practices contribute significantly to school improvement, it may not be a given that such practices automatically have a positive effect. Some instructional leadership domains, such as direct supervision of instruction, may actually generate a negative impact on school improvement by weakening teacher empowerment or autonomy (Walker and Qian, forthcoming). This seems especially so when institutional contexts are largely shaped by external accountability measures. It is worth noting Elmore's (2005, p. 135)

suggestion about how accountability ought to be understood: "accountability is defined by what individual teachers think students can do, not by their work environment or by the supervision of school leaders." In a similar vein, Linn (2003) proposed that "shared responsibility" (p. 3) should be emphasized in accountability systems. This does not appear to be case in Hong Kong where a substantial portion of responsibility flows onto teachers' desks.

Another explanation relates to the socio-cultural context of Hong Kong. Walker and Qian (forthcoming) used the term "cultural disconnection" to refer to "disconnection between what reforms demand and the cultural realities of teaching in and leading schools" (pp. 162-77). This poses questions about whether instructional leadership emphasizing direct supervision and inspection, triggered by the current accountability framework in Hong Kong, is actually congruent with "the broader culture of Hong Kong and the deep teaching and leadership structures and values which guide relationships and behaviors in Hong Kong schools" (not paginated yet). Like many of the current educational reform measures, instructional leadership is driven by global educational trends. As such, educational practices borrowed from other countries can be accompanied by conflicting values and incompatible conditions to the host society (Phillips and Ochs, 2003) – this raises concerns about cultural appropriateness (Walker and Dimmock, 2000). While instructional leadership as a whole is generally understood as an effective leverage for improving schools across diverse socio-cultural contexts, including in Hong Kong (e.g. Chan and Cheng, 1993), it is informative to note that some instructional leadership practices may have a negative impact on school improvement and student learning, especially if it is contextually inappropriate. Our analysis clearly indicates that principals' direct supervision and inspection is a case in point. Interestingly, research has shown that even in hierarchically structured societies such as Hong Kong, observation or inspection of teachers' classroom activities for the purpose of accountability is interpreted as principal intrusion into teachers' traditional domains (e.g. Lee, 2005; Walker and Dimmock, 2000).

Third, the negative moderating effect of principals' direct supervision suggests that there is a detrimental linkage between negative perceptions held by about leadership practices and student attachment to the school. As noted, "what teachers do in classrooms" is the most influential factor shaping students' perceptions of their school (Stanton-Salazar, 1997; Stanton-Salazar and Spina, 2000). It thus appears reasonable to speculate that teachers working with the pressure generated by accountability-oriented leadership practices such as direct supervision and inspection will either intentionally or unintentionally negatively influence students' attachment school to their school.

Limitations
There were several limitations of the study. First, because of the perceived sensitivity of to public exposure of value-added data we were forced to elicit voluntary participation. Consequently, the overall response rate in terms of the overall sample was very low. The number of sampled schools was also restricted by the fact that we only included schools where principals and key staff had worked in the same school for three consecutive years. We did this in order to get a better picture of the impact of leadership over time. Although low participation is not unusual in Hong Kong, the limitation might have generated potential problems of selection bias and certainly reduced the generalizability of the findings[14].

A second limitation is the cross-sectional dataset used. A longitudinal design with the available data would have provided more significant effects of instructional leadership.

Third, given that HKCEE scores were not available we relied on self-reported scores for the dependent variable. While this can be considered a limitation in terms of reliability, there was a significantly positive correlation between the average HKCEE score and the value-added data of school performance in the same schools (0.358, $p < 0.05$), thus suggesting the self-reported data is a fairly reliable measure. Even though the correlation is not particularly high it should be noted that the value-added school performance data is an aggregated index incorporating a range of sub-measures. In other words, the value-added data is not the exactly same as the aggregate of individuals' HKCEE scores. In this regard, the moderate correlation is understandable.

Finally, because of data inaccessibility and sensitivity, some important student characteristics (e.g. family SES), which are predictive of student achievement in similar studies, were not included in the level-1 equation in the final model. This absence of adequate control variables in the level-1 model is a weakness of the present study.

Implications for policy, practice, and research
Several implications for policy, practice and research emerge from our analysis.

This result of the negative influence of principals' direct supervision of instruction supports previous findings that teachers in East Asian societies value a reasonable level of autonomy, especially in terms of curriculum development (Lee, 2005; Lee and Dimmock, 1999). In these societies teachers seem to interpret a lack of overt engagement by administrators in curriculum as a signal that the principal trusts their curricular and instructional expertise, and that management of these areas is teacher business (Lee, 2005; Walker and Dimmock, 2000). The negative impact of direct supervision of instruction on student learning identified in the study suggests that the enactment of instructional leadership practices makes a difference. As Lee and Dimmock (1999) pointed out, if principals focus too much on practices associated with accountability and quality assurance, negative pressure on teachers increases. Whereas some pressure through quality assurance and accountability is necessary, it is useful to consider the extent to which such pressure is applied and how it is communicated to shape teachers' mindsets. Teacher instructional behaviors appear influenced by whether they see principal practices as stemming from student good or policy mandate.

Some "instructional management" practices identified in this study may inform principal practices. For example, strengthening practice around the following areas may guide instructional action: stimulating innovative, school-based, and contextualized instructional designs and projects; consciously articulating links between teaching and learning, and encouraging teachers to navigate effective instructional approaches to improve student academic achievement.

The study also shed light on how instructional leadership as a multidimensional construct plays out differently, especially within regulatory accountability policy environments. Principals' direct supervision of instruction and learning outcomes emerged as a key dimension within this environment. It appears that principal instructional leadership practices "encouraged" by centralized policy interfere with the values driving school life and pedagogies through somehow giving teachers the impression that their autonomy is being challenged in their traditional spheres of

control – curriculum and pedagogy. As Reynolds *et al.* (2002) pointed out, assertive principal instructional leadership, which is often supported by US-based research, may not work in differing socio-cultural contexts[15]. Based on our analysis, this seems to be true in Hong Kong.

This does not imply that direct supervision of instruction should be removed from the arsenal of principal instructional leadership. Rather, the point is that in some educational systems, in this case Hong Kong, the way principals' enact this supervision should be sensitive school context and teaching cultures, not just policy mandates and/or decontexualized research. For example, principals may provide more reflective and formative, rather of judgmental, comments when monitoring the know-how.

How supervisory practices are enacted appears closely linked to the intentional basis of principal actions. Principal instructional leadership practices are more likely to be effective if congruent with explicitly understood vision and within an understanding of collective formal and informal responsibilities, rather than simply molded in reaction to centralized accountability measures[16]. Teachers are more likely to respond to principals' direct supervision of instruction when they believe that their leader's intentions are underpinned by student good and teacher professional growth.

Notes

1. For example, reflecting the critical role of instructional leadership in implementing accountability policy measures in Hong Kong, over the last decade instructional leadership has been integrated into school leadership preparation and certification as a central component (Education Department, 2002). In other words, instructional leadership has underpinned leader development programs for aspiring, beginning and experienced principals in Hong Kong for almost a decade. Therefore, we speculate that instructional leadership plays an important role in shaping leadership practices in Hong Kong schools.

2. The agreement rate was low for two reasons. First, the EDB could not release school-specific value-added data without the agreement of individual principals. Therefore, we were forced to approach each principal. Concerns over loss of control over test results (not currently public information) became a significant obstacle to obtaining school participation. Second, the school level survey data contained questions about principal leadership which would be answered by other staff. In this high accountability context concerns for public school test results and perceptions of their own leadership led principals to decline participation in this study.

3. Notably, the original scale of HKCEE ranges 1-30. This was rescaled for easier interpretations of our analysis, ranging 3.33-99.9. This transformed scale works mathematically identical with the original scale in our statistical modeling.

4. All of the principals in our sample schools had been working as principal in the same school for three consecutive years.

5. Note that parental involvement in this study was measured by the perception of each student. This suggests that actual parental involvement might be different from students' perceptions.

6. Note that all the variables using a six-point Likert scale in this study have the following response categories: not at all, very little, little, partially, a lot, very significantly.

7. We used χ^2 test statistic, root-mean-square-error of approximation (RMSEA), comparative fit index (CFI), and Tucker-Lewis index (TLI). In particular, we relied more on standard cutoff recommendations for the RMSEA, CFI and TLI (Hu and Bentler, 1999; Fan and Sivo, 2007). For the RMSEA, values < 0.05 and 0.08 suggest a good model fit and an acceptable model fit,

respectively. For the TLI and CFI, values > 0.95 and 0.90 indicate goodness of fit and acceptable fit, respectively.

8. Since HLM 6.8, a multilevel analysis program, accommodates multiply imputed datasets at the level-1 only, for the level-2, we used a single imputation data.

9. MI techniques have been reported as significantly more effective than traditional techniques (e.g. listwise deletion, stochastic regression imputation) in addressing missing data (Schafer and Graham, 2002).

10. The imputation model is compatible with the analytical model used in this study (see Allison, 2002 for more details).

11. Standard errors were calculated by considering the within- and between-imputation variation in the parameter estimates.

12. We calculated the deviance statistics from each of five imputed datasets, respectively. The average deviance statistics was, then, calculated from using a SAS macro that combines χ^2 statistics from the five separate HLM analyses.

13. While adding a common set of level-2 predictors (or the same level-2 predictors) in level-1 slopes of interest is more common in the analysis of cross-level interactions, in this study we selectively added level-2 predictors in the school attachment slope (see Raudenbush and Bryk, 2002, p. 151) based on the aforementioned conceptual and analytical reasons.

14. Despite the low participation rate the study is the largest scale investigation into the effect of instructional leadership practices on student learning conducted in Hong Kong.

15. Reynolds *et al.* (2002) noted that assertive principal instructional leadership is not a significant predictor that determines effective school status in the Netherlands.

16. We note that Louis and Robinson (2012) article in this special issue found that external accountability policies can have a "positive" impact on principals' instructional leadership practices in the US schooling context. This suggests a twofold meaning related to our paper. First, the finding suggests that external accountability policy is a key driving force that shapes instructional leadership behaviors in the US as well as Hong Kong. In other words, principals' attitudes toward accountability policies appear to be an important predictor of principals' instructional leadership practices in the US school context (Louis and Robinson, 2012), which we think seems to be equally true for Hong Kong. Second, US principals tend to make sense of external accountability policy in a "positive" way, especially when they internalize accountability policy measures as "aligned with their own values and preferences" and when they view "district administrators as supportive of school-driven accountability initiatives" (Louis and Robinson, 2012, p. 1). However, unlike US counterparts, probably Hong Kong principals might have a difficulty in aligning their leadership values around certain positive goals embedded in external accountability policies due to their different socio-cultural and organizational contexts. While this statement should be empirically investigated by following studies, this perspective offers an implication for educational policy makers in Hong Kong by making them think of how current external accountability approaches should resonate with principals' own leadership values with more supportive manners.

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Appendix 1

Schools

School type	Government/aided	36 (85.7%)
	Direct subsidy scheme	6 (14.3%)
Medium of instruction	Chinese	12 (28.6%)
	Chinese and English	10 (23.8%)
	English	20 (47.6%)
School size	Small	7 (16.7%)
	Mid	17 (40.5%)
	Large	18 (42.9%)
School performance	Low	11 (26.2%)
	Mid	23 (54.8%)
	High	8 (19.0%)
Key staff		
Gender	Male	107 (59.8%)
	Female	70 (39.1%)
Role	Vice-principals	56 (31.3%)
	Panel chairs	96 (53.6%)
	Senior teachers	46 (25.7%)
Years of teaching in the present schools	0-3 years:	0 (0%)
	4-7 years	15 (8.4%)
	8-11 years	18 (10.1%)
	12 years or above	132 (73.7%)
Students		
Gender	Male	964 (47.3%)
	Female	1,065 (52.3%)
School attachment	Mean	4.27
	SD	0.75
Peer academic orientation	Mean	4.56
	SD	0.73
Perceived parental involvement	Mean	2.96
	SD	0.98
Years of attending the present school	Mean	6.69
	SD	1.25
HKCEE[b]	Mean	61.8
	SD	14.03

Table AI.
Characteristics of the
sample schools, key staff,
and students[a]

Notes:[a]$N = 42$ schools, 180 staff, and 2,037 students. However, figures in the table are based on the original data with missing values; [b]the original scale of HKCEE (i.e. 1-30) was transformed to the scale, ranging from 3.33 to 99.9 for easier interpretations

Appendix 2

	Years of enrollment in the school	School attachment	Peer academic orientation	Perceived parental involvement	Gender
Years of enrollment in the school	1	0.084**	0.054*	0.04	−0.021
School attachment	0.084**	1	0.46**	0.378**	0.039

Table AII.
Correlation matrix among
level-1 control variables

(continued)

	Years of enrollment in the school	School attachment	Peer academic orientation	Perceived parental involvement	Gender
Peer academic orientation	0.054*	0.46**	1	0.228*	0.061**
Perceived parental involvement	0.04	0.378**	0.228**	1	0.06**
Gender	−0.021	0.039	0.061**	0.060**	1

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