DIFFERENTIAL INFLUENCES OF CONTEXTUAL AND AFFECTIVE FACTORS

ON YOUNG ADOLESCENT READING PERFORMANCE

By

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ABSTRACT

A person's reading performance is the result of a combination of various factors. The current study was to investigate the influences of student and school background characteristics on student overall reading achievement. A sample of 2,922 tenth-grade students from 140 schools was included in this study from the Programme for International Student Assessment (PISA) 2018 database. Several background characteristics were examined at each level. At the student level, home literacy environment (HLE), reading attitudes and reading self-concept as well as parental emotional support were included. School-level variables include student misbehavior in school, student SES composite, and class size. Multilevel linear modelling (MLM) was utilized to model the relationship between student and school-level variables and students' overall reading achievement. The results suggested that students' HLE, reading attitudes, and reading self-concept had significant positive influences on the reading outcome.

Moreover, model comparisons revealed that the model with both student and school-level variables had the best model fit. All the variables at the school level were significant predictors for reading achievement (i.e., school SES composition, class size, and student misbehavior). Finally, the findings of the current study were discussed in the context of previous studies, and limitations, as well as recommendations for future research, were addressed.

Keywords: reading literacy, background characteristics, PISA 2018, high school, multilevel linear modeling

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CHAPTER I

INTRODUCTION

Literacy ability is a fundamental human right as well as a *sine qua non* of social and economic development in the modern world. According to data provided by the UNESCO Institute for Statistics (UIS), global progress in literacy continues. Half a century ago, roughly a quarter of youth aged 15 to 24 lacked fundamental literacy skills, and that number has fallen to less than 8% today (data retrieved from http://data.uis.unesco.org). Literacy capacity is critical to one's academic performance and life quality. In this era of information explosion, the public has shown an increasing demand for literacy. Apart from the capacity to read and acquire information from printed materials, one is also expected to communicate effectively using written language. Therefore, lack of fundamental literacy abilities restricts people from accessing information, resulting in social inequity and economic loss. On the other hand, well-developed literacy skills are generally associated with economic potential and a fulfilled life (Lonigan & Shanahan, 2009; Stahl et al., 2020).

Reading has always been an essential subject in K-12 education. As reading involves several subskills such as decoding and fluency, it takes years of learning for children to develop adequate knowledge and skills in reading. In the first few years of elementary school, many classes are dedicated to this "learning to read" process. Nonetheless, the focus of instruction and assessment will gradually shift from "learning to read" to "reading to learn" (Chall, 1983). Students are expected to have adequate

literacy skills to obtain different content knowledge from massive amounts of printed materials. Therefore, students with limited reading skills may also struggle with other school subjects such as mathematics and science. Such disadvantages can accumulate and lead to severe consequences. Moving from elementary school to middle school and high school, students with reading deficits are more likely to suffer from academic failure and juvenile delinquency (Fleming et al., 2004). For adults, reading difficulty can lead them to unfavorable positions such as unemployment, delinquency, and poor health condition (O'Reilly et al., 2019).

A student's academic performance is the cumulative result of present and prior family, community, and school experiences (Rivkin et al., 2005). Children begin learning to speak and read at early ages. Certain family and cultural background factors may have a substantial impact on children's reading development. Formal education takes place primarily in schools and classrooms. When children begin schooling, the school's unique background also influences students' literacy development. Therefore, factors that have an impact on children's reading performance must be thoroughly investigated to provide better support.

Literacy Challenges in the United States

According to the newest Nation's Report Card (2019) published by the National Assessment of Educational Progress (NAEP), the reading performance of American students remains far from optimistic. NAEP categorized participants into four achievement levels: Below Basic, Basic, Proficient, and Advanced. On average, students of all assessed grades were just above the basic line but did not reach proficiency. Approximately 34% of 8th and 37% of 12th graders still performed below the NAEP

proficient level in 2019. The percentage of students who perform below NAEP basic level for eighth and twelfth grades were 27% and 30%, respectively.

More alarming was a nationwide decline in average reading scores. There has been a retrogression in all three assessed grades. According to the same report, average reading scores for the fourth graders showed the lowest point since 2007. The eighth graders' average reading scores had fallen back to the 1998 level, and twelfth students' average reading scores were the lowest of all assessment years (data retrieved from https://www.nationsreportcard.gov). Students of specific groups were more disadvantaged. For example, the average score of some urban districts and some ethnic groups were considerably below the national average (NAEP, 2019).

Reading education is still a crucial challenge for the students in the United States. It is clear that American students' reading proficiency has remained a national concern since the report of A Nation at Risk (National Commission on Excellence in Education, 1983) was published. Consequently, literacy has attracted scholars' interest in various fields, such as psychology, linguistics, neuroscience, etc. However, due to diverse perspectives, scholars have been embroiled in a decades-long debate over the best methods to teach children to read, which is also known as the "reading wars" (Pearson, 2004). Despite the importance of classroom instruction to one's reading ability, reading development is cumulative and can be affected by various factors. In conjunction with genetic factors, family backgrounds, school conditions, and even interpersonal relationships can collectively affect an individual's reading ability.

Student Characteristics and Family Background

Literacy development results from the accumulation of each student's literacy experience during and after school. In this process, students' distinctive backgrounds and individual differences can significantly influence their literacy skills. Most children start exploring the surrounding environment and engage in some pre-reading activities at a very young age (Bell & McCallum, 2008). Predictably, the home literacy environment will greatly influence this "emergent literacy" phase. Children can acquire a wide range of knowledge and learn how to obtain knowledge from their literacy environment (Crain-Thoreson & Dale, 1992). However, children's enthusiasm and motivation for reading could be lessened throughout this process for various reasons such as having limited access to the reading material or lacking materials that match their reading level.

Besides the home literacy environment, policymakers, educators, and researchers have reached a consensus that parental involvement is a critical component of children's reading and academic performance (Graves & Wright, 2011). For adolescents, the family is the core social unit and a supportive resource in the development of self and social relationships (Song et al., 2014). Parents expect their children to succeed in school regardless of their educational backgrounds and financial conditions (Epstein, 1986). However, some parents hold a detrimental view about getting involved in their children's learning activities because they think that is the responsibility of the school (Seeley, 1993). Parental support assumes a significant part in one's academic performance (Knollmann & Wild, 2007) and mental and physical health (Macalli et al., 2020; Yeung & Leadbeater, 2010) from an early stage of life.

On the student's personal level, few would deny the importance of reading attitudes. Reading attitude has been identified as one of the most critical constructs under reading motivation (Bell & McCallum, 2008; Wigfield & Guthrie, 1997). Reading attitude is determined by the emotional system that prompts an individual to engage in or avoid reading activities (Alexander & Filler, 1976). As Stanovich (1986) argued, competent readers will become more proficient because of constant practice and accumulation in reading. On the other hand, a lack of basic reading skills will trigger a snowball effect for poor readers and cause accumulative disadvantage (Stanovich, 1986).

Similar to reading attitudes, reading self-concept, or self-concept as a reader, is another essential aspect of motivation (Morgan & Fuchs, 2007). It refers to one's insights of their reading ability and competence (Walgermo et al., 2018). Students' reading self-concept is closely related to their reading performance from elementary school to college (Lynch, 2002; Retelsdorf et al., 2014; Roth, 1959). One's reading self-concept is formed at a very young age. Because students with higher reading self-concept believe they are competent in a reading task, they are more likely to work persistently until the task is completed (Martin et al., 2017). Moreover, a positive self-concept tends to reinforce over time, resulting in a cumulative reading advantage (Chapman & Tunmer, 1995; Stanovich, 1986).

School Characteristics and Education Policy

Since the publication of the report *A Nation at Risk: The Imperative for Educational Reform* (National Commission on Excellence in Education, 1983), the federal government of the United States has been promoting education reform through the policies and laws to ensure that every student has access to quality education from

school. For example, the *No Child Left Behind (NCLB)* Act (2001) made the accountability system the focus of education reform. Furthermore, the bill requires states to establish standards for academic proficiency, including reading and math, and schools and districts are accountable to meet adequate yearly progress (AYP). As a centerpiece of the act, the *Reading First* program provides guidance and funding for supporting schools with reading instruction (Gamse et al., 2008). Later, the Obama administration's *Race to the Top* (RTTT) program (2011) further prompted states and local educational districts to improve outcomes for students.

Another primary focus of all educational policies and regulations is the best allocation of school resources. Class size has been an unavoidable topic of educational policy and research related to resource allocation. It is commonly believed that reduced class size will increase the time and attention each student receives from the teacher and therefore promote student learning (Angrist & Lavy, 1999; Molnar, 2000). Thus, policies concerning class size reductions are well received by parents, teachers, and administrators (Hoxby, 2000). Over decades, an accumulation of evidence has documented the benefits of small class size on students' academic performance (e.g., Crosnoe et al., 2004; Glass & Smith, 1979; Krueger, 1999). However, some also suggested that reducing class size is not desirable in terms of the "education production function" — the relationship between school investment and outcome. For example, Cho and colleagues' study on elementary students in Minnesota suggested that smaller class size has a positive influence on students' reading and mathematics performance, but the impact is trivial (Cho et al., 2012). Although the role of class size has been widely discussed and studied over the past few decades, there is still a relative void of research

conducted on secondary school students. Due to the increased difficulty of reading material, high school students may fall further behind in reading if they do not receive enough attention from their teachers due to the larger class size.

Since formal education is primarily conducted in schools and classrooms, many aspects of a school have a noticeable impact on a student's ability to complete their education (Christle et al., 2007). School is a place for pupils to study as well as socialize. The school climate may influence students' academic and behavioral adjustments (Brand et al., 2003). While many research studies on school climate have been conducted at the classroom level, this may not inform policy for high school students. High school students shift between classes throughout the day and must contend with differences in classroom restrictions and instructional routines from teacher to teacher (Felner et al., 1982). Therefore, high school students need to interact with a broader range of people, and peer influence may be more critical to high school students.

Researchers have identified a handful of demographic variables associated with student reading and academic performance. Socioeconomic status (SES) has been the one factor that received the most attention. Traditionally, SES research has concentrated on the student level, but SES on a school and local level SES have also been increasingly studied in recent years. For example, Rumberger and Palardy (2005) found that school SES is equally important for high school student's academic development as a student's family SES. Moreover, the school SES is also related to students' educational prospects (Alexander & Eckland, 1975). School SES is then recognized as a promising characteristic in relieving disadvantaged students' academic performance at the school level, and school economic integration policies have been adopted nationwide.

Consequently, school SES is a factor that should not be ignored in studying the influence of student reading performances.

International Large-scale Assessments

International large-scale assessments (ILSAs) have been conducted by international organizations since the late 20th century with the rise of quantitative research in the 1990s. ILSAs can offer a thorough perspective in monitoring the trend of educational programs, evaluating the success of an educational program, and comparing curricula between different states or provinces of the country or education systems (e.g., Taylor, 1994; Wixson & Carlisle, 2005). In recent decades, the results of ILSAs have been widely used to assess the effectiveness of education and to guide the development of educational policy (Lockheed & Wagemaker, 2013). Today, ILSAs are global phenomena with an increasing number of countries and regions participating.

Data yielded from ILSAs have been increasingly used for research that models achievement in reading instruction. As an example, the study conducted by Grilli et al. (2016) utilized the Trends in International Mathematics and Science Study (TIMSS) and Progress in International Reading Literacy Study (PIRLS) 2011 together for modeling Italian students' academic achievement in literacy, mathematics, and science. Ammermueller and Pischke (2009) also investigated peer effects with the PIRLS 2011 data.

In general, the rise of ILSAs and the attention they receive stems from national concerns about whether the students are well-positioned to compete in the context of globalization. The results of the flagship study of the Organisation for Economic Co-operation and Development (OECD) – Programme for International Student Assessment

(PISA) have generated numerous discussions worldwide. The United States ranked 25th place and 37th place for reading and mathematics out of 79 countries, respectively (OECD, 2019). According to OECD, the U. S. is the second-highest country on expenditure per student on educational institutions, but the investment does not receive a commensurate return. Reasons for the variation in performance across countries remain unclear. Differences in economic, culture, language and educational policies between countries can all contribute to differences in students' performance in literacy. Given the importance of the contextual factors, examination of these factors is necessary to help students improve their performance in reading and other subjects.

Multilevel Analysis

Education research often involves variables at different levels. It is generally believed that individuals are influenced by the social environment and groups to which they belong, and individuals can also in turn influence the social environment and groups in which they belong (Hox, 2010). It is inappropriate to study an attribute or behavior on the personal level without incorporating the contexts that may have an impact on the attribute or behavior (Heck et al., 2014). Individuals and social groups form a hierarchical structure. Therefore, when conducting the study, individuals and groups are defined at different levels. This hierarchical structure is particularly common in educational settings. For example, students as individuals are nested in classes, which in turn are nested in schools. To ensure the representativeness of the participants, most of ILSAs adopt stratified sampling techniques. That is, schools are firstly sampled from a list of eligible schools, then sample classrooms or students within each school.

Students within the same classroom will have generally more similarities with each other than with students from another classroom. Similarities between individuals can lead to many problems in data analysis, such as multicollinearity and biased estimation of standard error and other parameters. Therefore, many traditional statistical models such as the ordinary least-squares (OLS) multiple regression are not suitable for analyzing data with nested structure. Multilevel modeling (MLM) uses a correction procedure to estimate the correlation among individuals within a cluster, which is called intraclass correlation (ICC). Therefore, MLM is a more desirable approach for analyzing clustered data.

Present Study

The development of reading ability can be influenced by a complex set of factors and conditions from different levels, from early childhood to adulthood. Although many researchers have identified various factors that influence reading achievement, these studies have focused on the primary school level. Little research has been done on reading skills for high school students. However, as mentioned before, growing evidence suggests that the reading skills of American high school students are not promising.

This study aims to examine the influence of student- and school-level contextual factors on reading performance in tenth grade. The following questions will be examined by the current research:

1.   To what extent do student background factors affect student reading achievement?

2.   Are the effects of student background factors constant across schools?

3.   To what extent do school background factors affect student reading

achievement?

CHAPTER II

LITERATURE REVIEW

Good reading abilities are prerequisites for high school students regarding further education opportunities and job prospects. However, according to the statistics mentioned earlier, the current reading situation of American high school students is still makes one worrisome. In this chapter, we gathered and reviewed the literature related to factors influencing student reading achievement. Many background factors from different levels have been shown to affect students' reading achievement (Chiu & McBride-Chang, 2006; Rutkowski et al., 2013) such as student-family level, teacher level, and school level. The current study will focus on variables from the student level and school level due to the research purpose and data availability.

Studies were gathered through several databases, including Educational Resources Information Center (ERIC), JSTOR, ScienceDirect, EdITLib, ProQuest, PsychInfo, and Google Scholar. It is believed that by studying the characteristics influencing student achievement, educators and policymakers will develop a greater understanding of the impact of some contextual background factors on student achievement, allowing them to enhance student achievement to the greatest extent.

Student-level Factors Influencing Reading Achievement

Students are the subject of education and the most important asset of any educational institution (Singh et al., 2016). Therefore, students' reading and academic performance receive considerable attention. Students' unique background and individual differences can significantly influence their reading capabilities. Numerous studies have

been conducted to investigate factors affecting individual reading achievement in various ways. In addition to the commonly acknowledged factors such as student gender (Maccoby, 1998; Reilly et al., 2019), race (Desimone, 1999; Roscigno & Ainsworth-Darnell, 1999), and English Language Learner (ELL) status (Klingner & Vaughn, 1996), researchers continue to study more factors that may have an impact on students' reading ability. This section systematically reviewed three student-family background factors that have received considerable attention in recent decades – Home Literacy Environment (HLE), parental support, and reading attitude (Desforges & Abouchaar, 2003; Kush et al., 2005; Payne et al., 1994).

Home Literacy Environment

Home is the environment where children are first exposed to a language and develop literacy skills (Weigel et al., 2006). Children can acquire a wide range of precursor knowledge from their literacy environment (Crain-Thoreson & Dale, 1992). Children's neurological development is affected by their family's SES status, particularly the systems that support language and executive function (Hackman et al., 2010). Therefore, cognitive development is extensively studied and researched in connection to one's early developmental environment. Research on children's emergent literacy indicates that most children acquire their primary language skills long before formal schooling (Hart & Risley, 1995; Schneider et al., 2009). It has been evidenced by a large body of research that children enter elementary schools with various prior literacy experiences, and their prerequisite knowledge and skills take them to different starting points (e.g., Hart & Risley, 1995; Sénéchal & LeFevre, 2002; Wagner et al., 1997). Therefore, family-related factors that influence children reading have been one of the

researchers' main focuses, and HLE is one of the most essential factors in children's family backgrounds (Desforges & Abouchaar, 2003).

HLE refers to children's home-based literacy activities or interactions, family's attitudes towards literacy, household SES, and literacy resources (Hamilton et al., 2016). There is still a lack of a universal definition of HLE, and researchers usually construct the concept based on their unique perspectives. HLE can be defined by a range of resources and opportunities accessible to children and the parental attitudes, education, occupation, and resources that influence how these opportunities are available to children (Burgess et al., 2002). HLE is a multifaceted factor composed of various aspects, and it is impossible to include everything into the measure.

Most researchers have generally approached the construction of HLE from two perspectives. One is the household SES and learning resources available in a household for children to access and use. Pappas et al. (2003) investigated 102 children in New York City daycare centers and found that children from higher SES families had superior metacognitive and language skills than their peers from lower SES backgrounds. Moreover, preschool students from disadvantaged SES families are more likely to struggle with their early reading skills, which might lead to a lack of interest in academics in the following school years (Guo et al., 2015). Books have a unique role in the development of students' reading skills. Chiu and McBride-Chang (2006) reported that the number of books at home is a robust variable in interpreting variance in reading comprehension in their model. Raz and Bryant (1990) compared children from middle-class families and children from disadvantaged backgrounds. They found a significant difference in phonological skills between the two groups, and the cause of such

difference is closely related to one crucial HLE indicator – book availability (Raz &

Bryant, 1990). Rodriguez et al. (2009) also observed this phenomenon and suggested that

children with more books at home are more likely to explore and learn independently,

whereas children with inadequate HLE have a higher risk of consequent learning

difficulties. Similarly, Feitelson and Goldstein's study (1986) with Israel kindergartners

suggested that children who perform better in school tend to have more books at home,

and also tend to read more. Moreover, Brunello and colleagues (2017) analyzed data

from nearly 6,000 people in nine European countries and reported that books at home

were a critical index that highlighted the importance of childhood home conditions in

individuals' cognitive development and socio-emotional skills. Even after controlling for

parental factors, individuals with few books at home tend to result in low cognitive

ability and low education level (Brunello et al., 2017).

HLE is a thorough indicator of a student's family background variables. Merely

taking the family's financial aspects into account is highly one-sided. The other important

HLE factor is the parental education and occupation. Parents with higher educations tend

to have a higher social class and more free time from work for parent-child

communication and tend to place more emphasis on the family education of their children

(Creemers & Kyriakides, 2010). Moreover, Dubow et al. (2009a) suggested that parents'

educational attainment when their children were eight years old predicted the children's

educational and occupational achievement at the age of 48.

For children in the lower elementary grades, parent-child literacy interaction is

also an essential HLE factor, such as shared reading and storytelling. According to

Burgess (2011), literacy interaction begins in a child's infancy – over 84% of 0-18

months children in his study have been read to. Luo and colleagues (2021) constructed the variable by combing the parent book reading frequency and the number of books at home. In one often-cited meta-analysis, researchers reviewed 25 related studies and suggested that a lack of shared reading between parents and children was one of the most powerful predictors of reading problems and that it could explain 8% of the variance in the outcome measures (Bus et al., 1995). In addition to the benefit to children's literacy competence, shared reading and literacy interactions also have a positive influence on children's social and behavioral development (Foster et al., 2005). HLE is also a valuable resource for children from low socioeconomic families. Park (2008) compared the impact of HLE on fourth graders' reading performance across 25 countries and found that although home literacy environments have positive influences on children's reading in most countries, considerable cross-national variations were found in the effect of each home literacy measure. Despite the differences in the impact of different HLE measures on reading outcome, the positive effect of the HLE on primary school students' reading capability is confirmed in most countries, and the influence tends to be stronger when the country's economic level is higher (Park, 2008).

The influence of HLE on one's reading abilities has been recognized by numerous studies in preschool (Burgess et al., 2002) and elementary school (Niklas & Schneider, 2017), but there is little research on later school stages. Most research on HLE has focused on children in their preschool years due to the importance of HLE in promoting emergent literacy. HLE was evidenced to be linked with a wide range of language skills. Niklas and Schneider (2013) found that HLE can predict German kindergarteners' vocabulary and phonological awareness (PA), and it can further influence students' PA

after entering elementary school. Burgess et al. (2002) showed evidence for the relationship between HLE and oral language, phonological sensitivity, and word decoding ability among four- and five-year-old children. Carlson et al. (2012) further suggested that HLE is a good indicator in predicting the performance of receptive vocabulary and reading comprehension for children with moderate disabilities, such as developmental delay and autism. The influence of HLE is also applicable to bilingual children. Luo and colleagues' study (2021) with 108 English and Spanish Dual Language Learners (DLLs) aged 3-5 found that HLE served as mediators of the impact of family SES. They suggested that a positive HLE offers opportunities for children to learn a language and improves their learning potential by providing them with better skills in syntax and vocabulary (Luo et al., 2021). Farver et al. (2012) found a positive effect of HLE on Latino children's oral language skills and print knowledge of both English and Spanish. However, they discovered that HLE had the opposite influence on PA in English and Spanish and that literacy activities in one language could interfere with the development of the other language (Farver et al., 2012). Aside from the benefit for literacy skills, HLE is also a strong predictor of child social-emotional development. A better HLE is linked to less child hyperactivity and peer difficulties at age five (Hammer et al., 2018).

In addition to the impact on children's early reading skills, HLE also has the potential to have a long-term effect on reading and language development (Hart & Risley, 1995; National Institute of Child Health & Human Development [NICHD], 2005). Griffin and Morrison (1997) investigated the HLE's contributions to early literacy skills with 295 children in kindergarten from a large southeastern city. They found that a good

HLE rating is associated with better receptive vocabulary, general knowledge, and reading recognition skills, but not entering mathematics skills. Furthermore, the impact of HLE tends to persist throughout the research period, from kindergarten to second grade (Griffin & Frederick, 1997). At the high school level, Chiu and Chow (2007) showed HLE's positive influence on high school students across 41 countries. They found that students from families with high HLE conditions had higher interest and motivation in reading, were more persistent and studious at their reading tasks, therefore, had better reading performance (Chiu & Chow, 2007). Yalcin (2017), using the PISA 2012 data, found similar results for Turkish high school students. He advocated that HLE is the most significant and meaningful predictor of student reading, mathematics, and science achievement (Yalcin, 2017). Yalcin's finding of the relationship between HLE and Turkish high school students' reading achievement was confirmed by Celik and Yurdakul (2020) with the PISA 2015 data.

There is a considerable amount of literature devoted to the influence of HLE, and the relationship between HLE and reading performance seemed obvious. However, the impact of HLE on high school students' reading has been an area that has not received much attention from researchers because one's language development slows down after the ninth grade (Dong et al., 2020). More research is therefore needed to discern the effect of HLE on high school students' reading ability.

Parental Support

Parental support refers to a range of parental practices that are aimed at promoting children's educational success in and out of school (Seginer, 2006). Most parents have high educational aspirations and values for their children regardless of ethnicity or

socioeconomic status (Spera, 2004). Parental involvement is generally deemed a critical component of educational programs (Hoover-Dempsey et al., 2001). Support and respect from parents are indicative of good communication between parents and children, which promotes children to have a more positive attitude and emotion towards learning (Bowlby,1988). Previous studies on parent participation have constantly evidenced a positive role in their children's educational outcomes from students in kindergarten (Christian et al., 1998; Senechal & LeFevre, 2002) to secondary and high school (e.g., Hill & Tyson, 2009; Jeynes, 2005). Parental support also assumes a significant part in one's mental and physical health (Macalli et al., 2020; Yeung & Leadbeater, 2010) from an early stage of life.

The type of involvement parents provide to their children could be very different. Despite the self-explanatory meaning, the construction and research focus of parental involvement varies widely between researchers (Fan & Chen, 2001). Parental involvement in children's homework has now become an expectation and requirement of the school. Parents also agree that they are obligated and responsible to be involved in their children's homework, although they usually feel underprepared (Hoover-Dempsey et al., 1995; Hoover-Dempsey et al., 2001). Hoover-Dempsey and colleagues' literature review (2001) further suggested that children receive reinforcement, feedback on their performance, and aptitudes on the homework topic through parental instructional interactions. Although the links between student-perceived parental homework involvement, student homework behaviors, and academic achievement are constantly found across various research, parental involvement has differential functions on the students' grade level. Núñez et al. (2015) suggested that perceived parental involvement

is related to students' homework behaviors and has an impact on academic performance in junior high and high school, but not in elementary school.

However, research on the impact of parental involvement on children's educational achievement has generated conflicting results. As most researchers argued the benefit of parental involvement (e.g., Callahan et al., 1998; Hutsinger et al., 1998), others have found negative associations (e.g., Fan & Chen,2001; Moroni et al., 2015). Mata et al.'s (2018) study may offer a possible answer for such mixed findings. The researchers found that the relationship between parental involvement and academic performance was mediated by the children's perceived emotional quality of parental involvement (Mata et al., 2018). They suggest that it is not enough to involve parents in students' learning process or school activities, but students' affective characteristics of parental involvement and support are what really matters for children's academic performance and motivation (Mata et al., 2018).

Parents segue the support from assisting in completing and checking assignments in elementary school to emotional and motivational support in middle and high school (Seginer, 2006). Youngsters' perception of support from significant others is an essential aspect of their social and psychological environment (Song et al., 2014). Compared to perceived support from teachers or peers, parental academic and emotional support was most beneficial for academic motivation, achievement, and lower test anxiety (Song et al., 2014). Atoum and Al-Shoboul (2018) found similar results in Jordanian high school students. They claimed that support from family is the most important factor among friends and teachers for Jordanian adolescents, and family emotional support is the strongest predictor of children's emotional intelligence (Atoum & Al-Shoboul, 2018).

Gregory and Weinstein (2004) analyzed data from eighth to twelfth-grade students of the National Educational Longitudinal Study of 1988 (NELS:88) and found that parental and teacher support can have a cumulative effect on student academic performance. Students who received more support from their parents benefited more from their connection with teachers (Gregory & Weinstein, 2004). These conclusions are backed up by evidence internationally. For example, Atoum and Al-Shoboul (2018) studied 732 Jordanian high students and found that family is the most important factor among friends and teachers, and family emotional support is the strongest predictor of student IQ. On the other hand, Wentzel et al. (2016) suggested that parent and teacher variables (academic efficacy and academic expectations) were significant predictors of Mexican American adolescents' educational outcomes, but parental support could moderate such a relationship.

Parental emotional support refers to parents' emotional characteristics, including gestures or acts of attention, compassion, acceptance, and support that a parent expresses to their children (Boudreault-Bouchard et al., 2013; McCarty et al., 2005; Shaw et al., 2004). Lack of emotional support from parents in the early years has been found to be associated with a range of emotional and behavioral problems, for example, alcohol abuse (Shaw, 2006), as well as adolescent aggression and externalizing problems (Larsen & Dehle, 2007; McCarty et al., 2005). The extent to which relationships with parents are emotionally close and caring predicts students' motivation for academic activities at school as well as academic performance and behavioral outcomes (e.g., Gregory & Weinstein, 2004; Spera, 2006). As one crucial aspect, parental warmth directly impacts children's reading and math achievement, even after the family background condition was controlled (Davis-Kean, 2005).

High school students encounter various physical and cognitive changes as well as social and academic pressures. Youth perceived parental support could protect them from acute life stress, negative peer influences and social conflict (DeGarmo & Martinez Jr, 2006; Dubow et al., 2009b). Lambert et al. (2021) studied the data of the High School Longitudinal Study of 2009 (HSLS:09). They found conceptualizations of parental involvement (school activities, home activities, homework support, parent-child communication about education/occupation, and parental educational aspirations for their child's education) were significant predictors of GPA. Their findings also highlighted the substantial impact of parental involvement on students with elevated emotional and behavioral risks (Lambert et al., 2022). A four-year longitudinal study by Boudreault-Bouchard et al. with 605 adolescents also found a close relationship between parental support and adolescent well-being. They argued that paternal emotional support could promote adolescent self-esteem and reduce psychological distress throughout puberty (Boudreault-Bouchard et al., 2013). In addition to the influence on student reading and academic ability, parental involvement was also associated with lower rates of grade retention and fewer years in special education from kindergarten to eighth grade (Miedel & Reynolds, 1999). Likewise, Khajehpour (2011) found that parental involvement, emotional support, and emotional intelligence can positively predict Persian high school students' achievement in English language and mathematics. Due to the close links between parental support and involvement and all aspects of a student's life, it should not be overlooked in K-12 research.

Reading Motivation

Some researchers have begun to pay more attention to the influence of affective factors on literacy attainment. Reading motivation has consistently been placed at the center of all affective factors in reading and educational research. Motivational processes start spontaneously together with cognitive processes to facilitate text comprehension (Guthrie & Wigfield, 2005). Reading motivation contributes to knowledge acquisition in one's educational opportunities and career prospects (Wigfield & Guthrie, 1997). Since the ability to acquire knowledge from print materials is directly related to a student's academic capability, the importance of motivation for reading is self-evident.

Existing studies have consistently indicated the significant contribution of reading motivation to reading capacity and academic abilities (e.g., Morgan & Fuchs, 2007; Unrau & Schlackman, 2006; Wang & Guthrie, 2004; Wigfield & Guthrie, 1997). Guthrie et al. (1999) pointed out that motivation promotes reading activities and increases reading comprehension. Moreover, motivation promotes and directs individuals to learn new knowledge and enrich aesthetic experiences (Bell & McCallum, 2015). The impact of reading motivation on one's reading ability is not restricted to a particular school stage. Research has evidenced the influence of reading motivation on student reading performance in primary school (Cartwright et al., 2016), middle and high school (Chiu & Chow, 2010), as well as higher education levels (Wigfield, 1997).

Reading motivation is multidimensional in nature, including several subcomponents. Conradi et al. (2014) reviewed several related studies and summarized 12 motivation constructs associated with reading such as agency, attitudes, self-concept, and other related factors. Children are driven to read for a variety of reasons. Different

dimensions of reading motivation may be related to various student characteristics, reading purpose, and reading outcomes (Guthrie & Wigfield, 2000; McKenna et al., 1995). Guthrie et al. (2007) found that the general motivation variables can predict fourth-grade students' growth in reading comprehension, although few motivation variables were not statistically significant predictors. Among the different motivation dimensions, reading self-concept and reading attitudes were two of the most critical motivational influences (Bell & McCallum, 2016; Wigfield & Guthrie, 1997). Gambrell et al. (1996) suggested that individuals' reading motivation can be defined by their self-concept and the value they place on reading. On the other hand, an individual's attitude toward reading is a reasonably stable characteristic acquired via experience. Both reading attitude and self-concept are inextricably linked to a person's reading behavior, and frequency and are thus frequently employed as key concepts in assessing reading attitudes (Stokmans, 1999, Katzir et al., 2009).

Reading Self-concept. Reading self-concept has been one of the leading motivational variables of studies associated with K-12 students' reading and academic performance (e.g., Conradi et al., 2014; Morgan & Fuchs, 2007). However, researchers have conceived self-concept in a variety of ways. Referring to the study of Bong and Clark (1999) and Walgermo et al. (2018), reading self-concept can be defined as one's perception and affective responses of themselves toward their reading skills and competence.

There is consistent evidence that student self-concept is closely linked to their reading and academic performance. Students' reading self-concept has been identified as one of the best predictors of their reading performance (Lynch, 2002; Marsh et al., 2002).

Retelsdorf et al. (2014) provided evidence for the reciprocal relationship between reading self-concept and reading achievement with 1,508 secondary school students. Swalander and Taube (2007) also reported that verbal/academic self-concept had the most substantial influence on reading ability with 4018 eighth graders. Students who think they are competent in a reading activity are more likely to persevere until the task is done (Martin et al., 2017), and their self-concept tends to strengthen over time and form an accumulative advantage in reading (Chapman & Tunmer, 1995; Stanovich, 1986).

Self-concept is a complicated construct that may be impacted by social and environmental factors as well as by one's conduct. Students' self-concept is built through constant interactions with parents, teachers, and peers. In this process, students will gradually understand what they are expected to be as a student as well as the possible outcomes of their behaviors (Prince & Nurius, 2014; Shavelson et al.,1976). Marsh (1990) discovered a strong relationship between academic self-concept and achievement. Students who have positive academic self-competence tend to attribute their academic success to internal factors directly affecting their academic performance (Marsh, 1990). After experiencing academic success, students' academic self-concept is correspondingly strengthened, which in turn reinforces their motivation and interest in academics. As a result, their academic achievement is enhanced (Kurtz-Costes & Schneider, 1994; Marsh & Craven, 2006; Stipek & Weisz, 1981).

Furthermore, Marsh and colleagues (1983) found that non-academic self-concept is irrelevant with academic measurements, while academic self-concept is highly correlated with the academic assessment, and the degree of the relationship differs for students with different SES backgrounds. Although students' academic self-concept is

associated with their reading performance, their reading self-concept remains the best predictor of their reading performance (Marsh et al.,1983). Given the contribution of self-concept to students' reading and academic capabilities, schools have a responsibility to strengthen students' self-concept for supporting the development of students' academic skills in the long term.

Reading Attitude. Attitude is a psychological construct that is frequently studied in educational settings. Attitude is one's inner psychological and emotional inclination that influences whether one does something (McKenna et al., 1995). Drawn from the definition given by some of the most cited studies, reading attitude can be defined as students' feelings and emotions about reading that influence their propensity for reading behavior (e.g., McKenna et al., 2012; Smith, 1990; Thames & Reeves-Kazelskis, 1992). The reciprocal influence of reading attitude on reading attainment has been firmly established. The results of Bastug's (2014) study with 1,028 Turkish fourth and fifth-grade students demonstrated that reading attitude was a significant predictor of reading comprehension and academic achievement. Grolnick and Slowiaczek (1990) found similar results with 300 upper elementary students. They found that children's attitudes and beliefs about learning are potent determinants of school success (Grolnick & Slowiaczek, 1990).

Although the relationship between reading attitude and reading achievement is well established, the relationship differs across different stages of schooling. In general, individuals' attitudes towards reading deteriorate with age. A longitudinal study by Sainsbury and Schagen (2004) indicated that while students' enjoyment of reading declined, confidence as readers alone increased across the study period. Although

students' reading attitudes typically decrease with time, poor readers' reading attitudes decline significantly faster (McKenna, 2001; McKenna et al., 2020). If someone did not enjoy reading when they were in the early stages of schooling, they are unlikely to do so when they get older (McKenna et al., 1995). Moreover, boys generally have less positive reading attitudes than girls, which explains the well-evidenced gender gap in reading performance (Logan & Johnston, 2009; McKenna et al., 2020).

Petscher's (2010) meta-analysis revealed a stronger relationship between reading attitudes and achievement in primary school than in secondary school. Moreover, previous reading attitude can serve as a powerful predictor of future reading ability (Kush et al., 2005; Martinez et al., 2008). Kush et al. (2005) posed a "temporal-interaction" model that early reading attitudes were key causal predictors of reading performance in early adolescence. They argued that the relationship between children's reading attitudes and reading performance might seem irrelevant at early stages, but it tended to be closer and stronger as they moved to higher grades (Kush et al., 2005). Reading attitudes are thought to be gradually formed as a result of the acquired environment (e.g., Kaniuka, 2010; McKenna, 2001). Teachers, parents, and peers have the opportunity to impact children's reading attitudes (Harris & Sipay, 1990). Therefore, it is necessary for educators to provide children with appropriate reading behavior models, reading environments, and timely interventions in the early years of formal education to help them develop more positive attitudes towards reading and support their future academic development.

The primary purpose of formal education is to teach students. Therefore, students should be the focus of teaching and student achievement. The factors and forces outside

the school matter even more than what goes on inside (Pollack, 1993). The current study selected students' family background (i.e., HLE), parental characteristics (i.e., parental support), and student characteristics (i.e., reading motivation) to present a more comprehensive view of student background factors crucial to reading.

School-Level Factors Influencing Reading Achievement

School Socioeconomic Composition

Rising social inequality is one of the most important economic and social challenges in the United States. The distribution of opportunities and resources in a society that is growing increasingly reliant on information and education is a cause of public anxiety and concern. Referring to the data published by the educational trust (Morgan & Amerikaner, 2018), students in the poorest districts received almost $ 1,000 less per pupil than those in the wealthiest districts. Such invisible segregation is a clear departure from public education's mission of equity. Therefore, the influence of school socioeconomic composition (school SES) on student academic accomplishment has been an essential focus of policymakers for supporting children's academic success, especially those from economically disadvantaged backgrounds.

Despite the large body of research supporting the role of student family SES on academic achievement, the composition of the student population has a more profound impact on academic achievement (Coleman et al., 1966; Rumberger & Palardy, 2005). Willms (2010) examined the PISA 2006 data and found that school SES composition accounted for nearly half of the effect of school background factors. Schools with a higher SES condition tended to have students with higher standardized test scores and formed a more favorable study environment for students (Perry & McConney, 2010). The

meta-analysis by van Ewijk and Sleegers (2010) suggested that peer SES was a critical predictor of student performance in reading, mathematics, and science. Palardy (2013) indicated that students from schools with high SES were 68% more likely to complete high school and enroll in a four-year college. Moreover, the SES of the student's household could interact with the SES of the school (Coleman, 1990). As Alexander and colleagues (1979) suggested, school SES affects the quality and characteristics of peer networks. Specifically, students are more likely to get acquainted with high-SES peers in schools with higher-average-SES levels (Alexander et al., 1979). Consequently, students who attend lower-SES schools are more likely to be subject to a double disadvantage (Raudenbush & Bryk 1986).

An ample number of studies have identified the mechanism of school SES on student academic outcomes. Hart et al. (2013) examined their gene × environment interaction model with the data from Florida Twin Project on Reading, Behavior and Environment and found the moderating effect of school SES on the relationship between genetic factors and student reading achievement. The work of Lee and Smith (1997) on high school size and student learning also found that school SES can moderate the relationship between school size and student academic performance. Moreover, Rumberger and Palardy (2005) suggested that school policies and practices mediate the relationship between school SES and student academic growth. Palardy (2013) found that peer effects primarily mediated the influence of school SES. On the other hand, Agirdag (2018) found that the teachability culture (teachers' collective perceptions regarding their students' teachability) is also a mediator of the school SES effect.

Unsurprisingly, low SES schools are characterized by a lack of resources such as decent facilities, highly qualified teachers, and funding (Betts et al., 2000). In contrast, an increasing body of research shows that socioeconomically mixed schools outperform homogeneous schools in terms of receptive language, expressive language, and arithmetic proficiency (Perry & McConney, 2010, Palardy, 2013). Today, more than 100 school districts in the United States have begun implementing "socioeconomic integration" policies to seek the benefits of diversity for their students (Kahlenberg et al., 2017). For example, Wake County of North Carolina sought to have a maximum of 40% of students from low-SES backgrounds in each school, and Montclair city in New Jersey assigned all students to one of six zones based on many socioeconomic and demographic factors (Crosnoe, 2009).

Research on school SES has also yielded mixed results. While most argued that students from low-SES backgrounds could benefit from attending schools with higher SES, many have questioned the substantiveness of such effects (Marks, 2010). Most cited is a series of studies by Marks and colleagues, which highlighted that the substantial school-SES impacts documented in many research and policy literature were statistical artifacts (Armor et al., 2018; Marks, 2010; 2015; 2017). For example, using Australian longitudinal data, Marks (2015) concluded that the impact of school-SES was trivial after controlling for students' prior ability and did not need a policy response. Later, Armor et al. (2018) analyzed data from three states in the U.S. to investigate the school SES effect. They found significant school SES effects in cross-sectional models but not in longitudinal models, so they concluded that the large school SES effects were artifacts of aggregation (Armor et al., 2018). Sciffer et al. (2020) contradicted the findings of Armor

and colleagues' work using PISA 2015 data. They employed several structural equation models to address concerns about measurement errors and found evidence for school-level SES effects (Sciffer et al., 2020).

Vieno and colleagues (2005) suggested that school SES is important for students' sense of community in the school. Students from schools with higher SES had a more positive sense of community at school (Vieno et al., 2005). Later, Crosnoe (2009) analyzed a sample of 7th to 12th students from the National Longitudinal Study of Adolescent Health (Add Health) and found the "frog pond" effect caused by the student reallocation. He suggested that students with low SES encountered more competition and were at a higher risk of developing psychological problems in high-SES schools. Moreover, the disadvantages of attending a high-SES school were severe for minority students such as African American and Latino students (Crosnoe, 2009).

Understanding the relationship between student academic performance and school SES is noteworthy because it has the potential to aggravate or moderate segregation (Perry & McConney, 2010). Research favoring and criticizing the impact of school SES appears to be plausible and well-justified. Hence, an important direction for further research is to investigate the effect of school SES in a more comprehensive model for the evaluation of educational effectiveness.

Class Size

How to distribute educational resources most efficiently to maximize attainment for all student groups has always been a critical theme in educational research and policy. The teacher-student ratio is one of the primary determinants of the economic cost of education (Krueger, 2003). Therefore, the impact of class size on students' academic

performance is a recurring topic when discussing education reforms. The advocacy of reducing class size has been popular among parents and educators. Parents believe that their children will achieve school success by receiving more attention and personalized teaching from the teacher, and teachers and school administrators favor smaller classes for various reasons (Hoxby, 2000). In recent decades, at least 24 states have mandated or incentivized class-size reduction (CSR) in K-12 education (Chingos & Whitehurst, 2011).

One of the most persuasive studies on class size is the Project STAR (Student-Teacher Achievement Ratio; Word, 1990) conducted in Tennessee during the late 1980s. The Project STAR was a four-year longitudinal experimental study that involved approximately 12,000 students. Participants were randomly assigned to three conditions – a reduced-sized class (13-17 students), a regular-sized class (22 - 26 students) or a regular-sized class with full-time teaching aides (Word, 1990). Students were retained in the same experimental condition from kindergarten to third grade, but the teacher in each classroom was replaced with a new one each year.

The study demonstrated several benefits of small class sizes. Finn and Achilles (1999) summarized the findings of the Project STAR. Key findings regarding students' academic performance and classroom behavior were as follows: 1) the smaller class sizes had a positive effect on improving student performance in all school subjects, 2) smaller class sizes are beneficial for all genders, 3) minority students and students attending schools in urban districts were benefited more from smaller classes, and 4) small class sizes have a long-term positive effect on student classroom behavior.

Moreover, Konstantopoulos and Chung (2009) used the data from Project STAR and the Lasting Benefits Study, the next stage of Project STAR, to investigate the long-

term outcomes of the "small-class advantages". They found that students can benefit from previous participation in small-size classes in early elementary school through grade eight; small classes have the potential to narrow the achievement gap in reading and science in the later grades (Konstantopoulos & Chung, 2009). Nye and colleagues (2001) conducted a 6-year follow-up with the students who participated in the Project STAR and reported the same findings. They claimed that the impact of small classes persisted for at least six years and remained meaningful, which suggested the lasting benefits of CSR (Nye et al., 2001). Furthermore, Finn et al. (2005) found a substantial relationship between attending small classes in early grades and graduation from high school, and students with low SES benefited more from the small classes.

To this day, Project STAR is still the largest and most influential study regarding class size. It has had a profound impact on the development of education policy. As the datasets are publicly available, many researchers have used the Project STAR data for secondary analysis. Shin and Raudenbush (2011) used the Project STAR data and evidenced the "small-class advantages" on students' test scores in reading, listening, word recognition as well as mathematics, from kindergarten to third grade. They also suggested that the strong effects of small classes remained relatively stable across schools (Shin & Raudenbush, 2011). Smith and Glass's (1980) meta-analysis suggested that small class size also had a passive effect on the teacher's attitudes for instruction and students' attitudes toward learning and engagement.

Even though evidence consistently showed the benefit of small classes in the early grades and had enduring effects, some have questioned the returns of maintaining small classes. Hanushek (1986, 1997, 1998, 2003) has repeatedly stated in his series of works

that reducing class size might not be as desirable as most people expected. A common expectation of small class sizes is that teachers will be able to deliver more targeted and individualized instruction to each student, thereby improving student academic achievement. This hypothesis has not been supported by many studies (e.g., Cahen et al., 1983; Schanzenbach, 2014). Woessman and West (2006) used data from the International Mathematics and Science Study (TIMSS) to examine the effect of class size on test scores in 11 countries. They found that class size only had a significant small class advantages on students in Greece and Iceland. For example, East Asian countries that topped international examinations generally had large class sizes. They argue that hiring more competent teachers is better than insisting on reducing class size (Woessman & West, 2006).

The majority of previous research has been focused solely on the impact of class size in early primary school or the effects of educational experiences in primary school on later school stages. There are relatively few studies that address the role of class size in middle and high schools. Dee and West (2011) investigated the class size effects on middle school students' non-cognitive skills with the data from the National Education Longitudinal Study of 1988 (NELS:88). The results revealed the benefits of small class size to eighth-grade students' academic performance and a range of non-cognitive skills such as interest in school subjects and school engagement, and the effects persisted until the end of the research. They believe that CSR is a worthwhile investment as the non-cognitive abilities of students are advantageous for the job market as well as for higher education (Dee & West, 2011). Wyss and colleagues (2007) examined the effect of high school science class size (10 or fewer; 11-15; 16-20; 21-25; 26-30; and more than 30) on

student performance in introductory college science courses. They found that class size was a significant predictor of college science achievement, but the influence of small class size (10 or less) was negligible (Wyss et al., 2007). However, they suggested that small class size had a more significant impact on low achievers, but the students in the sample were all higher achievers. Thus, the relationship between class size and student achievement in high school student populations still needs further study.

Student Misbehavior

Student misbehavior is a factor that is perhaps obvious, but it is vital to emphasize nonetheless. It is a contentious issue in K-12 education and threatens class order and school discipline. A small fraction of pupils misbehaving in a classroom can considerably distract other students and irritate teachers in their efforts to complete the lesson plan (Barton et al., 1998). Reducing student misbehavior allows more effective teaching and learning for both the students exposing problem behaviors and their peers (Epstein et al., 2008).

The most prevalent student misbehavior includes distractibility, disengagement, and disobedience (Kulinna et al., 2003; Tsouloupas et al., 2014). Transitioning from elementary to middle and high school, teenagers undergo fast changes in their physical, emotional, and interpersonal development. Misbehaviors at the secondary school stage can be more serious such as truancy, substance use, and even gang membership (Finn et al., 2008; Stewart, 2003). Truancy is commonly associated with lower academic achievement and a higher dropout rate in high school (Alexander et al., 1997; White et al., 2001). Similarly, substance use, such as drug and alcohol abuse, is also linked to

various educational and societal problems such as school dropout, psychological issues, and juvenile delinquency (e.g., Swaim et al., 1998; Voelkl & Frone, 2000).

Finn and colleagues (2008) investigated the consequences of misbehavior in high school using NELS:88 data. They found that a higher level of misbehavior was associated with worse academic performance, a higher possibility of dropping out, and a lower possibility of attending post-secondary education. Furthermore, boys exhibited more delinquent behaviors than girls, but delinquent behaviors were not related to the race of the students (Finn et al., 2008). Using the same data, Rumberger and Larson (1998) found that higher levels of misbehavior in grades 8 and 12 were associated with a higher possibility of dropping out of high school or obtaining a graduate equivalency degree.

Schools are complicated communities in which students and instructors live and interact. Teachers are the leaders of the community, and they have a significant impact on students' intellectual and social development. Ratcliff et al. (2010) suggested that the quantity and quality of teachers' management activities have a significant impact on the teaching and learning environment. They observed that teachers used more time managing student misbehavior in classrooms that were identified as needing improvement (Ratcliff et al., 2010). Student misbehaviors are not only a threat to the behavior and learning of other students, but they also influence teachers. Extensive research on factors affecting teachers' well-being has discovered that student misbehavior is stressful for teachers and may have a negative impact on their levels of emotional weariness (Carson et al., 2011; Fernández-Balboa, 1991; Klassen et al., 2012; McCormick & Shi, 1999). A meta-analysis by Aloe et al. (2014) suggested that students' misbehavior is closely related to teacher accomplishment, emotional exhaustion, and

depersonalization. The pressure to manage student misbehavior can contribute to a rise in the turnover rate (Tsouloupas et al., 2010). Moreover, Ingersoll (2001) also suggested that the student discipline problem is one of the leading causes of teacher resignation in the United States. In light of the present teacher shortage and the importance of highly qualified teachers in learning, student misbehavior has a significant consequence on education outcomes.

Students' attitudes toward education, self-cognition, and future aspirations are impacted by the experiences, roles, and interpersonal connections they encounter in school (Kuperminc et al., 1997). Those who are having difficulties at school might influence other students by expressing their attitudes, beliefs, and behaviors (Jencks & Mayer 1990). In addition, peer cluster theory proposes that problem students can identify each other and form a group where they support and encourage misbehaviors (Oetting & Beauvais, 1987; Townsend et al., 2007). Successful schools provide safe and orderly learning environments and a positive school climate to promote educational outcomes. School climate refers to a group phenomenon that encompasses social, emotional, and physical norms and beliefs as well as expectations that makes students feel safe to live and study (Cohen et al., 2009). A healthy school climate benefits student academic achievement and relieves the impacts of poverty on achievement (Darling-Hammond et al., 2018). However, disruptive student behavior jeopardizes the school climate (Bradshaw et al., 2019). For example, Cothran et al. (2009) interviewed 23 teachers and 182 students in secondary school and found that both teachers and students agreed that student misbehavior has a detrimental impact on their learning and school climate. However, teachers frequently attribute student misbehavior to issues at home, whereas

students believe the reason for misbehavior is a lack of attention and engaging class topic (Cothran et al., 2009). Nonetheless, Sheldon and Epstein (2002) suggested that schools can enlist the help of family and community members to curb student misbehavior and create a safer school climate. Specifically, parenting and volunteering involvement significantly reduced the percentage of students sent to administrators' offices, detention, and in-school suspension (Sheldon & Epstein, 2002).

Although a student's family has a significant impact on their academic ability, formal education takes place primarily in schools. Many studies offer evidence that schools have a significant influence on student performance through different mechanisms. The current study chose factors related to the classroom (i.e., class size), school atmosphere (i.e., student misbehavior at school), and student composition (i.e., school socioeconomic composition) to reflect the importance of schools.

Secondary Study Using ILSA Data

Since the late 20th century, exchanges between countries and regions worldwide have become increasingly frequent, and global contacts have been strengthened continuously. ILSA is a reflection of this trend of globalization in education. Among the many ILSAs, the PISA of OECD and two flagship studies of the International Association for the Evaluation of Educational Achievement (IEA) — PIRLS and TIMSS attracted the most attention. Over the years, with the unceasing scale expansion of these ILSAs, the use of ILSAs for research has increased significantly (Rutkowski et al., 2010).

ILSAs allow researchers to study and improve literacy instruction and investigate how learning-related factors on different levels affect the educational outcome, such as attitudes, family background, and school characteristics (Anderson et al., 2007). For

example, Netten and colleagues (2016) compared the differential impact of linguistic and sociocultural diversity on Netherlandish L1 and L2 students using PIRLS data. They reported substantial disparities in parent educational attainment and home and school literacy environments between L1 and L2 pupils (Netten et al., 2016). Chen et al. (2020) utilized the PISA 2015 data and found that student and school-level factors were significant predictors of reading self-efficacy, which in turn significantly predicted student reading achievement.

Moreover, ILSAs provide policymakers with internationally comparable information (Addey et al., 2017). They allow education systems that do not have a tradition of employing standardized assessments to engage in global comparisons such as Germany, China, and Korea (Neumann et al., 2010). Caro and Lenkeit (2012) analyzed the PIRLS 2006 data to test ten hypotheses related to educational inequalities. In general, they offered a clear picture of the magnitude and mechanism of family SES to student achievement inequalities across five countries (Caro & Lenkeit, 2012). Similarly, Chiu and McBride-Chang (2006) examined the effect of gender and context factors on reading achievement using PISA data. They found a substantial impact on gender and reading enjoyment, as well as the socioeconomic related factors such as log GDP of the country, family SES, and school SES (Chiu & McBride-Chang, 2006). Using PISA 2000 data, Fuchs and Wößmann (2008) discovered that international disparities in student performance were primarily attributed to educational institutions. They suggested that school autonomy is related to superior student performance. Hanushek et al. (2013), on the other hand, evaluated PISA data from 2000 to 2009 and discovered that school autonomy was only favorable to developed and high-performing countries.

The ILSAs are so influential on education that the results of each testing cycle invariably spark a heated public and political discussion (Fertig, 2003). However, as noted in the National Academy of Education report on ILSAs, the ILSAs are more than simple rankings, and researchers should analyze the ILSAs data carefully to identify subtle gaps (Singer et al., 2018). Fertig (2003) also advocated the use of ILSAs data for a deeper analysis. Furthermore, one of the essential purposes of ILSAs is to examine influential contextual factors on student achievement to inform educational policy and reform (Sellar & Lingard, 2013; Singer et al., 2018).

CHAPTER III

METHOD

The purpose of the current study is to examine the influence of student and school background factors on high school students' reading achievement in the United States. The PISA 2018 International Database from the OECD was utilized for the current study. Several MLM models were built with student-level background factors as well as school-level background factors to explain the disparity in high school student reading performance. This section covers the following topics: (1) study design and data collection procedure of the PISA 2018 cycle, (2) sample and participants of the current study, (3) variables and methodology, and (4) statistical models and analysis procedures for each research question.

PISA 2018

The PISA was initially implemented in 2000. With a three-year testing cycle, PISA 2018 is its seventh study. PISA assesses 15-year-old students enrolled full-time in educational institutions on their academic achievement in the fields of mathematics, science, and reading. The goal of PISA is to determine whether students worldwide have acquired the critical knowledge and skills necessary for full participation in contemporary society. Therefore, the assessments analyze not just the ability of test-takers to replicate knowledge but also their ability to infer from what they have learned and to apply knowledge in unfamiliar circumstances. PISA provides information for educational development and reform by enabling policymakers and scholars to perform international comparisons.

Differentiating from other ILASs, PISA changes the focus of the cognitive evaluation on a cyclical basis. Reading literacy is the major domain of the PISA 2018 cycle. PISA assessments are computer-based. For PISA 2018, a new reading framework has been designed to address the critical differences between print and online reading (Afflerbach & Cho, 2010). Unless otherwise noted, PISA 2018 was conducted during a 56-day testing period (between March 1st to August 31st of 2018).

Participants

The PISA 2018 dataset was utilized for the current study. There were 3,598 students (1,774 females, accounting for 49.3% of the total sample) from 163 schools in the United States in the dataset. The dataset is well balanced in terms of gender. Moreover, all participants were in the tenth grade at the testing time.

PISA used a two-stage stratified sampling procedure to assure the representativeness of the participants in the research, except for Russia. In the first stage, a countrywide list of all eligible schools was used to sample schools with students aged 15 during the testing period. Schools were sampled with probability proportionate to size (PPS). Then, for countries that participated in the computer-based assessment and Global Competence 42 students were randomly selected within each sampled school. If the country participated in the paper-based assessment and did not participate in Global Competence, 35 students were selected from each sampled school.

Measurement

In addition to the reading assessment, PISA entails the completion of core background questionnaires by students, parents, teachers, and principals. These questionnaires shed light on the learning environment of students and covered necessary

constructs for tracking educational trends in the context of research on educational

system effectiveness (OECD, 2019). The current study acquired variables at the student

and school levels using corresponding questionnaires. The student questionnaire contains

66 questions, and several subitems are associated with each question.

Variables

Student-level Variables

The primary purpose of this study is to investigate the effects of different

contextual variables on high school students' reading performance. Background variables

at the student level were used as first-level variables in the MLM models. The student-

level variables used in this study include students' HLE, parental support, and reading

motivation. The following section will explain the characteristics and sources of each

variable.

HLE. The index of economic, social, and cultural status (ESCS) provided by the

OECD is used to indicate the student's HLE. The ESCS index is composed of three

variables related to student family background: parents' highest level of education,

parents' highest employment status, and household home possessions (availability of 16

listed household items and books in the house). The ESCS is presented as a standardized

score with a mean of zero and a standard deviation of one. Higher values indicate better

HLE conditions.

Parental Support. This variable reflects the positive behaviors parents

demonstrated or performed to their children in school life and academic ability

throughout the school year in which data were collected. It is represented by the PISA

constructed index of parents' emotional support (EMOSUPS), which is derived from the

3 items of the question on parental support on the student questionnaire (original item:

ST123). The original responses were coded in 4-point Likert scale (1 = Strongly disagree,

2 = disagree, 3 = agree, 4 = Strongly agree). Higher values indicate more perceived

emotional support from parents.

Reading Motivation. Reading motivation is represented by two constructs –

reading self-concept and reading attitude. Reading self-concept and reading attitude are

assessed by the related questions of the student questionnaire (original item: ST161).

Reading self-concept is the sum of six items under question ST161, and the items were

coded using a four-point Likert scale with responses ranging from 1 (strongly disagree) to

4 (strongly agree). Therefore, the reading self-concept index ranges from 6 (lowest level

of self-concept) to 24 (highest level of self-concept). However, for interpretation and

variable composition purposes, some initial responses of some items were reversely

coded. For example, ST161Q06HA (I have always had difficulty with reading) was

reversely coded as the question "I never had difficulty with reading" to fit the fashion of

"the higher the value, the greater the degree of the variable". The composite variable

reading self-concept and reading attitude showed good reliability (Cronbach's α = .846).

The reading attitude index was represented by the composite variable provided by

PISA (original variable: JOYREAD). It was constructed based on the 5 items under

question ST160. Zero represents the average reading attitude, and higher values indicate a

more positive attitude toward reading.

School-level Variables

Background variables at the school level were used as second-level variables in the MLM model. As with the student-level variables, the school-level variables were derived and developed from the principal-reported school questionnaire. The school questionnaire contains 29 questions, and several subitems are associated with each question. The school-level contextual factors used in this study include school SES composition, class size, and student misbehaviors at school. Each variable is addressed in detail below.

School SES Composition. School SES composition is represented by school principals reported percentage of students from socioeconomically disadvantaged homes, which is derived from the third item under question SC048 (SC048Q03NA01). Theoretically, this variable can range from 0 to 100 (percent).

Class Size. This variable is obtained from the school questionnaire reported by school principals in response to the question about the average class size of the test language (original item: SC003). It is a categorical variable with responses ranging from 1 (less than 15 students) to 9 (more than 50 students). Each category is incremented by four students. For instance, 2 denotes 16-20 students, 3 denotes 21-25 students, and so forth.

Student Misbehaviors. This variable is represented by the student misbehaviors that affect student learning, including truancy, skipping classes, inattention, threatening or bullying other students, lacking respect for teachers, and alcohol or illegal drug usage. It is constructed using school principals' responses to the 6 items under a question about phenomena of students that hindered students learning (Original items: SC061Q01TA to

SC061Q11TA). A four-point Likert scale was used to categorize the original responses (1 = Not at all, 2 = very little, 3 = to some extent, 4 = A lot). Therefore, this composite variable can range from 6 (worst school atmosphere) to 24 (best school atmosphere). The composite variable showed good reliability (Cronbach's α = .813).

Outcome Variable

The outcome variable is students' overall reading literacy score. PISA assigns ten random values from each participant's calculated posterior distributions of scores (OECD, 2009). Those random values are Plausible Values (PVs) of each student's score distributions. The outcome variable is the average value of the ten PVs (Cronbach's α = .992).

Procedures

The Statistical Product and Service Solutions (SPSS) version 25 was used to clean and validate the original data and conduct reliability assessments. Statistical Analysis Systems (SAS) 9.4 was used to perform MLM analyses using the Maximum Likelihood estimation method. After finding the best fitting model in general, the variables in each level were investigated for significance.

Data Cleaning and Validation

This process was conducted to validate the authenticity and quality of the data for subsequent analyses. The integrity of the data was verified in this step. Following that, a missing value analysis was conducted to examine whether the missing data occurred at random in nature. Prior to further analyses of the variables, some of the original variables were recoded to ensure that the larger the value, the more positive or frequent the associated attributes. Reliability analyses were performed for each set of items before

compositing variables. The relevant variables then were composited, and their

distributions were examined.

Descriptive Statistics

Descriptive statistics were performed on all variables used for the subsequent

analyses, including their means, standard deviations, and bivariate correlations to reading

literacy scores.

MLM Analysis

Prior to conducting any MLM models, intraclass correlation (ICC) and design

effect (DE) were calculated to determine the necessity of the MLM analysis.

Additionally, one rescaling process (variable centering) and one index of local effect

(proportion reduction in variance index, PRV) essential for result interpretation are also

introduced below.

Intraclass Correlation (ICC). ICC is the ratio of between-groups variance to the

total variance (Finch et al., 2019). ICC can be defined as

$$\rho = \frac{\tau^2}{\tau^2 + \sigma^2}, \qquad\qquad (1)$$

where τ^2 denotes the between cluster variance, and σ^2 indicates the variance within

clusters. The ICC value is between 0 and 1. A small ICC score indicates that the variance

between groups is minimal, and an OLS regression would be adequate (Heck et al.,

2014). While ICC values more than .05 are frequently used as a proxy for a significant

degree of variance between clusters, it is also usual to see ICC values between .05

and .20 in cross-sectional social science studies (Heck et al., 2014; Lorah, 2018).

Design Effect (DE). Due to the similarity of observations within the same cluster, it is critical to address the standard error violation while assessing disproportionate sampling and multistage cluster samples (Hox, 1998). DE is the ratio of the biased standard error to the standard error obtained from ordinary random sampling (Kish, 1965). Generally, a DE greater than 2.0 implies the need for MLM. It can be computed by:

$$DE = 1 + (n_{clus} - 1) * ICC. \qquad (2)$$

Variable Centering. It is often necessary to rescale independent variables to facilitate the interpretation of MLM models. The common practice is subtracting the grand-mean or the group-mean from each score. In addition to facilitating interpretation, centering variables can also reduce collinearity caused by including an interaction between variables in the model. Grand-mean centering had no impact on the function of the original regression model, but it changes the interpretation of the intercept. On the other hand, the group-mean centering technique complicates interpretation, but it provides extra information on the group structure and can result in unbiased estimates of level one effects. (Hox, 2010). Considering the advantages of each centering approach, all variables at the school-level were grand-mean centered, and all variables at the student level were group-mean centered.

Proportional Reduction in Variance Statistics (PRV). PRV is a commonly reported measure of the magnitude of the local effect, which is also referred to as R^2 for MLM (Rights & Sterba, 2019). The PRV index is calculated by comparing the null model's unexplained variance to the full model (Peugh, 2009; Rights & Sterba, 2019). The equation to get this statistic is:

$$PRV = 1 - \frac{unexplained\ variance\ from\ full\ model}{unexplained\ variance\ from\ null\ model}. \qquad (3)$$

Model Confirmation and Comparison. Multiple models were configured and compared to find the model that best fit the sample. The χ^2 difference tests were used to test differences between models. The χ^2 difference test compares the chi-square statistics for difference in model deviance of the null and alternative models (-2 * log likelihood), and the resultant statistic is approximately χ^2 distributed with degrees of freedom of the difference between the two models (Heck et al., 2014).

CHAPTER IV

RESULTS

Preliminary Analysis

The data used in this study were downloaded directly from the PISA website. The

student data and school data were then merged using the SPSS program provided by

PISA. After obtaining the consolidated data, the data cleaning process was initiated. The

current study only retained the U.S. subsample for subsequent analysis. Because the

variables were derived from questionnaire responses completed by students and

principals, there were many missing values in the data. For the variables that were used in

this study, students or principals with missing values were removed from the data. A total

of 676 students were removed from the original sample, and the final sample contains

2,922 students from 140 schools. A one-way analysis of variance (ANOVA) was

performed to examine if there were significant differences between the sample retained

and the missing data on the dependent variable. The result revealed a significant

difference between the original sample and retained sample on reading scores [F (1,

3,596) = 101.328, $p < .001$]. The students with missing data had significantly lower

reading scores, Cohen's $d = 0.42$. Since the nature of the missing values is unclear, the

reason for such a difference is unknown.

Descriptive Statistics

The descriptive statistics for all variables are summarized in Table 1. All variables

are approximately normally distributed, satisfying the assumptions of MLM.

The students in the sample scored an average of 513.23 points on this cycle of tests, which is slightly higher than the OECD average score of 505 points in reading. Nonetheless, U.S students' reading performance did not demonstrate improvement throughout the testing cycles since 2000 (OECD, 2019). Moreover, on average, U.S students had slightly lower reading attitudes, higher HLE conditions, and parental emotional support than other OCED countries. Students in the sample had a positive reading self-concept ($M = 17.82$, $SD = 3.52$), for a variable that ranges between 6 to 24. At the school-level, student misbehavior is still a problem in high school ($M = 14.42$ $SD = 2.89$), for a variable that ranges between 6 to 24. Most classrooms have more than 26 students, which are not considered typical small classrooms (20 or fewer students). Moreover, approximately 45.6% of students were considered economically disadvantaged.

Table 1

Descriptive Statistics for Key Variables (N = 2,922)

	M	*SD*	Min	Max	Skewness	Kurtosis
Reading Score	513.23	98.48	217.10	810.49	-.164	-.373
HLE[a]	0.15	0.99	-3.800	3.250	-.401	-.086
Parental Support	0.10	1.00	-2.45	1.035	-.638	-.772
Reading Self-Concept	17.82	3.52	6.000	24.000	-.259	.073
Reading Attitude	-0.07	1.09	-2.710	2.610	.035	-.356
Student Misbehavior	14.42	2.89	6.00	23.00	.412	.231
Class Size	25.91	5.05	13.00	38.00	-.120	.019
School SES Comps[b]	45.61	24.89	1.00	100.00	.206	-.803

Note. All students in the sample were 15-year-old and in 10th grade

[a]HLE: home literacy environment

[b]School SES Comps: school SES composition

Correlation

Table 2 summarizes the results of the correlation analysis between all the variables of interest. It is clear that all student-level and school-level variables are correlated to students' reading scores ($p < .01$). Reading self-concept had the highest coefficient ($r = .384, p < .01$) and class size had the lowest coefficient ($r = .074, p < .01$) in relation to reading scores.

School SES composition was found to be negatively correlated with all variables except with student misbehaviors. It is important to note that the school SES variable is a proxy for the percentage of students from economically disadvantaged backgrounds in the school. Therefore, the higher the value, the larger portion of students from

impecunious families are in the school. Furthermore, class size was found to be correlated only with two variables: reading attitudes and student misbehavior besides the reading scores. Specifically, with larger class sizes, students tend to have better reading attitudes and more misbehaviors. The HLE index, on the other hand, was correlated with all predictor variables except the class size. This suggested that students from families with high HLE are more likely to go to schools with peers from similar backgrounds and less student misbehavior in the school. They also had better parental emotional support, more positive reading self-concept, and reading attitude.

Complex intercorrelations among predictor variables were found, which may cause multicollinearity and lead to biased parameters estimation for traditional OLS methods (Hox, 2010)

Table 2

Correlation Matrix of the Original Variables (N = 2,922)

	1.	2.	3.	4.	5.	6.	7.
1. Reading score	-						
2. HLE[a]	.341**	-					
3. Parental Support	.091**	.179**	-				
4. Reading Self-Concept	.384**	.241**	.154**	-			
5. Reading Attitude	.332**	.154**	.080**	.390**	-		
6. Student Misbehavior	-.151**	-.186**	-0.028	-.038*	-0.028	-	
7. Class Size	.074**	0.023	-0.015	0.022	.049**	.090**	-
8. School SES Comps[b]	-.277**	-.400**	-.038*	-.056**	-0.025	.343**	-0.035

**: Correlation is significant at the .01 level.

*: Correlation is significant at the .05 level.

[a]HLE: home literacy environment

[b]School SES Comps: school SES composition, lower numbers indicate smaller portion of students from disadvantaged backgrounds

MLM results

Several models were developed to answer research questions. All models were analyzed using SAS with the Maximum Likelihood (ML) estimation technique. The following section describes each tested model in detail. A summary of all models' parameters and can be found in Table 3.

Table 3

MLM Results Summaries for Predicting Reading Scores

Parameters	M_0	M_1	M_2	M_3
Regression Coefficients (Fixed effects)				
Intercept (γ_{00})	513.02 (3.68) [†]	512.98 (3.69) [†]	512.97 (3.69) [†]	556.00 (6.19) [†]
HLE (γ_{10})	-	15.34 (1.82) [†]	15.29 (2.13) [†]	15.29 (2.13) [†]
Reading SC (γ_{20})	-	7.22 (0.49) [†]	7.21 (0.54) [†]	7.21 (.54) [†]
Attitude (γ_{30})	-	17.90 (1.53) [†]	17.97 (1.59) [†]	17.97 (1.59) [†]
Parental support (γ_{40})		-0.45 (1.57)	-0.48 (1.70)	-0.48 (1.70)
School SES (γ_{01})	-	-		-1.03 (0.11) [†]
Class Size (γ_{02})	-	-		1.49 (0.52) [*]
Misbehavior (γ_{03})	-	-		-2.14 (0.99) [*]
Variance Components (Random effects)				
Residual (σ^2)	8298.28 (222.59) [†]	6513.22 (174.71) [†]	6231.50 (179.72) [†]	6232.40 (179.64) [†]
Intercept (τ_{00})	1465.16 (228.99) [†]	1565.62 (230.02) [†]	1581.76 (230.24) [†]	672.83 (118.79) [†]
School SES (τ_{01})				
Class Size (τ_{02})				
Misbehavior (τ_{03})				
HLE (τ_{11})	-		156.47 (67.89) [*]	156.41 (67.88) [*]
Reading SC (τ_{21})	-		6.28 (4.00)	6.2740 (3.99)
Attitude (τ_{31})	-		23.04 (33.78)	22.99 (33.77)
Parent support (τ_{40})			55.45 (45.44)	55.41 (45.44)
Model Summary				
-2LL	34872.0	34198.7	34181.4	34091.0
AIC	34878.0	34212.7	34203.4	34119.2
BIC	34886.9	34233.3	34235.8	34160.2
Parameter estimated	3	7	11	14

[*] $p <.05$
[†] $p <.001$

The Null Model (M₀)

The null model was initially developed to investigate the variance in the outcome variable across different levels. It is an intercept only model that might be used to see if MLM is necessary for a given data. The null model for this investigation is represented by the equations below:

$$Y_{ij(Reading\ Score)} = \gamma_{00} + u_{0j} + \varepsilon_{ij}, \qquad (4)$$

where the Y_{ij} is the dependent variable (the reading score of the student i in school j), the

γ_{00} is the overall average reading score of all students, the ε_{ij} is the student-level random

effect, and the u_{0j} represents the school-level random effect. Notice that no predictor was

entered in this model. The results shown in Table 3 present a significant variance in the

outcome variable on both student ($\tau_{00} = 1465.16$, $\chi^2 = 6.40$, $p < .001$) and school-level

($\sigma^2 = 8298.28$, $\chi^2 = 37.28$, $p < .001$), which indicates that students' overall reading

achievement significantly varied individually and across schools. Therefore, variables at

the student and school-levels could be added into the model to explain the variations.

There were also significant differences in reading scores between students in the

same school ($\sigma^2 = 8298.28$, $\chi^2 = 37.28$, $p < .001$). The ICC was .15, indicating that

school differences account for 15% of the variance in students' overall reading

achievement. In addition, the design effect (DE) of the null model is 3.98, which satisfies

the criteria for MLM analysis (Lai & Kwok, 2015). The ICC and DE indices both

indicated the need for MLM.

The Random Intercept Model with Student Level Variables (M₁)

Several explanatory variables were added to the model after establishing the

necessity of MLM. Firstly, four variables at the student-level were added to the null

model to test their effect on the overall reading achievement. This model (M₁) is a

random intercept model, which allows the overall average reading score to vary across

schools. The combined model can be mathematically represented in the following way:

$$Y_{ij(Reading\ Score)} = \gamma_{00} + \gamma_{1j}\left(HLE_{ij} - \overline{HLE_j}\right) + \gamma_{2j}\left(RSC_{ij} - \overline{RSC_j}\right) +$$

$$\gamma_{3j}\left(RA_{ij} - \overline{RA_j}\right) + \gamma_{4j}\left(EMOSUPS_{ij} - \overline{EMOSUPS_j}\right) +$$

$$u_{0j} + \varepsilon_{ij} \tag{5}$$

Compared to the null model, the current model has smaller Akaike Information Criterion statistic (AIC) and Bayesian Information Criterion statistic (BIC) indices. Regardless of the number of parameters estimated in the model, smaller AIC and BIC indices indicate better model fit (Heck et al., 2014). Moreover, 2 times the log of the likelihood (-2LL) is also commonly used as a model fit metric for ML estimations. For nested models, checking the -2LL difference between the two models is a common way to compare the model fit of the two models, and the -2LL difference follows χ^2 distribution (Azen & Walker, 2011). The $\chi2$ difference test suggested that the current model had significantly better model fit than the null model ($\Delta\chi2\ (4) = 673.3$, p < .001). Combining goodness-of-fit indices, this model is better than the null model.

The intercept γ_{00} is 512.98 ($p < 0.001$), indicating that the average reading score for all students is 512.98 when other factors are eliminated. Moreover, the average reading scores differ significantly across schools ($\tau_{00} = 1581.76$, $p < 0.001$). The results also suggested that HLE, reading self-concept, and reading attitude were significant predictors for the outcome variable ($\gamma_{10} = 15.34$, $p < 0.001$, $\gamma_{20} = 7.22$, $p < 0.001$, $\gamma_{30} = 17.90$, $p < 0.001$, respectively). To be specific, on average, a one unit change in a student's HLE index will result in 15.34 points change on the student's language test score when controlling for the influence of other factors. Similarly, as the reading self-concept index increases by one unit, the student's reading score will increase by 7.22

points when holding other factors constant. Furthermore, a one unit increase in a

student's reading attitude index will results in 17.90 points' increase on the student's

reading test score when holding the effect of other factors constant. However, parental

emotional support was not a significant predictor for the outcome variable (γ_{40} = -0.45, p

< 0.001).

The Random Intercept and Random Slope Model with Student Level Variables (M₂)

M_2 is an extension of M_1 by adding random components to slopes (i.e.,

$u_{1j}, u_{2j}, u_{3j},$ and u_{4j}). The new combined model (M_2) can be expressed as the

following mathematical equations:

$$Y_{ij(Reading\ Score)} = \gamma_{00} + \gamma_{1j}\left(HLE_{ij} - \overline{HLE_j}\right) + u_{1j}\left(HLE_{ij} - \overline{HLE_j}\right) +$$

$$\gamma_{2j}\left(RSC_{ij} - \overline{RSC_j}\right) + u_{2j}\left(RSC_{ij} - \overline{RSC_j}\right) +$$

$$\gamma_{3j}\left(RA_{ij} - \overline{RA_j}\right) + u_{3j}\left(RA_{ij} - \overline{RA_j}\right) +$$

$$\gamma_{4j}\left(EMOSUPS_{ij} - \overline{EMOSUPS_j}\right) +$$

$$u_{4j}\left(EMOSUPS_{ij} - \overline{EMOSUPS_j}\right) + u_{0j} + \varepsilon_{ij} \quad\quad (6)$$

As demonstrated in the Table 3, the parameter estimates are similar to M₁. The

overall average reading score for all students is 512.97 (γ_{00} = 512.97, p < 0.001), and the

average reading scores differ significantly across schools (τ_{00} = 1581.76, p < 0.001). The

HLE, reading self-concept, and reading attitude were significant predictors for the

outcome variable with similar estimates (γ_{10} = 15.29, p < 0.001, γ_{20} = 7.21, p < 0.001,

γ_{30} = 17.21, p < 0.001, respectively). To be specific, on average, with one unit increase in

a student's HLE index will result in 15.29 points increase on the student's language test

score when holding the influence of other factors. Similarly, as the reading self-concept

index increase by one unit, the student's reading score will increase by 7.21 points when holding other factors constant. Furthermore, a student's reading attitude index increase by one unit will results in 17.21 points increase on the student's reading test score when holding the effect of other factors constant. Parental emotional support was not a significant predictor for the outcome variable (γ_{40} = -0.48, $p < 0.001$). Moreover, the influence of student's HLE condition on reading scores varies significantly across schools (τ_{01} = 156.47, p =.001). However, reading self-concept, reading attitude, and parental emotional support did not vary significantly across schools.

Compared to M_1, M_2 has smaller AIC and BIC indices (AIC = 34203.4, BIC = 34235.8). The χ2 difference test also suggested that the current model had a significantly better model fit than the M_1 ($\Delta\chi$2 (4) = 17.3, p < .001). Combining goodness-of-fit indices, the M_2 is better than M_1. Such results indicate that entering the random variance component of the student-level variables in the model explains the data better than the fixed slope model (M_1), although only HLE had a significant effect. The results of M2 suggested that HLE, reading self-concept and, reading attitudes all had a positive influence on students' reading performance, while HLE had different impacts across schools.

The Random Intercept and Random Slope Model with Student and School-level Variables (M3)

Both student-level and school-level variables were added to the null model. The current model allows both slope and intercept to have random components. The combined model can be represented as:

$$Y_{ij(Reading\ Score)} = \gamma_{00} + \gamma_{01}\left(SCHSES_j - \overline{SCHSES}\right) + \gamma_{02}\left(CLSIZE_j - \overline{CLSIZE}\right) +$$

$$\gamma_{03}\left(MISB_j - \overline{MISB}\right) + \gamma_{1j}\left(HLE_{ij} - \overline{HLE_j}\right) +$$

$$u_{1j}\left(HLE_{ij} - \overline{HLE_j}\right) + \gamma_{2j}\left(RSC_{ij} - \overline{RSC_j}\right) +$$

$$u_{2j}\left(RSC_{ij} - \overline{RSC_j}\right) + \gamma_{3j}\left(RA_{ij} - \overline{RA_j}\right) +$$

$$u_{3j}\left(RA_{ij} - \overline{RA_j}\right) + \gamma_{4j}\left(EMOSUPS_{ij} - \overline{EMOSUPS_j}\right) +$$

$$u_{4j}\left(EMOSUPS_{ij} - \overline{EMOSUPS_j}\right) + u_{0j} + \varepsilon_{ij} \qquad (7)$$

As shown in the equation, three additional fixed effects associated with school variables were estimated. The intercept estimate of this model is larger compared to the previous three models. The average reading score for all students is now 556.00 ($\gamma_{00} = 556.00$, $p < 0.001$). Similar to M_1 and M_2, the main effect γ_{10}, γ_{20} and γ_{30} were significant, but γ_{40} was not. That is, as HLE, reading self-concept, and reading attitude each increased by one unit, the predicted student's reading score will increases by 15.29, 7.21, and 17.97 points, respectively. Three additional fixed effects associated with the school-level variables were estimated. School SES composition was found significant at the .001 level, while class size and student misbehavior were significant at the .05 level. Specifically, when controlling the influence of other variables, as schools' students from low SES backgrounds increase by one percentage point, the student's reading score will decrease by 1.03 points ($\gamma_{01} = -1.03$, $p < 0.001$). Analogously, as the student misbehavior in school index increases one unit, the student's reading score will decrease by 2.14 points ($\gamma_{03} = -2.14$, $p < .05$). Moreover, as the class size increases by one unit, the student's reading score will increase by 1.49 points ($\gamma_{02} = 1.49$, $p < .05$) with all other variables held constant, suggesting the larger the class size, the better reading scores.

The results also indicated a significant random effect of the intercept and HLE. The significant intercept indicated that average reading scores differ significantly across schools (τ_{00} = 672.83, $p < 0.001$). Similarly, there were also significant differences in the effects of students' HLE conditions on the reading scores of students across schools (τ_{01} = 156.47, p =.001). The current model has the lowest AIC and BIC indices (AIC = 34119.2, BIC =34160.2). Compared to M_2, the current model has a significantly better model fit ($\Delta\chi^2_{(4)}$ = 90.4, p < 0.001). AIC, BIC, and the likelihood ratio test were all in favor of the current model. Thus, the current model was retained for further interpretation. There was a large reduction in the level two residual when the school-level variables were added to the model, which also indicates the current model is a more comprehensive model for predicting students' reading scores.

In quantitative research, it is crucial to report effect sizes. Effect sizes enable the comparison of outcomes across studies (Kelley & Preacher, 2012). In MLM, R^2 can be defined as the proportion of variance explained or proportion reduction in variance (PRV). The PRV for student-level was.25 [(8298.28 - 6232.40) / 8298.28], indicating that student-level variables combined explained 25% of variance in the overall reading scores. The PRV for school-level was .095 [(1465.16 - 672.83) / 8298.28], suggesting that school-level variables combined explained 9.5% of the variance in the average overall reading scores. The results of M_3 suggested that student level variables (HLE, reading self-concept, and reading attitudes) and a school-level variable (class size) had positive influences on student reading performance, and two school-level variables (student misbehaviors and school SES composition) had negative influences on student reading performance.

CHAPTER V

DISSCUSSION

Since the "Equal Educational Opportunity" report conducted by Coleman and colleagues released in the 1960s, students' family backgrounds have received widespread attention from sociologists, educators, and policymakers as an important factor influencing students' academic success (Coleman et al., 1966). At the same time, extensive emphasis also has been placed on the effects of academic education in overcoming the influence of student and family traits. As previously indicated, the results of many ILSAs revealed that U.S. students are not as internationally competitive in reading as expected, and the NAEP reports also have demonstrated nationwide declines in U.S. students' reading performance (NAEP, 2019). At the high school level, in particular, reading is no longer the focus of school education (Swan, 2003). For a high school student, the lack of appropriate literacy abilities may be particularly complex and problematic. They may have difficulties graduating from high school or pursuing higher education. Consequently, initiatives to enhance reading performance should be encouraged.

The current study explored the influences of the background characteristics of students and schools on high school students' general reading performance using MLM. Taken together, the results demonstrated that both student and school characteristics could jointly influence students' reading achievements. The current study provides evidence to support the findings of previous research related to elementary grades and

extends those findings to high school. If the influence of these contextual factors is ignored, efforts to improve teaching may be futile.

To summarize, the HLE condition, reading self-concept and reading attitude were influential factors in students' reading achievement. At the school level, class size had positive influence on students' overall reading performance, but school SES composition and student misbehavior at school were detrimental to the reading performance. In the following sections, the research question analysis and findings are organized and explained. The implications for literacy education and suggestions for future research are also discussed.

Student Background Characteristics

As mentioned in the results section, students' HLE condition, reading self-concept and reading attitude had a positive impact on students' overall reading achievement. Among all the predictors, reading self-concept (γ_{20} = 7.21, *SE* = 0.54) had the largest positive effect on the outcome variable. The relationship between self-concept and reading attainment has been established among elementary school students (Bouffard et al., 2003; Chapman & Tunmer, 1997; Logan & Medford, 2011; Lynch, 2002; Stahl et al., 1996). The current study supported such a relationship among high school students. Students with more positive reading self-concepts had higher scores on reading tests. However, one's reading self-concept and performance on reading tasks are reciprocally related (Morgan & Fuchs, 2007; Retelsdorf et al., 2014). In other words, if a student frequently struggles with reading, it makes sense that they develop a more negative self-concept in reading. Conversely, their self-perception will likely improve if they are able to perform better in reading activities because they can relate to reading with more

enjoyable experiences (Medford & McGeown, 2012). Retelsdorf et al. (2014) even suggested that previous reading achievement is the primary determinant of one's self-concept as a reader.

Followed by reading self-concept, reading attitude had the second largest impact on reading scores (γ_{30} = 17.97, *SE* = 1.59). It is worth noting that, on average, U.S. students have slightly lower than average attitudes toward reading among the 79 countries that participated in the PISA 2018 study, while they had higher HLE conditions. This finding is consistent with previous studies demonstrating that students' reading attitudes were closely associated with their reading performance (McKenna & Kear, 1990; Retelsdorf et al., 2011). Reading attitude is directly linked to reading involvement and proficiency as well as life-long reading and learning (Schiefele et al., 2012). Although one's reading attitudes may stem from early reading experiences, reading attitudes are relatively stable over time (Cecil Smith, 1990). Students in high school are confronted with greater challenges such as physical changes and social pressure, so investigating students' emotional factors concerning reading can help educators assist them with their reading difficulties (McKenna et al., 2012). Interventions concentrating on reading motivation have led to improvements on reading achievement, but one's reading motivation is related to many factors (Guthrie et al., 2007). Therefore, it is important to take these motivational factors into account when designing reading programs and interventions for high school students to better assist them in reading and academics. However, as Medford and McGeown (2012) mentioned, reading motivation was closely linked to one's psychological traits. As a result, attempts to promote students' motivation to read might be met with resistance.

The findings also highlighted the influence of students' HLE. This variable had the third largest influence among all the predictor variables (γ_{10} = 15.29, *SE* = 2.13). The HLE has primarily been investigated in the context of developmental psychology. Previous studies have shown that disparities in neural development were closely linked to an individual's early HLE, specifically on the systems that service language and executive function as well as other cognitive functions (Hackman et al., 2010; Petrill et al., 2004). As most research related to HLE has been devoted to preschool and early elementary school students (Barnes et al., 2022; Chiu & McBride-Chang, 2006; Niklas & Schneider, 2013), the current finding provided evidence for the effect of HLE on high school students. However, the effect of HLE may be mediated by other factors during the high school years. Lehrl and colleagues' longitudinal study (2020) indicated that the influence of HLE on a person's literacy, language and arithmetic skills in preschool and early elementary school affected their reading comprehension and mathematical skills in secondary school. HLE can have a long-term impact on one's academic performance in later life through its effect on early learning abilities (Sammons et al., 2015). Therefore, the attention to HLE should start early. Components of early HLE include child-parent interaction, parenting beliefs, and family resources. Although some aspects of HLE such as parental education and household income, are difficult to change, parents can still create a better early HLE through their efforts. For example, parents should be more attentive to the HLE they have created and respond positively to the needs of their children (Toth et al., 2020). As a possible solution, take the children to the bookstore or library nearby (Burgess, 2011). It is also possible to find philanthropy programs that offer children's books for free such as Dolly Parton's Imagination Library. Furthermore, the

results indicated that the influence of HLE varies across schools. This may be because students with good HLE are more likely to attend schools with more peers from similar family backgrounds. This can be seen in Table 2, where HLE and school SES composition have the strongest correlation ($r = -.400$, $p < .001$).

Nonetheless, parental emotional support did not have a significant effect on the outcome variable. This finding contradicts the findings of previous research that parental emotional supports were beneficial to students' academic performance (e.g., Wentzel et al., 2016; Zhang et al., 2011). Deslandes and colleagues (1999) suggested that it may be more beneficial to student academic achievement when the focus of parental support is on homework, whereas parental emotional support may be more beneficial to student's wellbeing and psychological states such as self-esteem and distress (Boudreault-Bouchard et al., 2013).

School Background Characteristics

All three school-level variables included in this study were found to be significant predictors of student reading achievement. Among the school-level variables, school SES composition had the largest impact on student reading performance, followed by class size, and student misbehaviors.

School SES composition was found to have a negative influence on student reading performance ($\gamma_{01} = -1.03$), indicating that the higher the proportion of students from low-income families, the lower the reading scores. Legewie and DiPrete (2012) suggested that low SES schools are more likely to have a loafing culture that leads to poor academic performance. Furthermore, while there has always been a considerable gender advantage in academic performance, the advantage for females in schools with

adequate resources and suitable learning environments is not as pronounced (Demanet et al., 2013). Previous research has also shown that school SES composition had a significant influence on academic performance and that influence was independent of the SES background of individual students (Perry & McConney, 2010). Haughbrook et al. (2017) even suggested that school-level SES is a better predictor of students' early reading skills than school quality (indicated by the assigned grades). The school's SES composition affects a students' peer network, and peer networks have a significant impact on high school students' academic performance and post-secondary education (Engberg & Wolniak, 2010; Palardy, 2013). Although school SES composition has been shown to impact academic performance, improving the SES composition of a school could be more challenging than other characteristics. Policies can provide schools with more resources, but it is difficult to provide schools with more students from high SES families. How to further reduce socioeconomic segregation in schools and attract students from high SES backgrounds to join schools with low SES may be a feasible policy direction to support student academic performance.

School SES composition ($r = .343$, $p < .001$) was closely related to student misbehaviors at school, which means that the greater the percentage of students from low SES families, the greater the number of student misbehaviors. Consistent with many prior studies (e.g., Barton et al., 1998; Finn et al., 2008), student misbehaviors in school are unfavorable for student reading achievement. Student misbehavior has been recognized as one of the top priorities of classroom management (Boynton & Boynton, 2006). A large body of research has shown that misbehavior in school can lead to a progressive loss of interest in studying, resulting in lower grades and even dropout (Blum et al., 2000;

Finn et al., 1995). Consequently, student behavior management should be one of the most important school policies to improve student academic performance. At the student's family level, HLE had a significant positive effect on reading performance. At the school level, the SES composition of students was also an essential factor for reading performance. Findings of the present study underlined the importance of educational resources on high school students' reading performance. it is difficult for educators to improve either of these factors. However, educators can pay more attention to students from economically disadvantaged backgrounds and provide timely and targeted intervention to prevent reading failure. It is also feasible for policymakers and school administrators to introduce policies to break the economic segregation of schools.

Moreover, the results showed that the class size can positively predict student reading outcomes ($\gamma_{02} = 1.49$), suggesting that larger classes are more favorable for student reading achievement in high school. This finding contradicts previous research that small class size is a contributing factor to student academic performance. For example, Glass and Smith's (1979) meta-analysis suggested that the relationship between class size and achievement is stronger in secondary grades than the elementary grades, and students in smaller classes learned more when other contagions are similar. However, it is possible that the class size variable used in this study was measured from the school-level and therefore loses some accuracy. The average school size of the sample was significantly correlated with the total school student enrolment of the year ($r = .465$, $p < .001$), which means that the smaller classes may represent a smaller school size. Woessman and West (2006) suggested that only in countries with low teacher salaries can significant class-size impacts be detected. Considering the enormous expenses

incurred in reducing class sizes, it should not be the priority in an education production function, at least not for high schools. In conclusion, as some researchers have noted, attempting to reduce class size to improve student academic performance may not be an effective strategy (Odden, 1990; Slavin, 1989).

Limitations and Recommendations for Future Study

The current study contains several limitations. First, the original data contained missing values at both student and school levels. To ensure the integrity of the nested data structure, individuals with missing data were deleted listwise from the sample. Since the reason for missing data is unknown, the sample's representativeness may be compromised by excluding participants. Some statistical methods may be used by further research to compensate for this deficiency. PISA is mainly used for international comparisons. Future studies may also consider expanding the findings with an international scope.

Additionally, the influence of teachers on students' academic outcomes is one of the most critical aspects of all the factors that relate to student achievement (Sanders et al., 1997). NCLB requires all classrooms to be staffed with highly qualified instructors as a crucial component of improving students' literacy outcomes (U.S. Department of Education [ED], 2002). In addition, after adding all the student and school variables, there are still significant residuals in both levels. Future researchers may consider adding more variables to explain these variances at different levels and include teacher-level variables in their models. A more comprehensive model should involve student, teacher, and school-level variables.

Given the importance of reading skills to educational success, it is necessary to support student reading ability by investigating the factors that contribute to reading success and providing students with the requisite support. This study indicated that high school students' reading ability was influenced by various factors from multiple dimensions. Therefore, in addition to focusing on instruction and learning, improving student reading competence necessitates the collaboration of parents, educators, and policymakers.

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