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Differential influences of affective factors and contextual factors on high-proficiency readers and low-proficiency readers: a multilevel analysis of PIRLS data from Hong Kong

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Abstract

Background: This study examined the impact of the reading-related affective factors *home environment* and school *environment* on predicting the likelihood of students being either high-proficiency or low-proficiency readers. Data from 3,875 Hong Kong SAR Grade 4 students participating in an international comparative assessment were analyzed.

Methods: Multilevel regression analysis was used to model the relationship between affective factors (i.e., reading attitude, reading motivation, and reading self-concept) peer bullying, family context (i.e., home socioeconomic status/SES), and school context (i.e., school SES, school bullying, and school safety and order).

Results: The likelihood of being a reader with high proficiency was found to be associated with reading attitude, reading motivation, reading self-concept, peer bullying, school bullying, and school SES, whereas the likelihood of being a reader with low proficiency was associated with reading self-concept and peer bullying only.

Conclusions: These findings suggest that reading-related affective characteristics and school context may be more likely to promote rather than limit reading success.

Keywords: Reading attainment; Reading attitude; Reading motivation; Reading self-concept; Bullying

Background

Many large-scale research studies have examined the impact on student reading attainment of affective factors such as student attitudes towards reading and of home and environmental variables. However, this type of research has been far less common in Eastern countries than in Western. In similar vein, there is little evidence as to whether the links between reading attainment (especially in terms of good and poor readers) and affective and home-school factors reported in the West apply in similar strength in the East. The robust evidence gathered in international surveys of students' reading attainment offers an opportunity for this omission to be redressed.

Every five years since 2001, the International Association for the Evaluation of Educational Achievement (IEA) has conducted its Progress in International Reading Literacy Study (PIRLS), a survey of the reading standards of Grade 4 students worldwide. IEA has consequently collected extensive information about the home,

school, and national contexts that potentially influence reading development. IEA trusts that providing internationally comparable data about trends in primary students' reading achievement will stimulate ongoing research interest in this field and inform educational policies across the globe. Of particular interest to this current paper is the fact that the PIRLS surveys have looked at the reading progress of primary school students worldwide engaged in learning to read such alphabetic languages as English, as well as at students learning to read ideographical languages such as Chinese.

IEA defines reading literacy as the ability to understand and correctly use those written language forms required by and/or valued by individual societies (Campbell et al. 2001; Mullis et al. 2006; Mullis et al. 2009). The reading literacy framework that IEA uses takes into consideration a number of background scenarios reflecting a variety of national, community, school, classroom, and home contexts. Individual students receive instruction in school and accumulate literacy experiences in and out of the classroom, eventually acquiring enduring reading skills, attitudes, and habits. As the PIRLS data show, students' reading achievement is powerfully influenced by a number of social, cultural, and contextual factors, including the quality of the teaching children receive, the quality of literacy training and opportunities in school, the resources utilized in lessons, the reading syllabus, and the school's overall curriculum. Also of relevance is the importance of reading-enhancing variables out of school, including parental and social expectations, cultural and social environments, and a range of country-specific factors.

In the PIRLS 2011 assessment, Hong Kong SAR Grade 4 students ranked first in terms of reading ability among the 45 participating countries and regions. We performed preliminary multilevel analyses in an effort to identify contextual, social, and classroom predictors of Hong Kong SAR reading scores in PIRLS 2011. Results of the analyses showed that students' reading attainment was associated with their reading attitudes, reading motivations, and reading self-concepts. Home and school environments also had significant influences on students' reading attainment. However, we did not address the extent to which these findings applied to students with different levels of reading skill (i.e., readers with low proficiency and readers with high proficiency). In order to address this research gap, we analyzed the data collected in Hong Kong SAR in PIRLS 2011 to determine what role affective factors (i.e., reading attitude, reading motivation, and reading self-concept) and home and school environments (i.e., home SES, school SES, school bullying, and school safety and order) played in the likelihood of individual students being high-proficiency readers or low-proficiency readers. In order to set the present study against prior research, we briefly review a selection of pertinent studies into the relationship between the affective factors of home and school environments and reading attainment below.

Literature review

Affective factors and reading attainment: roles of reading attitude, reading motivation, and reading self-concept

In the 2001, 2006, and 2011 PIRLS assessment cycles, students' reading attitudes, motivations, and self-concepts were found to be associated with their reading attainment across countries globally (Mullis et al. 2012; Mullis et al. 2003; Mullis et al. 2007). Although a general association between these affective factors and reading attainment has

been found in prior research, the influences of these factors on reading attainment may vary in different cultures (e.g., the Western and Eastern cultures).

Reading attitude

It is generally agreed that the attitude students hold toward reading plays a vital role during the period when they are being nurtured to be competent readers and to have high academic achievement (Guthrie et al. 2000). Walberg and Tsai (1985) reported from their research the strong correlation between positive reading attitudes and reading achievement. In their study, these attitudes included believing that reading is important, enjoying reading, having a high self-concept as a reader, and having a verbally stimulating home environment where verbal interaction took place regularly.

Smith (1990) defines attitude toward reading as "a state of mind, accompanied by feelings and emotions that make reading more or less probable" (p. 215). Fitzgibbons (2004), who anchors Alexander and Filler's (1976) points of view on this matter, defines reading attitude as the *feelings* students have about reading. These feelings, he says, are important in terms of leading students to avoid or approach different reading situations. Thames and Reeves-Kazelskis (1992) point out that reading attitude is one of the major factors explaining the degree of student willingness to engage in reading activities. As such, it can be said that, for students, reading attitude is the willingness to take part in reading, with that willingness arising out of their feelings about this activity.

The considerable attention paid to the importance of reading attitude by educators and researchers has steered the development of integrated models of this affective domain of reading. One of these models, proposed by McKenna (1994), is grounded in the notion that the development of reading attitude relies on three factors: (a) the self-perceived judgments that an individual has about his or her reading outcomes, (b) the self-perceived judgments that this person has in regard to others' expectations of his or her reading outcomes, and (c) his or her specific reading experiences. The model thus has implications for fostering students' reading attitudes given the supposition/implication that reading experiences are affected by actual experiences as well as by parents' and teachers' nurturing of those experiences (McKenna et al. 1995).

Many of the above studies imply a causal association between reading attitude and reading attainment (Schofield 1980), leading researchers to regard reading attitude as an affective stimulant of reading development (see, in this regard, McKenna et al. 1995). There is both theoretical and empirical support for the influence of students' attitudes toward reading on their reading attainment. For example, the theoretical framework proposed by McKenna et al. (1995) highlights the significant role of reading attitude in *learning* to read. Empirical evidence supporting the association between reading attitude and reading performance comes from correlational studies (e.g., Askov and Fischbach 1973; Swalander and Taube 2007) and longitudinal studies (Kush et al. 2005; Martinez et al. 2008). Swalander and Taube (2007) found that reading attitude influenced reading ability. Kush and colleagues' (2005) longitudinal study demonstrated that students' reading attitudes measured in Grades 2 and 3 predicted reading attainment in Grade 7 but did not predict reading attainment in Grades 2 and 3, a pattern suggesting a causal link between reading attitude and reading attainment and what the

authors called a "temporal-interaction effect" in the linkage. In other words, the link changes developmentally, with reading attitude playing an increasing role in later reading development.

Most of the research relating to reading attitude has been conducted with English-speaking subjects in Western societies. However, teachers of Chinese children find a ready resonance in the majority of conclusions and generalizations in this literature. Teachers in Chinese societies are aware that Confucian ideas help lay the foundation to attitudes and principles held by educators, families, and children in many classrooms in the East. Cheng and Wong (1996) observed that respect for authority and a reluctance to stand out from the crowd results in many students being unwilling to challenge authors and to question inconsistencies in text. Harmony is stressed as a desirable quality, and attitudes that "rock the boat" are strongly discouraged. Thus, although students are expected to make progress as individuals, teachers and parents generally discourage them from questioning authors at a personal level and from challenging the interpretations offered by teachers.

Reading attitude has been conceptualized as a multidimensional construct (Mathewson 1994), and quite different types of reading attitude are reported in various studies, such as recreational attitude and academic reading attitude in the study by McKenna et al. (2012). However, in order to accord with the framework proposed by IEA (Campbell et al. 2001; Mullis et al. 2006; Mullis et al. 2009), we examined students' *general* attitudes about reading in the present study.

Reading motivation

Research has consistently shown that being motivated to read usually contributes both to reading comprehension and to the endurance of effective reading behavior (Morgan and Fuchs 2007; Wigfield and Guthrie 1997). People who are strongly motivated to read and are interested in a topic will usually persist in seeking to understand the meaning of unfamiliar vocabulary and concepts encountered in text (Griffiths and Snowling 2002; Guthrie et al. 2001). Poor readers, in contrast, often have little interest in reading either as a pastime or as a vehicle for learning: they lack the motivation and impulse to acquire information via reading (Lepola et al. 2000). Their lack of practice in fathoming the meaning of text leaves them reluctant to persist with improving their reading skills (Stanovich 1986).

Theoretical frameworks of reading motivation usually relate to motivation models. Pintrich and Schunk (2002) propose that motivation can be subdivided into a variety of components, such as interest, effort, choice of tasks, and persistence as well as achievement. According to Graham and Weiner (1996), motivation can be conceptualized in terms of the "expectancy-value" framework. In this regard, Biggs (1995), for example, proposed a relatively simple theoretical construct of student motivation, wherein students are motivated to learn when the task is important to them and when they expect success. According to this notion, the extent to which students are motivated is determined by their perception of how likely they are to attain a goal (expectancy) and by how much they want to realize that goal (value). Another influential theory pertaining to motivation is the achievement goal theory, which enriches many traditional motivation theories (see, for example, Ho et al. 2007; Lam 2004). This theory helps explain, with respect to reading, the interwoven relationship between reading goals, cognitive

processes, and reading attainment. Theoretical models such as these not only position reading motivation and reading attitude as the affective elements of reading attainment, but also make clear that motivation is a construct brought about by different components, including attitude.

As the review by Schiefele et al. (2012) reminds us, researchers have endeavored to identify and examine various dimensions of reading motivation. Fitzgibbons (2004), for example, is not alone in proposing that reading motivation is multi-variant. He singles out three factors: (a) the learner's interest in reading, (b) his or her attitude toward reading, and (c) his or her reading-related behavior. Although different dimensions of reading motivation are evident across studies, the well-accepted theoretical constructs of reading motivation as comprising both intrinsic and extrinsic elements tend to dominate (Guthrie et al. 1999; Wigfield and Guthrie 1997).

Intrinsic reading motivation involves reading engagement that is associated with personal interest in the reading activity itself (Hidi 2000), whereas extrinsic reading motivation refers to reading engagement influenced by external values and demands (Ryan and Deci 2000). In line with this distinction, intrinsic motivation and extrinsic motivation have different associations with reading attainment. Wang and Guthrie (2004) found USA Grade 4 students' ability to successfully comprehend text had a positive association with intrinsic motivation and a negative association with extrinsic motivation. Gottfried (1990) reported that children with intrinsic motivation measured at age seven performed successfully in later reading tasks measured when they were eight and nine years of age. As an obviously important determinant of proficiency in reading (Wigfield 1997a, b), we considered intrinsic reading motivation in our study.

Consistent with a similar finding in many studies in the West, a positive association between reading motivation and reading attainment has been found among Chinese populations. Lau (2004) reported that intrinsic motivation along with self-efficacy, attribution beliefs, and reading strategies had strong relationships with Hong Kong SAR Chinese Grade 7 students' reading comprehension and academic achievement. Law (2009) similarly found from her analysis of data from a sample of Hong Kong SAR Chinese Grade 5 students that their intrinsic reading motivation, beliefs about intelligence and ability, and meta-cognitive awareness of the use of reading strategies were associated with reading comprehension.

Although positive relationships between intrinsic reading motivation and reading attainment have been found among Chinese students, few studies, if any, have examined this relationship among students with diverse levels of reading skills (e.g., readers who have a high level of reading proficiency and readers who have a low level of proficiency). One of the main aims for the present study was to address this issue. There is some evidence in the literature (e.g., Logan et al. 2011) that intrinsic reading motivation is a more important contributor of reading comprehension for students with low reading ability than for students with high reading ability. As such, we might assume that intrinsic reading motivation is a better predictor than extrinsic motivation of someone being a poor reader rather than a good reader.

Reading self-concept

The relevance of one's self-concept as a reader has long been emphasized in reading research. Athey (1971) concluded from his review of studies on this matter that "self-

reliance" and "self-confidence" are important contributors to successful reading. According to Harter (1983), self-concept is a model that enables us to organize perceptions of ourselves in different situations, and it helps us to form expectations, based on our past experiences, for our actions and abilities in the future. Self-concept in relation to self-image is the cognitive or thinking aspect of oneself (Purkey 1988). In simpler terms, self-concept refers to the beliefs that we hold about ourselves (Rice and Dolgin 2002). For Huitt (2009), academic self-concept includes two perceptions. The first is a general or overall self-concept of how good we think we are academically, and the second is a set of specific content-related outcomes that describes how well we perform in separate subjects.

Possessing a strong self-concept as a reader is often regarded as a key factor affecting whether we have faith in our ability to read, will persist with a reading task, or will give up (Henk and Melnick 1992). Researchers have shown that reading self-concept is invariably linked to academic achievement (Kurtz-Costes and Schneider 1994). The perception we have of ourselves as an effective reader strongly impacts on our reading performance (Chapman and Tunmer 1995; Henk and Melnick 1992; Wagner et al. 1989). For example, if we are confident of our reading ability, we are more likely to persist with difficult and perplexing text. In an intervention study, Ames (1990), however, found that students who had a low self-concept of their abilities were able to persist in their reading tasks with the use of learning strategies, high motivation, and positive attitudes toward reading. Shell et al. (1995) found that good readers generally have more positive self-concepts than poor readers. The latter are not inclined to read for pleasure; they see themselves as poor at performing most reading tasks and are reluctant to persist with tasks that they might fail at and which could therefore bring them embarrassment and shame. Research on reading self-concept among Chinese students is scarce and so it, too, became a major focus of our present study.

Home environment and reading attainment: role of home socioeconomic status

The socioeconomic status (SES) of the family is another strong predictor of academic achievement (Bradley and Corwyn 2002; McCulloch and Joshi 2001; Shonkoff and Phillips 2000; Sirin 2005). In a large-scale international assessment, SES was found to account for considerable individual differences in adolescents' reading attainment across countries and cultures (Chiu and McBride-Chang 2006). Children from low SES families tend to achieve low academic outcomes due to disadvantages in home resources and parental investments in their offspring's education (Mistry et al. 2008). They are also more likely than children from higher SES home environments to be at risk of having literacy difficulties (Lonigan 2003; Nicholson 2003). In contrast, children from high SES family backgrounds tend to benefit from having abundant educational investments by their parents, along with provision of literacy stimulation at home, facilities for completing home assignments, and time spent fostering scholastic achievements.

Family SES typically is measured in many studies with reference to family income (Nicholson and Gallienne 1995; Pungello et al. 1996; Ramey and Ramey 1998). However, with regard to the current study, information about family income was not present in the PIRLS dataset. We consequently used parental occupation and home educational resources as important indicators of family SES. We also expected to find

the status of parents' respective occupations and the presence of plentiful educational resources at home playing key roles in fostering children's reading development.

School environment and reading attainment: role of school SES, school bullying, and school safety and order

School SES is another variable strongly associated with academic performance in many studies. Ogle et al. (2003), for example, found students in private schools in the USA tending to outperform those in public schools on reading tasks because of the former having access to many more educational resources. Snow et al. (1998) found students' academic performance generally varying much more across than within schools in the USA, and students from richer schools typically having better achievement than students from poorer schools. In essence, the association between school SES and academic achievement usually reflects the influence of the context in which children are educated.

Students who feel secure at school are better placed to achieve well than are children who are uncomfortable and feel threatened. Peer bullying at school and school safety and order are key factors associated with academic achievement and progress (Glew et al. 2005). Empirical evidence demonstrates that school bullying has detrimental effects on students' academic outcomes, school attendance, and self-esteem (Rigby 2003; Rigby and Cox 1996; Sharp 1995). Bullying problems appear to be most prevalent among elementary school-age children (Whitney and Smith 1993), and it appears that the victims of bullies and the bullies themselves are likely to be low achievers and to have negative feelings about school (Glew et al. 2005). Research evidence also demonstrates that children with specific language impairments are more likely to be bullied by their peers at school than are normally-developing children (Knox and Conti-Rams den 2003).

There is also evidence showing the harmful effects of feeling insecure at school on school achievement and the negative impact of unsafe and disorderly school environments on school development (Buhs et al. 2006; Nishina et al. 2005). Student misconduct not only interrupts normal instructional activities and leads teachers to hold negative attitudes toward students (Hastings and Bham 2003) but also results in students avoiding school activities (Dinkes et al. 2007). Apart from the obvious traumatic effects of high-level violent behavior, physical assault, and weapon use in schools, research shows that hateful language, social exclusion, and intimidation are significantly detrimental on student development (Nansel et al. 2001).

Prior research has seldom taken into account the role of contextual factors when examining the influences of reading attitude, reading motivation, and reading self-concept on reading attainment. The present study will hopefully help fill this gap.

Study aims

As reviewed above, prior research has generally demonstrated a close relationship between reading-related affective factors (i.e., reading attitude, reading motivation, and reading self-concept) and reading attainment. However, researchers have rarely tested this relationship with large numbers of good and poor readers in a single study. Our primary goal in conducting the current study was to examine the relationship between these affective factors, home environment, school context, and reading attainment among Chinese good and poor readers in a subsample of the large-scale dataset gathered during the PIRLS 2011 survey. We also particularly wanted to compare the strength of

this relationship between good and poor readers directly by testing, through use of a multilevel logit regression model, the extent to which these variables predicted the likelihood of the students in the sample being good or poor readers.

Method

Rationale for using PIRLS data

PIRLS 2011 defined Grade 4 students' reading ability according to a four-point scale (i.e., low, intermediate, high, and advanced levels). Students' reading scores on a reading attainment test were set against these levels, which served as international benchmarks (Mullis et al. 2007). In line with this definition, *good readers* in the present study refer to readers with high proficiency who reached the high- or advanced-level benchmarks. As competent readers, they were able to retrieve significant details embedded across the texts, to provide support for inferences, to interpret figurative (e.g., graphs and tables) information, and to understand organizational features of the text. *Poor readers* refer to readers with low proficiency. These readers were below the low-level benchmark and lacked basic reading skills, such as the ability to recognize, locate, and reproduce explicitly stated details in the text. *Average readers* refer to readers whose reading competency placed them at the intermediate-level benchmark. They could read with some proficiency and understand, for example, narrative plots at a literal level. They could also draw some inferences from a text, and identify connections across texts.

As reviewed above, the affective factors examined in the present study (i.e., reading attitude, reading motivation, and reading self-concept) and the environments in home and school are significant contributors of reading development among typically-achieving children. We therefore expected these factors to have played a significant role in the reading success of the high-proficiency PIRLS 2011 readers. We also expected that adverse environments featuring school bullying and poor school safety and order would have strongly contributed to reading failure among readers with low proficiency, given that such environments can heighten low reading self-concept in relation to reading difficulties.

We focused on the Hong Kong SAR students who participated in PIRLS 2011 because Hong Kong SAR was one of the two Chinese societies that participated in this survey. Most importantly, Hong Kong SAR students topped the list in the PIRLS 2011 assessment. Therefore, findings drawn from analyses of these data may have important implications for educational policies and practices.

PIRLS sampling procedure

To ensure the representativeness of the participants in the different countries surveyed in PIRLS, IEA used a rigorous two-stage stratified sampling procedure, wherein schools were sampled in the first stage and students in the second (Joncas 2007). Specifically, in each country, around 150 schools representing a broad spectrum were selected, and then around 30 students were sampled from each school. In line with standard sampling procedures, 3,875 students were selected from 132 schools in Hong Kong. The mean age of these children was 10 years.

PIRLS data collection

IEA required the sampled primary Grade 4 students in each country to complete a reading attainment test and a questionnaire. The association also asked students'

teachers and school principals to fill out questionnaires. Parents of the participating students were invited to fill out a home questionnaire.

IEA worked with experts from the participating countries to create and verify translated test items in the reading attainment test and to test the validity and reliability of these items (Mullis et al. 2007). The experts also conceptualized and created derived variables and indexes in the questionnaires and tested their validity and reliability (Trong and Kennedy 2007). Each student completed an 80-minute test booklet and an additional 15- to 30-minute questionnaire.

Reading comprehension test

The IEA PIRLS 2011 reading comprehension test was designed to measure Grade 4 students' reading literacy. The test contained 10 passages and questions covering a wide range of text types and topics encountered by Grade 4 students in their regular classroom experiences. Five passages were chosen to permit assessment of literary reading materials (e.g., short stories, narrative extracts, and traditional tales). The other five passages were designed to assess comprehension of informational text (e.g., expository passages, instructions, and manuals).

To reduce the influence of fatigue and learning effects resulting from completing a long test, PIRLS used a balanced incomplete block (BIB) design (Kennedy and Sainsbury 2007). Because each student responded to only a portion of the test items, a multiple imputation technique was used to create five sets of plausible values of reading scores for the whole sample (Foy et al. 2007). To maximize the evaluative precision of the test, an Item Response Theory (IRT) approach was also used to combine and scale students' responses in the test (i.e., to estimate the reading attainment scores of students based on their responses to their respective subtests of questions from the overall test). Accordingly, reading scores were IRT scale scores with an international mean of 500 and a standard deviation of 100.

Due to administration restrictions, information on the reliability of the PIRLS 2011 reading attainment test is not available for reporting here. However, the test did have good reliability in PIRLS 2006. During this iteration of PIRLS, the average inter-scorer reliabilities for the constructed-responses were further examined by looking at the agreement between independent scorers. This was found to be 96% for the Hong Kong SAR sample tested in PIRLS 2006 (Martin et al. 2007).

Questionnaires

IEA also designed multiple items to measure a theoretical construct in the student, home, teacher, school, and curriculum questionnaires. Most items were designed to measure response frequencies (e.g., every day or almost every day, once or twice a week, once or twice a month, and never or almost never). For the purpose of this study, we used in our multilevel analysis the student-level and school-level indexes or derived variables that IEA computed from responses on the student, home, and teacher questionnaires.

Variables

Affective factors (i.e., reading attitude, reading motivation, and reading self-concept), peer bullying, home context (i.e., home SES), and school context (i.e., school SES, school bullying, and school safety and order) were used for our later multilevel regression analyses. The variables and indexes were reverse-coded for the multilevel analyses. Table 1 presents the component items of the variables. A brief description of them follows.

Table 1 Creation of the variables in the multilevel logit regression model

Name of variable	Items deriving from	Values of derived variable
Students' reading attitudes	• I read only if I have to • I like talking about books with other people • I would be happy if someone gave me a book as a present • I think reading is boring • I would like to have more time for reading • I enjoy reading *Choices:* agree a lot, agree a little, disagree a little, and disagree a lot	The sum of students' responses to the component items (reverse-coding the negative statements "I read only if I have to" and "I think reading is boring")
Students' reading motivation	• I like to read things that make me think • It is important for me to be a good reader • My parents like it when I read • I learn a lot from reading • I need to read well for my future • I like it when a book helps me imagine other worlds *Choices:* agree a lot, agree a little, disagree a little, and disagree a lot	The sum of students' responses to the component items
Students' reading self-concept	• I usually do well in reading • Reading is easy for me • Reading is harder for me than for many of my classmates • If a book is interesting, I don't care about how hard it is to read • I have trouble reading stories with difficult words • My teacher tells me I am a good reader • Reading is harder for me than any other subject *Choices:* agree a lot, agree a little, disagree a little, and disagree a lot	The sum of students' responses to the component items (reverse-coding the negative statements "Reading is harder for me than for many of my classmates", "I have trouble reading stories with difficult words", and "Reading is harder for me than any other subject")
Home SES	• Students' responses to two questions about home educational resources and aids (number of books in the home and availability of two home study supports, i. e., internet connection and their own room) • Parents' responses to three questions about home educational resources (number of children's books in the home, and parents' education and occupation)	1 = many resources (students reporting that they had more than 100 books in the home and two home study supports, and parents reporting that they had more than 25 children's books in the home, that at least one parent had finished university, and that at least one parent had a professional occupation); 3 = few resources (students reporting that they had 25 or fewer books in the home and neither of the two home study supports, and parents reporting that they had 10 or fewer children's books in the home, that neither parent had gone beyond upper-secondary education, and that neither parent was a small business owner or had a clerical or professional occupation); 2 = some resources (all other responses)
Peer bullying	• "I was made fun of or called names", • "I was left out of games or activities by other students", • "Someone spread lies about me",	The sum of students' responses to the component items

Table 1 Creation of the variables in the multilevel logit regression model *(Continued)*

	• "Having something stolen", • "I was hit or hurt by other student(s)", • "I was made to do things I didn't want to do by other students") *Choices:* at least once a week, once or twice a month, a few times a year, and never	
School SES	NA	The average of home SES scores of students from a same school
School bullying	NA	The average of home SES scores of students from a same school
School safety and order	• This school is located in a safe neighborhood • I feel safe at this school • This school's security policies and practices are sufficient • The students behave in an orderly manner • The students are respectful of the teachers *Choices:* agree a lot, agree a little, disagree a little, and disagree a lot	The sum of teachers' responses to the component items

Readers with high proficiency, average readers, and readers with low proficiency

This was an outcome variable in the multilevel analysis. In PIRLS 2011, students' reading ability was defined on a four-point scale as international benchmarks in terms of their reading scores on the reading attainment test (Mullis et al. 2009). Specifically, students with a score of 625 or above, 550 or above, 475 or above, and 400 or above were regarded as reaching the advanced, high, intermediate, and low international benchmarks, respectively. In this study, all students in the Hong Kong SAR sample were classified into three categories (i.e., readers with high proficiency, average readers, and readers with low proficiency) according to their international benchmark score. In this study, readers with high proficiency were students who achieved the advanced or high international benchmark (at or above 550), average readers were students who achieved the intermediate international benchmark (at or above 475 but below 550), and readers with low proficiency were those students whose scores set them at or below the low international benchmark (below 475).

Students' reading attitude

This variable was derived from students' level of agreement on six statements, each of which had a four-point Likert response scale. The derived variable was created by summing students' responses to the component items. The Cronbach's alpha coefficient of this variable for the present sample was 0.73.

Students' reading motivation

This variable was derived from students' level of agreement on six statements, each with a four-point Likert response scale. The derived variable was created by summing students' responses to the component items. The Cronbach's alpha coefficient of this variable for the present sample was 0.86.

Students' reading self-concept

This variable was derived from students' level of agreement on seven statements, each with a four-point Likert response scale. The derived variable was created by summing students' responses to the component items. The variable had a Cronbach's alpha coefficient of 0.7 for the present sample.

Home SES

This index was used to measure home environment and the extent to which it supports students' learning. This student-level variable was derived from students' responses to two questions about home educational resources and aids and parents' responses to three questions about home educational resources. The derived variable was created by recoding the responses to the component items, thus yielding values of 1 = many resources, 2 = some resources, and 3 = few resources (Mullis et al. 2009). The Cronbach's alpha coefficient of this variable for the present sample was 0.53.

Peer bullying

This variable was used to measure the bullying-related experiences of students at school. This student-level variable was computed from students' responses to six items about their experiences of school-bullying behaviors. The derived variable was created by summing students' responses to the component items. The Cronbach's alpha coefficient of the variable for the present sample was 0.77.

School SES

This school-level variable was created by averaging the home SES scores of students from a same school.

School bullying

This school-level variable was created by averaging the peer-bullying scores of students from a same school.

School safety and order

This variable was used to measure teachers' perceptions of safety and order in their respective schools. This school-level variable was derived from teachers' level of agreement, expressed via a four-point Likert response scale, with five statements. The derived variable was created by summing teachers' responses to the component items. The Cronbach's alpha coefficient of the index for the present sample was 0.73.

Analysis

Given the nested nature of the data (i.e., students nested in schools), HLM software (Raudenbush et al. 2010) was used to conduct the following multilevel analyses. Because the proportion of missing data for the derived variables was less than five percent, a mode substitution method was used to handle the missing-value problem in this study.

Multilevel logit regression model was used to examine the combined influences of the affective factors, home environment, and school environment on the probabilities of

students being readers with high proficiency and readers with low proficiency. Multilevel logit regression analysis was chosen to address the research questions, given that the dependent variable was a categorical variable with three categories—readers with high proficiency, average readers, and readers with low proficiency (Hox 1995).

Multinomial logit and probit was used to predict the probability of students being readers with high proficiency or readers with low proficiency. This approach made it possible to estimate the likelihood that a variable value belonged to a specific category (i.e., a reader with high proficiency or a reader with low proficiency) rather than an arbitrarily assigned category (i.e., an average reader) (Hox 1995; Raudenbush et al. 2010). Sampling weights (i.e., both student-level and school-level weight variables) provided in the PIRLS 2011 data were incorporated into the analyses.

The first step of the analysis was to develop a variance components model without predictors. It should be pointed out that no error term was included in Equations 2a and 2b (below), an approach different from that used in a standard multilevel regression analysis. The reason for doing this is that the lowest level of variance in a logit regression model is completely determined by the predicted value for ϕ_{1ij} / ϕ_{3ij} or ϕ_{2ij} / ϕ_{3ij}, which means that no separate term can be entered into the model (Hox 1995). It follows that the lowest level variance in the logit regression will have a precise value of 1 when the mean is known (the ϕ_{1ij} / ϕ_{3ij} or ϕ_{2ij} / ϕ_{3ij} in the multinomial case given here).

Student-level model:

$$\text{Prob}\left[\text{reader with low proficiency} = 1 \,\middle|\, \beta_j\right] = \phi_{1ij} \tag{1a}$$

$$\text{Prob}\left[\text{reader with high proficiency} = 1 \,\middle|\, \beta_j\right] = \phi_{2ij} \tag{1b}$$

$$\text{Prob}\left[\text{average reader} = 1 \,\middle|\, \beta_j\right] = \phi_{3ij} = 1 - \phi_{1ij} - \phi_{2ij} \tag{1c}$$

$$\log\left[\phi_{1ij} / \phi_{3ij}\right] = \beta_{0j(1)} \tag{2a}$$

$$\log\left[\phi_{2ij} / \phi_{3ij}\right] = \beta_{0j(2)} \tag{2b}$$

School-level model:

$$\beta_{0j(1)} = \gamma_{00(1)} + u_{0j(1)} \tag{3a}$$

$$\beta_{0j(2)} = \gamma_{00(2)} + u_{0j(2)} \tag{3b}$$

In the student-level regression model, the probabilities in Equations 1a, 1b, and 1c that Student i in School j falls into Category 1 (reader with high proficiency), 2 (reader with low proficiency), or 3 (the reference category, i.e., an average reader) are ϕ_{1ij}, ϕ_{2ij}, and ϕ_{3ij}, respectively. In Equations 2a and 2b, the log-odds of Student i in School j falling into the high-proficiency reader category (ϕ_{1ij}) or low-proficiency reader category (ϕ_{2ij}) relative to that of falling into the average reader category (ϕ_{3ij}) were predicted by the respective intercepts (β_{0j}). In the school-level

regression model (Equations 3a and 3b), β_{0j} was estimated as a function of the intercept (γ_{00}) and the residual (u_{0j}).

The student-level variables (i.e., students' reading attitude, motivation, and self-concept, home SES, and peer bullying) and school-level variables (i.e., school SES, school bullying, and school safety and order) centered about their grand means, which were then entered into the regression model.

Student-level model:

$$\text{Prob}\left[\text{reader with low proficiency} = 1 \,\middle|\, \beta_j\right] = \phi_{1ij} \tag{4a}$$

$$\text{Prob}\left[\text{reader with high proficiency} = 1 \,\middle|\, \beta_j\right] = \phi_{2ij} \tag{4b}$$

$$\text{Prob}\left[\text{average reader} = 1 \,\middle|\, \beta_j\right] = \phi_{3ij} = 1 - \phi_{1ij} - \phi_{2ij} \tag{4c}$$

$$\begin{aligned}\log\left[\phi_{1ij}/\,\phi_{3ij}\right] = {} & \beta_{0j(1)} + \beta_{1j(1)}\text{students' readingattitudes}_{ij} \\ & + \beta_{2j(1)}\text{students'readingmotivations}_{ij} \\ & + \beta_{3j(1)}\text{students' reading self–concepts}_{ij} + \beta_{4j(1)}\text{homeSES}_{ij} \\ & + \beta_{5j(1)}\text{peer bullying}_{ij}\end{aligned} \tag{5a}$$

$$\begin{aligned}\log\left[\phi_{2ij}/\,\phi_{3ij}\right] = {} & \beta_{0j(2)} + \beta_{1j(2)}\text{students' reading attitudes}_{ij} \\ & + \beta_{2j(2)}\text{students'readingmotivations}_{ij} \\ & + \beta_{3j(2)}\text{students' reading self–concepts} + \beta_{4j(2)}\text{homeSES}_{ij} \\ & + \beta_{5j(2)}\text{peer bullying}_{ij}\end{aligned} \tag{5b}$$

School-level model:

$$\begin{aligned}\beta 0j\,(1) = {} & \gamma 00(1) + \gamma 01(1)\text{school SESj} + \gamma 02(1)\text{school bullyingj} \\ & + \gamma 03(1)\text{school safety and orderj} + \text{u0j}(1)\end{aligned} \tag{6a}$$

$$\beta 1j\,(1) = \gamma 10(1) + \text{u1j}(1) \tag{6b}$$

$$\beta 2j\,(1) = \gamma 20(1) + \text{u2j}(1) \tag{6c}$$

$$\beta 3j\,(1) = \gamma 30(1) + \text{u3j}(1) \tag{6d}$$

$$\beta 4j\,(1) = \gamma 40(1) + \text{u4j}(1) \tag{6e}$$

$$\beta 5j\,(1) = \gamma 50(1) + \text{u5j}(1) \tag{6f}$$

$$\begin{aligned}\beta 0j\,(2) = {} & \gamma 00(2) + \gamma 01(2)\text{school SESj} + \gamma 02(2)\text{school bullyingj} \\ & + \gamma 03(2)\text{school safety and order}_j + u_{0j(2)}\end{aligned} \tag{7a}$$

$$\beta_{1j(2)} = \gamma_{10(2)} + u_{1j(2)} \tag{7b}$$

$$\beta_{2j(2)} = \gamma_{20(2)} + u_{2j(2)} \tag{7c}$$

$$\beta_{3j(2)} = \gamma_{30(2)} + u_{3j(2)} \tag{7d}$$

$$\beta_{4j(2)} = \gamma_{40(2)} + u_{4j(2)} \tag{7e}$$

$$\beta_{5j(2)} = \gamma_{50(2)} + u_{5j(2)} \tag{7f}$$

In the student-level regression model, the probabilities in Equations 4a, 4b, and 4c that Student i in School j will fall into Category 1 (high proficiency), 2 (low proficiency) and 3 (average reader) are ϕ_{1ij}, ϕ_{2ij}, and ϕ_{3ij}, respectively. In Equations 5a and 5b, the

log-odds of Student i in School j being a good reader (ϕ_{1ij}) or a poor reader (ϕ_{2ij}) relative to an average reader (ϕ_{3ij}) are predicted by the effects of the student-level variables, where β_{0j} represents the respective intercept and β_{1j} to β_{5j} represent the respective coefficients of students' reading attitude, students' reading motivation, students' reading self-concept, home SES, and peer bullying. In the school-level regression model, β_{0j} was estimated as a function of the effects of the school-level variables, where γ_{00} represents the intercept, and where γ_{01} to γ_{03} represent the respective coefficients of school SES, school bullying, and school safety and order. β_{1j}, β_{2j}, β_{3j}, β_{4j}, or β_{5j} was estimated as a function of the respective mean slope (i.e., $\gamma_{10,}$ γ_{20}, γ_{30}, γ_{40}, or γ_{50}) plus residual (i.e., $u_{1j,}$ $u_{2j,}$ $u_{3j,}$ $u_{4j,}$ or u_{5j}).

In order to estimate the variance explained by the predictors, the additional variance explained by the added student-level or school-level variables was computed using this formula: (remaining variance without added predictors-remaining variance with added predictors)/remaining variance without added predictors. Accordingly, the total variance explained by the added variables was calculated using this formula: student-level variance explained by the null model × student-level variance explained by the added predictors + school-level variance explained by the null model × school-level variance explained by the added predictors.

Results

Group descriptive statistics

As shown in Table 2, according to the international benchmarks, 6.84% of the Grade 4 Hong Kong SAR students were classified as readers with low proficiency, and 66.5% were classified as readers with high proficiency (Mullis et al. 2009). With respect to the affective factors (i.e., students' reading attitude, motivation, and reading self-concept), readers with high proficiency tended to have more positive affection for reading than average readers did, while average readers tended to have more positive affection than readers with low proficiency did. The differences in home SES and peer bullying between readers with high proficiency and average readers differed little from that between average readers and readers with low proficiency. Table 3 presents descriptive statistics for the school-level variables.

Table 2 Means and standard deviations of students' reading attainment and the student-level variables for all participants, and for average readers, readers with low proficiency, and readers with high proficiency

Variable	Possible maximum score	All (*n* = 3,875)	Average (*n* = 1,033)	Low proficiency (*n* = 265)	High proficiency (*n* = 2,577)
		Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)
Reading attainment	/	571.04 (60.79)	520.58 (20.24)	438.29 (31.45)	604.93 (36.19)
Students' reading attitude	24	18.38 (3.74)	17.43 (3.67)	16.77 (3.18)	18.93 (3.7)
Students' reading motivation	24	19.74 (3.99)	19.19 (4.14)	18.53 (4.85)	20.08 (3.78)
Students' reading self-concept	28	20.88 (3.79)	19.59 (3.63)	18.42 (2.89)	21.65 (3.68)
Home SES	3	2.03 (0.43)	1.99 (0.4)	1.91 (0.4)	2.06 (0.44)
Peer bullying	24	10.42 (3.9)	10.69 (4.18)	11.77 (4.65)	10.17 (3.66)

Table 3 Means and standard deviations of the school-level variables for all participants (*n* = 132)

Variable	Possible maximum score	Mean	SD
School SES	/	2.02	0.21
School bullying	/	10.47	1.14
School safety and order	20	17.33	2.09

The next round of multilevel analyses that was conducted examined the role of these variables in predicting the probabilities of the students in the sample being readers with high proficiency or readers with low proficiency.

The multilevel models

Table 4 presents the results of the null model, which shows that, for readers with low proficiency, 59.17% of the variance (59.17% = 1 / [1 + 0.69] × 100%) in the dependent variable occurred at the student level and 40.83% of the variance (40.83% = 0.69 / [1 + 0.69] × 100%) occurred at the school level. For readers with high proficiency, 65.79% and 34.21% of the variance (65.79% = 1 / [1 + 0.52] × 100%; 34.21% = 0.52 / [1 + 0.52] × 100%) occurred at the student level and at the school level, respectively.

The first portion of Table 5 presents the fixed effects of the multilevel logit regression model. The likelihood of students being readers with low proficiency was negatively related to students' reading self-concept (i.e., significant coefficient $\gamma_{30(1)}$) and positively related to peer bullying (i.e., significant coefficient $\gamma_{50(1)}$). The likelihood of being readers with high proficiency was positively associated with students' attitude to reading and their reading self-concept (i.e., significant coefficients $\gamma_{10(2)}$ and $\gamma_{30(2)}$), but it was negatively associated with students' reading motivation and peer bullying (i.e., significant coefficients $\gamma_{20(2)}$ and $\gamma_{50(2)}$). At the school level, the likelihood of being readers with high proficiency was positive for school SES and negative for school bullying (i.e., significant coefficients $\gamma_{01(2)}$ and $\gamma_{02(2)}$).

Table 4 Summary of the null model

Fixed effects	Coefficient	SE	*t*-ratio	Approximate *df*
For readers with low proficiency				
Intercept ($\beta_{0(1)}$)				
Intercept ($\gamma_{00(1)}$)	−1.63	0.14	−11.60***	37
For readers with high proficiency				
Intercept ($\beta_{0(2)}$)				
Intercept ($\gamma_{00(2)}$)	0.81	0.09	9.47***	118
Random effects	**Variance**	**SD**	**df**	χ^2
For readers with low proficiency				
Student-level intercept ($\sigma^2_{(1)}$)	1.00			
School-level intercept ($u_{0(1)}$)	0.69	0.83	131	310.61
For readers with high proficiency				
Student-level intercept ($\sigma^2_{(2)}$)	1.00			
School-level intercept ($u_{0(2)}$)	0.52	0.72	131	450.63

Note: ***$p < .001$.

Table 5 Summary of the multilevel logit regression model predicting the probabilities of students being high-proficiency readers and high-proficiency readers, using student- and school-level predictors

Fixed effects	Coefficient	SE	*t*-ratio	Approximate *df*
For readers with low proficiency				
Intercept ($\beta_{0(1)}$)				
Intercept ($\gamma_{00(1)}$)	−1.93	0.12	−15.66***	128
School SES ($\gamma_{01(1)}$)	−1.22	0.77	−1.59	13
School bullying ($\gamma_{02(1)}$)	0.06	0.09	0.67	64
School safety and order slope ($\gamma_{03(1)}$)	−0.06	0.05	−1.08	53
Students' reading attitudes slope ($\beta_{1(1)}$)				
Intercept ($\gamma_{10(1)}$)	0.01	0.02	0.36	102
Students' reading motivation slope ($\beta_{2(1)}$)				
Intercept ($\gamma_{20(1)}$)	0.02	0.03	0.81	59
Students' reading self-concept slope ($\beta_{3(1)}$)				
Intercept ($\gamma_{30(1)}$)	−0.09	0.03	−2.96**	21
Home SES slope ($\beta_{4(1)}$)				
Intercept ($\gamma_{40(1)}$)	−0.17	0.26	−0.64	21
Peer bullying slope ($\beta_{5(1)}$)				
Intercept ($\gamma_{50(1)}$)	0.06	0.02	3.03**	131
For readers with high proficiency				
Intercept ($\beta_{0(2)}$)				
Intercept ($\gamma_{00(2)}$)	0.91	0.08	11.02***	77
School SES ($\gamma_{01(2)}$)	1.21	0.38	3.19**	28
School bullying ($\gamma_{02(2)}$)	−0.17	0.06	−2.84**	128
School safety and order slope ($\gamma_{03(2)}$)	0.00	0.03	0.12	128
Students' reading attitudes slope ($\beta_{1(2)}$)				
Intercept ($\gamma_{10(2)}$)	0.05	0.02	2.44*	84
Students' reading motivations slope ($\beta_{2(2)}$)				
Intercept ($\gamma_{20(2)}$)	−0.05	0.02	−2.68**	99
Students' reading self-concepts slope ($\beta_{3(2)}$)				
Intercept ($\gamma_{30(2)}$)	0.16	0.02	8.74***	53
Home SES slope ($\beta_{4(2)}$)				
Intercept ($\gamma_{40(2)}$)	−0.03	0.13	−0.23	90
Peer bullying slope ($\beta_{5(2)}$)				
Intercept ($\gamma_{50(2)}$)	−0.03	0.02	−1.96*	68
Random effects	**Variance**	**SD**	**df**	**χ^2**
For readers with low proficiency				
Student-level intercept ($\sigma^2_{(1)}$)	1.00			
School-level intercept ($u_{0(1)}$)	0.55	0.74	124	120.24
Students' reading attitudes slope ($u_{1(1)}$)	0.01	0.07	127	69.90
Students' reading motivation slope ($u_{2(1)}$)	0.02	0.12	127	124.69
Students' reading self-concept slope ($u_{3(1)}$)	0.01	0.08	127	90.81
Home SES slope ($u_{4(1)}$)	0.45	0.67	127	75.70
Peer bullying slope ($u_{5(1)}$)	0.01	0.08	127	110.92

Table 5 Summary of the multilevel logit regression model predicting the probabilities of students being high-proficiency readers and high-proficiency readers, using student- and school-level predictors *(Continued)*

For readers with high proficiency				
Student-level intercept ($\sigma^2_{(2)}$)	1.00			
School-level intercept ($u_{0(2)}$)	0.39	0.63	124	259.42***
Students' reading attitudes slope ($u_{1(2)}$)	0.01	0.08	127	148.02
Students' reading motivation slope ($u_{2(2)}$)	0.00	0.07	127	139.08
Students' reading self-concept slope ($u_{3(2)}$)	0.01	0.08	127	134.26
Home SES slope ($u_{4(2)}$)	0.25	0.50	127	122.90
Peer bullying slope ($u_{5(2)}$)	0.00	0.06	127	143.29

Note: *$p < .05$; **$p < .01$; ***$p < .001$.

The second portion of Table 5 presents random effects of the multilevel logit regression model. For readers with low proficiency, all predictors explained 20.29% of the school-level variance and 8.32% of the total variance in the dependent variable. For readers with high proficiency, all predictors explained 25% of the school-level variance and 8.5% of the total variance in the dependent variable. Note, however, that the added predictors accounted for no variance at the student level given that the intercept-only regression model was specified for the student-level data analyses (see the section above headed "Analysis").

The above findings suggest that reading attitudes, reading motivation, and reading self-concept have different impacts on low-proficiency readers and high-proficiency readers. Home and school environments likewise appear to have different influences on the reading outcomes of readers with low reading proficiency and readers with high reading proficiency.

Discussion

Different influences of affective factors on readers with high proficiency and readers with low proficiency

The study's finding that reading attitude was a significant predictor of Hong Kong SAR Grade 4 students being readers with high proficiency but *not* of readers with low proficiency suggests that reading attitude may play a less important role in accounting for the reading failure of readers with low proficiency than is commonly assumed. There is evidence demonstrating that the effects of affective factors (e.g., reading interest) on reading are mediated by cognitive skills (e.g., attention) (Hidi 1990, 1995). Poor readers may thus, for example, suffer from attentional deficits (Dykman and Ackerman 1991; McGee et al. 1989) and so be less likely than normal readers to focus on and persist in reading tasks for a long time. Other reading-related cognitive deficits, such as deficits in working memory and rapid naming, have been associated with reading difficulties among poor readers (see, for example, Wimmer et al. 2000).

As we anticipated, reading motivation played a different role in predicting readers with low proficiency and readers with high proficiency. Like reading attitude, reading motivation did not predict readers with low proficiency in the present study, a finding which suggests that low reading motivation may not be a factor of poor reading performance. The association between reading motivation and reading performance

among poor readers in previous research (e.g., Lepola et al. 2000) may reflect the possibility that low reading motivation is a consequence rather than a cause of poor reading performance.

A particularly interesting finding in this study was the negative relationship between reading motivation and the probability of students being high-proficiency readers. This finding is not consistent with previous findings that readers who are highly motivated to read usually perform better on reading tasks (Gottfried 1990; Wang and Guthrie 2004). One possibility may be that the PIRLS 2011 items designed for these two constructs were highly correlated, such that the effect of reading motivation may have been subsumed by reading self-concept. Another possibility could be that this variable tapped some aspects of motivation and so was not a very good indicator of reading motivation. This finding provides a reason for concern and merits further research.

Consistent with the finding by Chapman and Tunmer (1995) that the extent to which students perceive themselves to be readers with high proficiency or readers with low proficiency influences the reading prowess of "normal" children, the Hong Kong SAR primary school children's self-concept about reading was a significant predictor of whether they might be readers with high proficiency or readers with low proficiency. Similarly, highly self-sufficient students who had positive feelings and confidence about reading were found to form the majority of readers with high proficiency, whereas students who lacked confidence in their reading were less likely to steer themselves away from being readers with low proficiency towards being readers with high proficiency.

Different influences of contextual factors on readers with high proficiency and readers with low proficiency

Another variable made up of multiple components concerns environmental influences on reading at home. Many researchers have found a positive association between family SES and academic achievement in general (Sirin 2005). However, in our study neither the probability of readers with low proficiency nor the probability of readers with high proficiency was predicted by home SES when the effects of affective factors and school factors were taken into account. These findings suggest that the influence of family context on reading attainment during children's formal education is not as strong as that of school context or student characteristics (such as reading-related attitude, motivation, and self-concept examined in this study).

It is important to remember that home SES as measured in this study is an ordinal variable. A major limitation of the study is the insensitivity of the ordinal scales used in the PIRLS questionnaires. A persistent problem in the analysis of cross-national survey data relates to the method used to combine data collected from questionnaire items in order to generate composite measures for latent variables analyzed using parametric approaches (Keeves et al. 2006). Other measures of home SES, such as family income, may be included in future research to clarify the role of this variable in reading development.

In our study, school SES was a significant predictor of students being high-proficiency readers, but not low-proficiency readers. School SES measured via the mean

of family SES in a school in effect reflects the family SES of schoolmates within a school. In Chiu and McBride-Chang's (2006) study, school SES was a more important predictor than family SES of reading comprehension. In line with this finding, school SES in our study was also a stronger variable than the student-level variable of family SES in regard to predicting the probability of a student being a reader with high proficiency. This finding suggests that school context is far more important than family environment in fostering reading development. Future studies may need to replicate our findings by focusing on more features of school context (e.g., school quality, cooperation among teachers).

Bullying in school has long been a concern in studies in the West. However, it may not have been afforded the attention it deserves in the East, given the strongly rooted Confucian-related beliefs in these societies. Confucian values include respect for authorities and for the rights of compatriots. Delinquent behavior accordingly is less widespread in Eastern societies than in many Western ones (Greenberger et al. 2000; Stewart et al. 1998). Chinese children also have the reputation of being more civil to one another and to teachers, and teachers are usually very vigilant to ensure that bullying is relatively uncommon; this is certainly the case in Hong Kong SAR primary schools. Our findings suggest that peer bullying behaviors, especially incivility, had a role to play in the reading development of readers with high proficiency and readers with low proficiency. Being bullied at school seems to have featured as a particularly important variable for high-proficiency readers.

Inconsistent with findings from studies in the West, school safety and school order were not significant predictors of the likelihood that a student would be a high-proficiency reader or a low-proficiency reader. This finding may reflect the lesser prevalence of student misconduct and school violence in Chinese societies in the East than in societies in the West (Greenberger et al. 2000; Stewart et al. 1998; Wong et al. 2008).

Limitations of the present study

The major limitation of this study is that a large proportion of variance in the dependent variable was not explained: only 8.50% explained variance in total for readers with low proficiency, and only 8.32% explained variance in total for readers with high proficiency. One reason may be that we examined only affective and contextual factors in our study. Future studies may need to examine the relative contributions of affective, cognitive, and contextual factors to reading attainment. Moreover, longitudinal studies are needed to investigate the possible causal relationship between the affective factors and reading attainment.

Conclusions

Students' affective characteristics (reading attitude, reading motivation, and reading self-concept), peer bullying, and school context indexed by school SES and the school environment itself were found to have influences on the probabilities of students being readers with low proficiency or readers with high proficiency. In

particular, all of these variables were associated with the likelihood of students being high-proficiency readers, whereas only reading self-concept and peer bullying were related to the probability of students being low-proficiency readers. These findings suggest that reading-related affective characteristics and school context may be a factor promoting reading success rather than a factor contributing to reading failure.

Competing interests
The authors declare that they have no competing interests.

Authors' contributions
SK is the National Research Coordinator of PIRLS project Hong Kong component. He carried out the PIRLS 2001, 2006 and 2011 studies in Hong Kong. SK and XY reviewed the literature, designed and carried out the analyses, and prepared the manuscript. All authors read and approved the final manuscript.

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