



WHAT DID YOU HAVE FOR BREAKFAST THIS MORNING?

Breakfast has long been considered the most important meal of the day. For children, a well-balanced and nutritious breakfast is believed to contribute to healthy behaviour/lifestyle, cognitive function, and educational outcomes. Many research studies have demonstrated there is a significant,¹ positive relationship between eating breakfast and academic achievement, and skipping breakfast can, conversely, have detrimental effects on such performance (e.g., Hoyland, Dye, & Lawton, 2009; Adolphus, Lawton, & Dye, 2013; Littlecott, Moore, Moore, Lyons, & Murphy, 2016; Vishnukumar, Sujirtha, & Ramesh, 2017).

Given that nutritional issues can be barriers to student learning, international assessment programs such as PISA, TIMSS, and PIRLS include student wellness as part of their study frameworks and include questions about students' eating habits. The PISA 2015 framework for the analysis of student well-being comprises five dimensions: cognitive, psychological, physical, social, and material well-being. Physical well-being includes questions about healthy eating habits, and 15-year-old students were asked about their eating habits in the Student Questionnaire. For example, the following Yes/No question from the questionnaire relates to breakfast consumption: "On the most recent day you attended school, did you eat breakfast before going to school?" (Borgonovi & Pál, 2016).

In TIMSS 2015 (which assesses students in grades 4 and 8) and PIRLS 2016 (which assesses Grade 4 students), questionnaires were also used to gather information about students' characteristics, attitudes toward learning, motivation, self-concept, and readiness to learn. The readiness to learn topic includes questions about students' eating routine. For instance, the Student Questionnaires ask the following question: "How often do you eat breakfast on school days?" The response options are: Every Day, Most Days, Sometimes, and Never or Almost Never (Mullis & Martin, 2013; 2015).

¹ Throughout this research brief, "significant" refers to statistical significance.

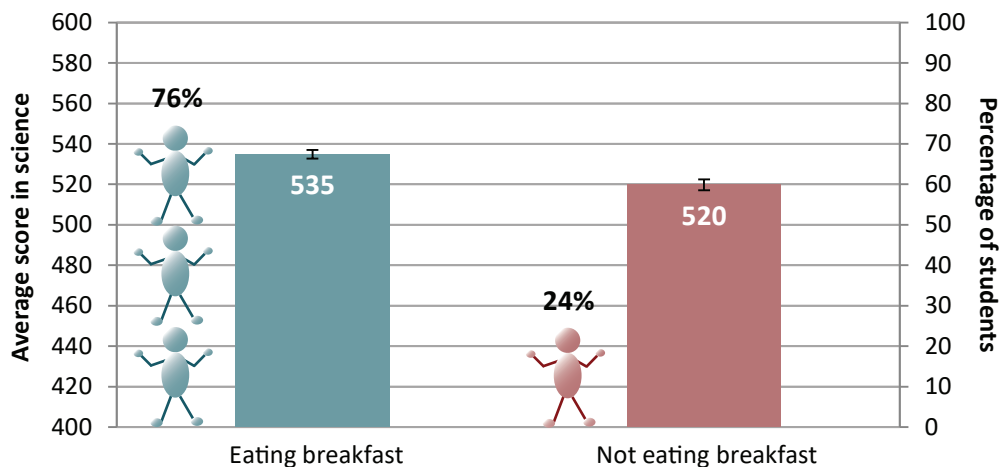
This research brief investigates the relationships between eating breakfast and Canadian and provincial achievement results for PISA 2015, TIMSS 2015, and PIRLS 2016. The study also examines relationships between eating breakfast and achievement results by language of the school system (French and English), gender, immigration status, and socioeconomic status (SES)²/economic, social and cultural status (ESCS).³ The study also analyzes trends across each assessed grade level, i.e., Grade 4, Grade 8, and Grade 10.

Canadian students who eat breakfast have better achievement results

Results from PISA 2015 indicate that for Canadian 15-year-old students overall, for French- and English-language school systems, and for both males and females, those who eat breakfast perform significantly better in science than those who do not eat breakfast.⁴ Almost one in four 15-year-old Canadian students do not eat breakfast, and girls are less likely to eat breakfast than boys. In addition, proportionally more students from English-language school systems don't eat breakfast compared to their peers in French-language school systems. The correlation between breakfast consumption and better science performance is also evident in non-immigrant and second-generation immigrant students; however, there is no significant relationship between science performance and the breakfast habits of first-generation immigrant students.⁵ Although economic, social, and cultural status (ESCS) is strongly related to achievement, there are no significant relationships among relatively low and high ESCS, eating breakfast, and achievement (figures 1 and 2 and tables 1 to 3).⁶

One in four Canadian 15-year-olds did not eat breakfast this morning

FIGURE 1 PISA 2015 – Relationship between eating breakfast and science achievement



² Socioeconomic status (SES) in TIMSS 2015 and PIRLS 2016 is a composite of five resources for learning derived from student and parent reports.

³ The PISA 2015 index of economic, social, and cultural status (ESCS) is derived from family background variables and students reporting the availability of specific household possessions.

⁴ In PISA 2015, science was the major domain and reading and mathematics were minor domains; hence, results for science are reported here.

⁵ In terms of immigration status, PISA 2015 students are classified as non-immigrant: students who have at least one parent who was born in Canada; first-generation immigrant: students who are foreign-born and have foreign-born parents; and second-generation immigrant: students who are born in Canada and have foreign-born parents.

⁶ Data in figures and tables are based on tests of statistical significance of group means. No correction was made for multiple comparisons.

TABLE 1 PISA 2015 – Relationship between eating breakfast, language of the school system, and science achievement

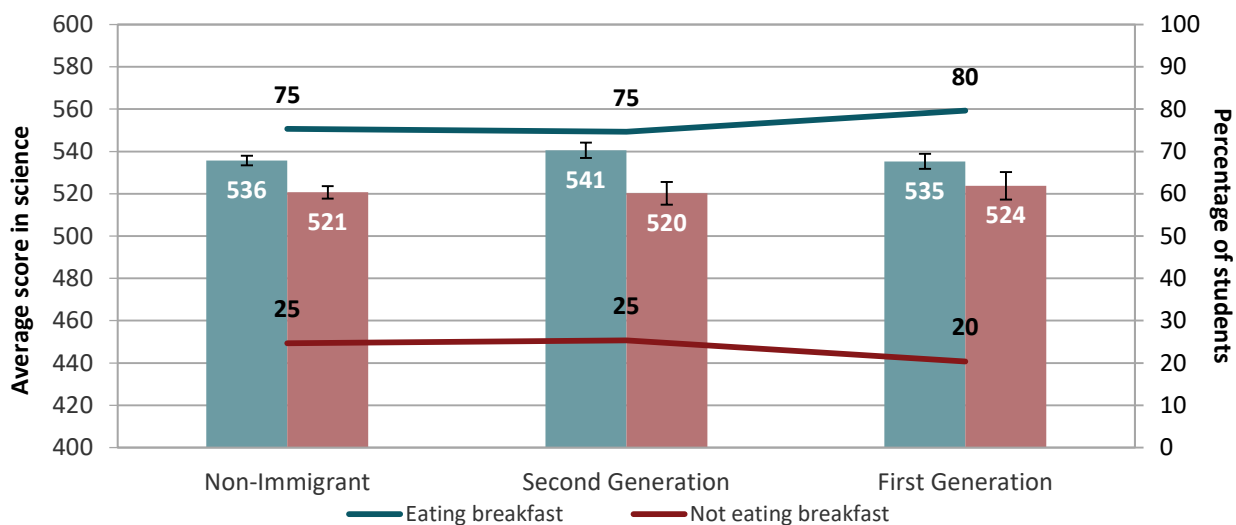
	Students in Anglophone Systems			Students in Francophone Systems		
	% of Students	Average Achievement	Difference	% of Students	Average Achievement	Difference
Eating breakfast	74	533	12*	83	541	26*
Not eating breakfast	26	521		17	515	

* Denotes significant difference

TABLE 2 PISA 2015 – Relationship between eating breakfast, gender, and science achievement

	Female			Male		
	% of Students	Average Achievement	Difference	% of Students	Average Achievement	Difference
Eating breakfast	72	534	14*	80	536	16*
Not eating breakfast	28	520		20	520	

* Denotes significant difference

FIGURE 2 PISA 2015 – Relationships between eating breakfast, science achievement, and immigration status**TABLE 3 PISA 2015 – Relationships between eating breakfast; science achievement; and economic, social, and cultural status (ESCS)**

Socioeconomic status	Eating Breakfast		Not Eating Breakfast		Difference
	% of Students	Average Score	% of Students	Average Score	
Lowest quarter of ESCS	70	493	30	487	6
Highest quarter of ESCS	81	567	19	560	7

Among Nova Scotia, Quebec, Ontario, and Saskatchewan, 15-year-old students who eat breakfast have significantly higher science performance on PISA 2015 than those who do not. It is also interesting to note that Newfoundland and Labrador has the largest proportion of students reporting not eating breakfast (31 percent), while Quebec has the lowest (18 percent). The proportion of students who don't eat breakfast in the remaining provinces ranges from approximately 22 to 28 percent (Table 4).

TABLE 4 PISA 2015 – Relationship between eating breakfast and science achievement by province

Province	Eating Breakfast		Not Eating Breakfast		Difference ¹
	% of Students	Average Score	% of Students	Average Score	
Newfoundland and Labrador	69	512	31	501	11
Prince Edward Island	76	520	24	503	16
Nova Scotia	73	526	27	512	13*
New Brunswick	76	512	24	499	12
Quebec	82	544	18	519	25*
Ontario	73	533	27	519	13*
Manitoba	77	505	23	493	12
Saskatchewan	72	501	28	486	15*
Alberta	74	545	26	538	7
British Columbia	78	544	22	534	10
CANADA	76	535	24	520	15*

¹ Difference in average scores varies due to rounding

* Denotes significant difference

In all instances, students in Grade 4 and Grade 8 math and science (TIMSS 2015) and Grade 4 reading (PIRLS 2016) who eat breakfast every day perform significantly better than those who eat breakfast most days, sometimes, or never or almost never. In most cases, students who reported eating breakfast most days perform better than those who sometimes or never or almost never eat breakfast, and the difference in achievement is about the same in math and science and at the Grade 4 and Grade 8 levels. Interestingly, proportionally more Grade 8 students don't eat breakfast every day or most days (29 percent) compared with Grade 4 students (16 percent). This means the proportion of students not eating breakfast increases between Grade 4 and Grade 8 and remains high in Grade 10 (figures 3 to 5).

FIGURE 3 TIMSS 2015 – Relationship between eating breakfast and achievement (Grade 4 mathematics and science)

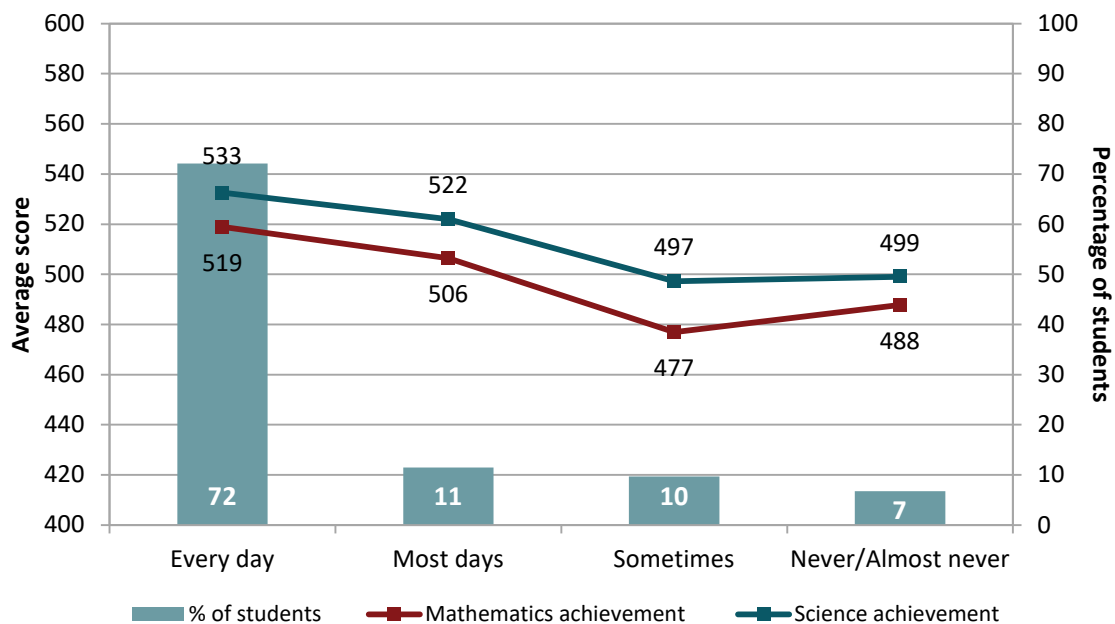


FIGURE 4 TIMSS 2015 – Relationship between eating breakfast and achievement (Grade 8 mathematics and science)

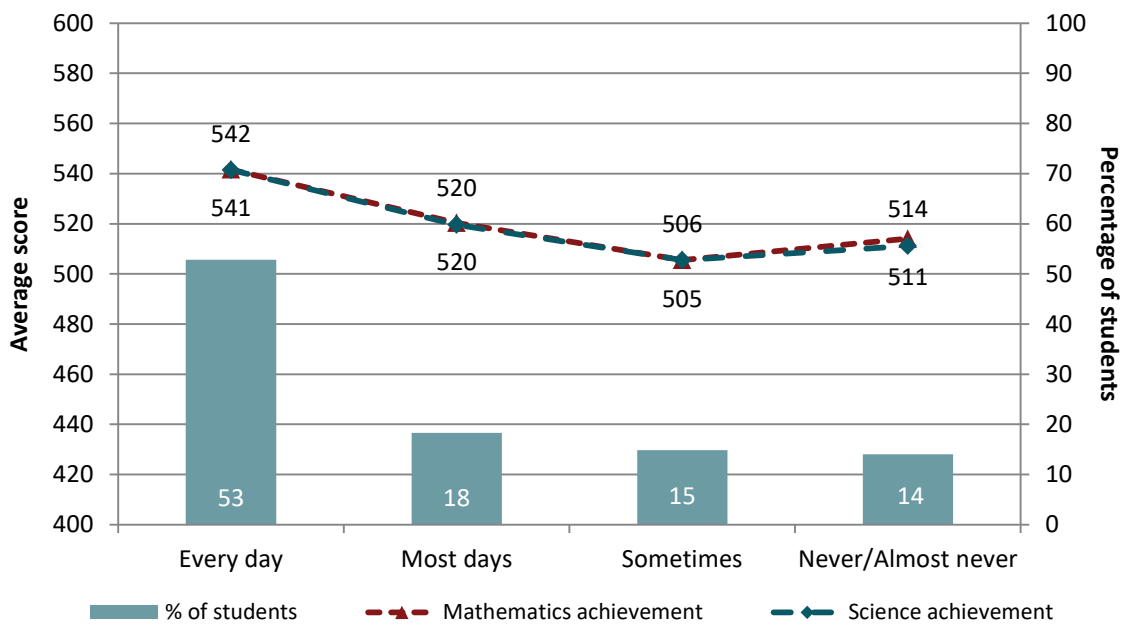
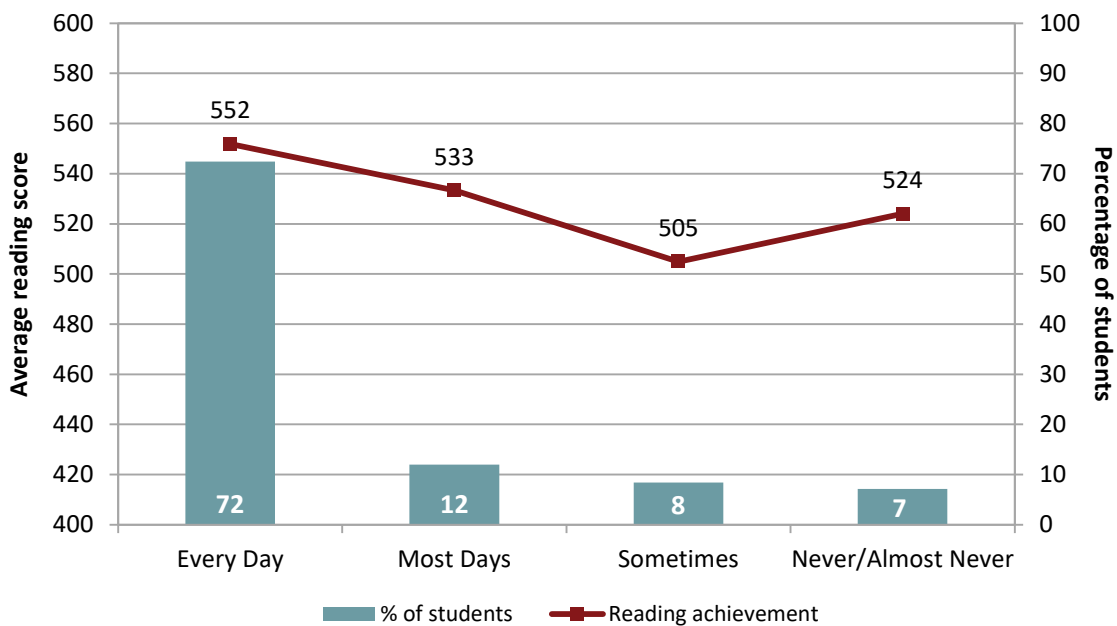


FIGURE 5 PIRLS 2016 – Relationship between eating breakfast and achievement (Grade 4 reading)



The relationship patterns between breakfast consumption and achievement, evidenced in PISA 2015, hold true for both TIMSS 2015 and PIRLS 2016 with respect to language of the school system (English and French), gender, and for students born in Canada. Likewise, for students born outside Canada, math and science achievement is higher for students who report eating breakfast every day versus those who do not. Students in both Grade 4 and Grade 8 who eat breakfast every day attain higher achievement than those who don't, regardless of their SES level.

In analyzing the trends across Grade 4 (TIMSS and PIRLS), Grade 8 (TIMSS), and Grade 10 (PISA), one sees a clear pattern of results: students who report eating breakfast every day attain higher achievement outcomes on the assessments than students who do not.

Conclusion

This analysis of PISA and TIMSS (2015) and PIRLS (2016) data reinforces the view that eating breakfast regularly is important for the healthy development of children and adolescents and is associated with better educational outcomes. It is notable that as many as one-third of Canadian schools offer free breakfast programs at the elementary level, with significant differences across provinces (Brochu, O’Grady, Scerbina, & Tao, 2018). This difference demonstrates that in a number of instances, educators recognize that many children are not coming to school ready to learn. Findings from the PIRLS 2016 Teacher Questionnaire indicate that many teachers report that a lack of student nutrition had an impact on the teacher’s ability to instruct. Ministries and departments of education, school districts, and schools, therefore, should find effective ways to communicate and promote the importance and benefits of children eating breakfast. Such communication should be directed internally within school systems as well as externally to parents/guardians.

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