Key Points

- Student- and school-level effects can be analyzed quantitatively.

- Hierarchical linear modeling analysis can account for the presence of other related variables.

- Student-level variables can be classified into demographics and school behaviours.

- School-level variables can be classified into context and climate.

Educational researchers now have the ability to conduct research that acknowledges the manner in which the data we collect is nested in different levels.

For instance:
- students are nested within classrooms;
- classrooms are nested within schools;
- schools are nested within school boards;

and so on.

These nested structures are important since students' educational outcomes (e.g., achievement) are influenced by their background and previous experiences, and by the classrooms they are in or the schools they attend (e.g., teaching practices, school policies). If we want to fairly explore differences we see in student achievement across schools, it is essential to simultaneously examine these student, classroom, and school factors. Fortunately, there are now techniques such as Hierarchical Linear Modeling (HLM) that make it possible to conduct such analyses. Highlighted below are some of the findings from a recent study completed for the Eastern region of schools in Ontario based on such an analysis.

Researchers separate student-level variables into two categories: demographics and school settings. Demographic variables related to students' background, and research suggests that they explain much of the variation in student achievement. Examples include age, family structure and socioeconomic background. School settings are those individual variables related directly to education, and may include variables such as IEP, attendance, and work habits. Similarly, classroom- and school-level variables are usually separated into two categories: context and climate. Context variables describe the physical background, such as class-size, school location and resources. Climate variables describe characteristics of the environment, such as culture or administrative policy. Examples of these variables include school size, French language programs, and proportion of students from low-income families. With HLM it is possible to determine those student- and school-level factors that are associated with differences in students' achievement.

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The table below lists the results of one of our analyses exploring elementary students' language arts marks.

Table 1. Hierarchical linear model for elementary students' language arts marks.

Student-level variables	Effect (Standard error)
Gender (1 = boys; 2 = girls)	+0.20 (0.02)
Number of parents (1 = two parents; 2 = other)	-0.10 (0.02)
IEP (1 = no IEP; 2 = IEP)	-0.30 (0.03)
French language program (1 = not enrolled; 2 = core; 3 = immersion)	+0.07 (0.03)
Work habits (scale)	+1.83 (0.02)
Student-level variables	Effect (Standard error)
School type (1 = K-6, 2 = K-8)	-0.24 (0.08)
Number of students suspended (per 10 students)	-0.03 (0.01)

From the student-level variables, we can see that, on average boys scored one-fifth of a letter grade lower than girls (3 percentage points). Similarly, students with IEPs obtain lower scores. Finally, students with good work habits (e.g., efficacy, student engagement) performed better. At the school level, K-6 schools tended to have slightly higher levels of student achievement than K-8 schools. Moreover, schools with fewer numbers of students suspended had slightly higher overall scores across students.

While these findings help us to begin to understand those factors that are associated with the student achievement differences we find, they also highlight the need for further research. As an example, the analyses that were completed were unable to include school climate variables associated with different teaching practices and policies.

Student- and school-level effects can uncover factors in teaching and learning upon which our lens should be focused. In turn, schools that adopt carefully-adapted strategies have the potential to improve student achievement.

More important than the curriculum is the question of the methods of teaching and the spirit in which the teaching is given.

- Bertrand Russell

Questions Raised

- What other resources can be provided to students with IEPs so they have an equal opportunity at success?

- What types of learning activities can teachers do to improve students' work habit skills?

- Which school characteristics (that can be readily observed) should be measured to determine their effects on student achievement?

MiSA
Ottawa Region