Trends in students' school experiences and attitudes towards mathematics and science:

TIMSS 2015-2023

Sylvia Denner, Aidan Clerkin, Vasiliki Pitsia and Gráinne McHugh

IEA TIMSS 2023

Foras Taighde ar Oideachas Educational Research Centre

Educational Research Centre 2025

Trends in students' school experiences and attitudes towards mathematics and science:

TIMSS 2015-2023

Sylvia Denner, Aidan Clerkin, Vasiliki Pitsia and Gráinne McHugh

Educational Research Centre 2025

TRENDS IN STUDENTS' SCHOOL EXPERIENCES AND ATTITUDES TOWARDS MATHEMATICS AND SCIENCE:
TIMSS 2015-2023

Sylvia Denner

Aidan Clerkin

Vasiliki Pitsia

Gráinne McHugh

July 2025

Available to download from www.erc.ie

https://doi.org/10.70092/2091315.0625

ISBN: 978-1-911678-36-6 (PDF)

How to cite this report:

Denner, S., Clerkin, A., Pitsia, V., & McHugh, G. (2025). *Trends in students' school experiences and attitudes towards mathematics and science: TIMSS 2015-2023*. Educational Research Centre. https://doi.org/10.70092/2091315.0625

Design: Silverbark Creative

Copyright © 2025 Educational Research Centre, DCU St Patrick's Campus, Dublin 9, D09 AN2F.

Findings and opinions expressed in this document are those of the authors. While every effort has been made to ensure the accuracy of the analyses presented in this report, we cannot guarantee the accuracy or completeness of the material. We make every effort to minimise disruption caused by technical errors. If errors are brought to our attention, we will try to correct them. Neither the authors nor the Educational Research Centre are liable for losses, damages, liability or expense arising from the work in this report. Furthermore, we are not responsible for changes in the findings that may occur should underlying data be updated.

Contents

Acknowledgements

The TIMSS 2023 team would like to thank all staff at the Educational Research Centre for their help with the administration of the study and the publication of this report. Thank you to George Piccio, Rachel Perkins, Brendan O'Neill, Natasha Toole, Emmet Feerick, Eimear Heffernan, Fionnuala Shortt, and Eleni Lagoudaki, who all contributed to earlier phases of the study, as well as to Jude Cosgrove (former CEO), John Regan (current CEO), Peter Kennedy (IT manager), administration staff, including Anne Comey, Damian Downes, Patricia Gaffney, Lynn Jackson, and Cian Ó Raghallaigh, data managers, Adrian O'Flaherty and John Coyle, and the temporary staff members who helped with packing and coding.

Outside of the Educational Research Centre, we would like to thank An Chomhairle um Oideachas Gaeltachta & Gaelscolaíochta (COGG) for facilitating translation services, those who provided laptop rental and technical support to facilitate digital testing, and the post-primary test administrators. Thanks also to the Department of Education for their coordination of a National Quality Control Monitoring programme.

We would also like to acknowledge the contributions of the members of the National Advisory Committees, at both primary and post-primary levels, for their guidance and support through the implementation of TIMSS 2023 in Ireland and the time given to reviewing drafts of this report. The membership of both committees (as of May 2025) is listed here, in alphabetical order.

Primary

Aedín Ní Thuathail (Irish Primary Principals' Network).

Áine Lynch (National Parents Council – Primary).

Cormac Ó Tuairisg (Gaeloideachas).

Eddie Fox (Educate Together).

Mark Bohan (Department of Education).

Máirín Ní Chéileachair (INTO).

Micheál Killilea (Department of Education, Social Inclusion Unit).

Noreen Fiorentini (Department of Education Inspectorate, Chair).

Patrick Sullivan (National Council for Curriculum and Assessment).

Rory Collins (Oide).

Seán Delaney (Marino Institute of Education).

Post-primary

Anne O'Dwyer (Mary Immaculate College).

Elizabeth Smith (Department of Education).

Gerry Hyde (State Examinations Commission).

Kathy O'Sullivan (University of Galway).

Linda Ramsbottom (Department of Education Inspectorate, Chair).

Liz O'Neill (Department of Education).

Mark Bohan (Department of Education).

Niamh O'Meara (University of Limerick).

Oliver McGarr (University of Limerick).

Páraic Treacy (Mary Immaculate College).

Paul Behan (National Council for Curriculum and Assessment).

Rachel Linney (National Council for Curriculum and Assessment).

Ryan Gallagher (University College Cork).

Finally, we extend our sincere gratitude to those who took part in TIMSS 2023. Thanks especially to the school coordinators who facilitated the testing in the schools, and to the school principals, teachers, and parents/guardians who completed questionnaires. Most importantly, thanks to the students who completed the TIMSS assessment and questionnaires. Without the collective effort of all involved, this study and the findings presented would not be possible.

Acronyms and abbreviations

CBA	Classroom-Based Assessment
CSL	Children's School Lives
CI	Confidence Interval
DEIS	Delivering Equality of Opportunity in Schools
ERC	Educational Research Centre
IEA	International Association for the Evaluation of Educational Achievement
LNDL	Literacy, Numeracy and Digital Literacy
PIRLS	Progress in International Reading Literacy Study
PISA	Programme for International Student Assessment
SE	Standard Error
STEM	Science, Technology, Engineering, and Mathematics
TESS	Tusla Education Support Service
TIMSS	Trends in International Mathematics and Science Study

Chapter 1: Introduction

The Trends in International Mathematics and Science Study (TIMSS) is an international study examining educational achievement. Conducted since 1995, it now provides 28 years of trend data to support countries in making informed policy decisions. In addition to measuring trends in students' mathematics and science achievement, TIMSS collects key information about contexts for student learning. In Ireland, data from TIMSS have been used to inform, monitor and evaluate policy-relevant attributes of students' learning that can aid interpretation of differing levels of mathematics and science achievement. The key attributes examined in this report are students' experiences in school and their attitudes towards mathematics and science.

This chapter provides a brief introduction to TIMSS and a summary of the performance of Fourth Class and Second Year students in Ireland in mathematics and science in TIMSS 2023. Following this, an overview of student experiences in school (absence from school, sense of school belonging, and experiences of bullying) and attitudes towards mathematics and science (liking, confidence, and valuing mathematics and science) is provided to set the context for the analyses presented in the subsequent chapters.

What is TIMSS?

TIMSS is an international study that evaluates the mathematics and science knowledge and skills of students in Fourth Grade (Fourth Class in Ireland) and Eighth Grade (Second Year in Ireland)[1] across participating countries. It provides both national and international comparative data to support policy-makers and educators in making informed decisions. The study is directed by the TIMSS and PIRLS International Study Center at Boston College, USA and is managed by the International Association for the Evaluation of Educational Achievement (IEA), a non-profit consortium of research institutes. In Ireland, the Educational Research Centre (ERC) managed participation in TIMSS 2023 on behalf of the Department of Education.

TIMSS is conducted every four years, with the first assessment taking place in 1995. TIMSS 2023 was the eighth cycle, with 65 participating countries (59 at Fourth Grade and 44 at Eighth Grade). Ireland has participated in five cycles of TIMSS: 1995, 2011 (at Fourth Grade only), 2015, 2019, and 2023. In the 2023 cycle, almost all participating countries, including Ireland, administered the test digitally.

TIMSS 2023 in Ireland: Summary of key findings

In Ireland, 4,750 pupils in Fourth Class and 5,090 students in Second Year participated in the test. In general, students in Ireland achieved a reasonably high level in TIMSS 2023, relative to other countries. At both grade levels, students in Ireland achieved mean mathematics and science scores that were significantly above the international averages.

Fourth Class pupils achieved a mean score of 546 in mathematics and 532 in science, with the international averages being 503 and 494, respectively. In Fourth Grade mathematics, seven countries achieved mean scores higher than Ireland's, while four countries achieved similar scores. The mean mathematics score of Fourth Class pupils in Ireland was significantly higher than the scores of 46 countries. In Fourth Grade science, ten

1 In this report, we use *Fourth Grade* and *Eighth Grade* to refer to the two internationally defined grade levels that are assessed by TIMSS in all countries. In Ireland, these grade levels are known as *Fourth Class* and *Second Year*. We use these terms when referring specifically to the results for Ireland.

countries achieved significantly higher mean scores than Ireland and eleven countries had similar mean scores, while 36 countries had significantly lower scores than Ireland.

Second Year students achieved a mean score of 522 in mathematics and 525 in science, with the international averages being 478 for both subjects. Their mathematics performance was significantly lower than that of five countries, similar to four countries, and significantly higher than 34 countries. In science, Second Year students' performance was significantly lower than that of four countries, similar to nine countries, and significantly higher than 30 countries.

The strong focus on trends in TIMSS allows analysis beyond within-cycle comparisons. Performance in TIMSS has remained stable in recent years at both grade levels and for both subjects, with no statistically significant changes in mean scores since 2015.

Overall, boys and girls in Fourth Class achieved similar scores in both mathematics and science in TIMSS 2023, with no significant differences on average. However, significant differences between boys and girls were seen at Second Year for both mathematics and science. In mathematics, Second Year boys' mean score (528) was 14 points higher than girls' (514); in science, boys' mean score (529) was nine points higher than girls' (520). These significant gender differences in TIMSS 2023 mark a change from 2019 and 2015, where no significant gender differences had been observed. For a more detailed discussion of mathematics and science achievement in Ireland and internationally, and for more details on the administration of TIMSS, readers are referred to the initial TIMSS 2023 national report (McHugh et al., 2024).

Student experiences in school

Students' experiences in school play a crucial role in shaping their academic success and personal growth (Eccles & Roeser, 2011). The experiences include everything they encounter and participate in both academically and socially. One area in particular is student engagement. This incorporates behavioural, emotional, cognitive, and academic components (Appleton et al., 2008; Finn, 1989; Fredricks et al., 2004). The emotional component includes affect or sense of belonging. Sense of belonging plays an important role in students' school life as students with a strong sense of school belonging tend to feel safe at school and enjoy school. Korpershoek et al.'s (2020) meta-analytic review of the relationship between students' sense of school belonging and academic performance in secondary school found a small positive correlation. In Ireland, Kavanagh et al. (2015) found that Second Class pupils who liked school had significantly higher mathematics scores compared to those who did not like school. Similarly, in TIMSS 2015, Fourth Class pupils who had a high sense of school belonging scored significantly higher in mathematics and science than those who had little sense of school belonging (Perkins et al., 2020). At post-primary level, the relationship between sense of belonging and achievement has also been reported by OECD (2003), noting that students who feel a strong sense of belonging are more likely to be engaged in school activities, both academically and socially.

Indicators of behavioural engagement include participation in class, involvement in extra-curricular activities, completing homework, and school attendance. In understanding school absenteeism, it is important to note the difference between students who are reluctant to go to school despite parental encouragement and students who are absent without parental knowledge (i.e., truancy) (Department of Education & National Educational Psychological Service, 2024). The interventions and policy implications for either group will differ, with the former benefitting from such actions as counselling and individualised learning support, while truancy may require mentoring or behavioural interventions. In TIMSS 2023, students were asked to describe 'about how often [they are] absent from school' and so it is unclear from these data if any absences are known or unknown to the parent/guardian. While it is often not possible to know the reason for absence, it is important to note that research findings show that there is a strong association between absence and achievement (Hancock et al.,

2018). In Ireland, for both Fourth Class and Second Year, Perkins et al. (2020) found that students' absence from school was negatively, and significantly, associated with student achievement in both mathematics and science. Similarly, Shiel et al. (2001) found that the difference in mean reading and science scores in the Programme for International Student Assessment (PISA) between students in Ireland who were not absent from school and those who were absent for 1-2 days in the two weeks prior to testing was statistically significant. The most recent School Attendance Report for Ireland at the time of writing (Tusla Education Support Service (TESS), 2023) shows that at both primary and post-primary levels, the COVID-19 pandemic severely impacted school attendance in 2021-22, which was the first year since the onset of the pandemic without widespread school closures. More recent data from the USA (Malkus, 2025) highlight the scale of the potential issue by showing that chronic absenteeism increased on a widespread basis during the pandemic, and that the increases have largely persisted into 2024.

Bullying is a pervasive problem in educational settings that can significantly impact students' mental health, academic performance, and overall development. Furlong et al. (2010) suggest that a broad consensus on the definition of bullying is that bullying is a subset of peer victimisation that involves intentionality, repetition, and power imbalance. The *Bí Cineálta* definition of bullying, which sets out clear criteria to help school communities, is that:

> Bullying is targeted behaviour, online or offline that causes harm. The harm caused can be physical, social and/or emotional in nature. Bullying behaviour is repeated over time and involves an imbalance of power in relationships between two people or groups of people in society. (Department of Education, 2024a, p. 17)

Bullying can take different forms. Physical bullying involves hurting a person's body or possessions and includes such behaviours as hitting, punching, or kicking. Name-calling, teasing, or mocking are often referred to as verbal bullying. Relational bullying refers to social exclusion, such as being ignored or spreading rumours about someone (Crick & Grotpeter, 1995; Foody et al., 2017). With the increasing use of digital devices and social media, cyberbullying, a specific type of bullying, has become a key concern for schools and parents. Cyberbullying differs from traditional forms of bullying and can be an invasion of home and personal space. Cyberbullying through both online games and social media has become more prevalent as access to digital devices among children has increased (O'Neill & Dinh, 2015). Meta-analyses by Nakamoto and Schwartz (2010) and Gardella et al. (2017) indicated that bullying, including cyberbullying, negatively affects educational outcomes across almost all subjects. Previous studies have shown a strong negative association between different types of bullying behaviour and student achievement (e.g., Rutkowski & Rutkowski, 2018; Wagemaker & Mirazchiyski, 2023).

The following are a number of key policy initiatives in relation to the topics examined in this report. The *Wellbeing Policy Statement and Framework for Practice* (Department of Education, 2019) sets out the vision that the promotion of wellbeing is at the core of every school. The statement acknowledges the importance of the individual and their immediate relationships in their social context and the wider community. In the school setting, wellbeing risk factors include disengagement, absenteeism, isolation and alienation, violence/aggression, bullying, and relationship difficulties. In Ireland, departmental initiatives that directly address various elements of wellbeing of students include reform of the Junior Cycle (Department of Education and Skills, 2015a) including the introduction of Wellbeing as an area of learning, and the *Primary Curriculum Framework* (Department of Education, 2023a), which recognises that social and emotional development significantly influence success in learning. A number of action plans have been published over the years in relation to bullying, including the *Action Plan on Bullying* in 2013 (Department of Education and Skills, 2013) and more recently the *Cineálta: Action Plan on Bullying* (Department of Education, 2022) and *Bí Cineálta Procedures to Prevent and Address Bullying Behaviour for Primary and Post-Primary Schools* (Department of Education, 2024a). In relation to school attendance and in line with the *Education (Welfare) Act 2000*, all primary schools, including special schools, and post-primary schools must report annually on student non-attendance at an aggregated level (TESS, 2023).

Student attitudes towards mathematics and science

Students who have a strong interest in mathematics and science often find these subjects engaging and are more likely to be intrinsically motivated in these classes. Intrinsic motivation influences behaviour (Deci & Ryan, 1985) and students who are intrinsically motivated are more likely to persist and try novel ideas in order to achieve the goals they have set for themselves (Ryan & Deci, 2000a). There have been several studies over the years that have shown positive correlations between intrinsic motivation and academic achievement (e.g., Adamma et al., 2018; Gottfried, 1985).

In Ireland, existing research has shown a positive association of liking mathematics and science with achievement in these subjects (e.g., Perkins et al., 2020). However, attitudes towards science often appear to be more positive compared to mathematics. For example, at primary level in TIMSS 2011 and TIMSS 2015, Fourth Class pupils reported comparatively more positive attitudes towards science than mathematics (Clerkin & Creaven, 2013; Perkins et al., 2020). When comparing the genders, in TIMSS 2015, Fourth Class boys were more likely than girls to report liking science, while girls were only slightly more likely than boys to indicate they like mathematics. In contrast, Second Year girls were slightly more likely than boys to report liking science, while boys were slightly more likely than girls to indicate they like mathematics (Perkins et al., 2020).

Confidence in mathematics and science means that a student believes in their own ability to understand, learn, and succeed in these subjects. An element of this confidence is self-efficacy which can be considered as a person's belief in their ability to achieve desired outcomes (Bandura, 2001), and so if students do not believe that they can achieve desired outcomes by their actions, they have little motivation to act, or to continue on if they face difficulties (Bandura, 2006). A powerful influence on self-efficacy is past performance, where repeated success on the manageable small parts of a task will boost self-efficacy (Urdan & Schoenfelder, 2006). There is substantial research indicating a positive association between students' confidence in learning mathematics and science and their academic achievement. A meta-analysis of TIMSS data indicated that self-confidence has a moderate association with mathematics achievement (Çiftçi & Yıldız, 2019). A similar association has been observed for students in Ireland (Carroll et al., 2023; Perkins et al., 2020; Pitsia, 2022).

Students who place high value on mathematics and science are often extrinsically motivated to learn these subjects due to future opportunities, such as securing a well-paying career. Ryan and Deci (2000b) would categorise this extrinsic motivation as identified regulation, whereby individuals recognise the value of the behaviour and see it as important for their personal goals. For instance, a student may study mathematics because they understand it is essential for their future career, even if they do not enjoy it. There is substantial research indicating a positive association between students' perceived value in learning mathematics and science and their academic achievement. This relationship is often explored through the lens of the expectancy-value theory, which suggests that students' motivation and performance are influenced by their beliefs about the value of a task and their expectations for success (Eccles, 2009). Results from TIMSS 2015 for Ireland showed that while the majority of Second Year students valued mathematics and science, a larger proportion valued mathematics over science, with only one in 10 students reporting that they do not value mathematics, while 27% of students reported that they do not value science (Perkins et al., 2020).

The development of positive attitudes among students is outlined as a primary aim in the current *STEM Education Policy Statement* (2017-2026) (Department of Education and Skills, 2017a) and its accompanying *STEM Education Implementation Plan to 2026* (Government of Ireland, 2023). The Policy Statement includes as one of its goals that "all learners will have an excellent understanding of Science, Technology, Engineering, and Mathematics (STEM) disciplines, methods and processes, and a positive attitude towards STEM education" (Department of Education and Skills, 2017a, p. 13). The realisation of the STEM plan is carried out in conjunction with the Department of Education's (2024b) recent *Literacy, Numeracy and Digital Literacy Strategy* (LNDL) (2024-2033). A key objective of the LNDL strategy to improve the learner experience is to promote learner engagement

and motivation, with particular attention to gender differences in attitudes, confidence, and achievement in mathematics. Similar aims are also evident in recent curricular developments at primary level, such as in the revised specifications for mathematics (Department of Education, 2023a, 2023b) and the proposed specifications for science, technology, and engineering (National Council for Curriculum and Assessment, 2024).

Structure of this report

The data for this report are based on student responses to a questionnaire that was administered following the TIMSS test session. The remainder of this report is structured as follows: Chapters 2 and 3 focus on the experiences in school of students in Fourth Class and Second Year, respectively. Chapters 4 and 5 describe the attitudes towards mathematics among students in Fourth Class and Second Year, respectively. Chapters 6 and 7 focus on students' attitudes towards science in Fourth Class and Second Year, respectively. Finally, Chapter 8 provides a summary and discussion of the key findings arising from the analysis. While all the chapters focus on trends, Chapters 2 and 3 compare 2019 and 2023 and the other chapters compare 2015, 2019, and 2023. This is because the questions and response options in relation to students' experiences in school in the 2015 cycle differed substantially from those in the subsequent two cycles; therefore, the data are not presented.

Across all the chapters, the findings are presented in relation to student gender, school gender, and school DEIS status. In order to provide some contextual information that may assist readers when interpreting the data presented in the following chapters, Table 1.1 shows the number of schools in TIMSS 2023 and the proportions of students by student gender, school gender, and school DEIS (Delivering Equality of Opportunity in Schools) status category.

Table 1.1: Description of TIMSS 2023 dataset by student gender, school gender, and DEIS status, Fourth Class and Second Year

		Fourth Class *N* (schools) = 153	Second Year *N* (schools) = 153
		% pupils (weighted)	% students (weighted)
Student gender	Boys	49	53
	Girls	51	47
School gender	All boys	9	15
	All girls	7	17
	Mixed	84	68
School DEIS status	DEIS Urban 1	10	–
	DEIS Urban 2	11	–
	DEIS Rural	9	–
	DEIS	–	31
	Non-DEIS	70	69

How to interpret the analyses in this report

The following notes can be used to interpret the results reported in the following chapters.

Achievement scores

Estimates of student achievement in mathematics or science are reported on a scale that is set to an international 'centrepoint' of 500 with a standard deviation of 100.

Measures of uncertainty

Estimates of achievement are prone to uncertainty arising from sampling and measurement error. To quantify this error, when a mean achievement score or percentage is estimated for a group (e.g., for all students in Ireland), this value is accompanied by a standard error (SE). The SE is a gauge of the level of uncertainty around the estimate in question. The smaller the SE, the more confident we can be that the observed value is likely to reflect that of the population. Conversely, larger SEs indicate more uncertainty around the estimate.

A 95% confidence interval (CI) is a range of values such that there is a 95% probability that the true population score lies within this interval. We can create 95% CIs around a mean achievement score by (i) multiplying our estimated SE by 1.96, and (ii) adding this amount to, and subtracting it from, the mean score. Often – although not always – if the CIs around two sets of means overlap, it indicates that the difference between the two means is not statistically significant. Conversely, if two CIs do not overlap, that indicates a statistically significant difference in means.

Statistical significance

A difference between groups is considered statistically significant if we can be confident that it is unlikely to have occurred by chance. In this report, statistical significance tests are reported at the 95% confidence level and measurement and sampling error are accounted for in the statistical comparisons. Where reference is made to a *significant difference* (i.e., *significantly lower* or *significantly higher*) in this report, a test of statistical significance has been conducted.

Readers should note that a statistically significant difference does not necessarily imply that a difference is substantive or meaningful in terms of its implications for policy or practice. To assist in interpreting outcomes related to student achievement, effect sizes associated with the magnitude of differences observed are also provided (see below).

Effect sizes

Effect sizes provide a standardised way to compare the magnitude of differences or relationships between two variables. In this report, Pearson's *r* is used as the effect size to describe the strength of the relationship between two continuous variables (see below), and Hedges' *g* is used to describe the magnitude of differences in mean achievement scores between two or more groups of students. Hedges' *g* is a modified version of another well-known effect size, Cohen's *d*, and is more suitable for use when sample sizes in the groups being compared are very different (as is sometimes the case in this report), while estimates of *g* and *d* are very similar when sample sizes are more closely matched.

Guidelines on labelling effect sizes are available but should be interpreted cautiously and with due recognition of the local context, as it is increasingly recognised that the effect sizes associated with interventions

in education tend to be smaller in practice (Evans & Yuan, 2022; Kraft, 2020) than might be expected based on older guidelines (e.g., Cohen, 1988). As a loose rule of thumb, the USA's What Works Clearinghouse has previously described effect sizes of .25 or higher as "substantively important" (2014, p. 23) and the UK's Education Endowment Foundation describes effects ranging from .19 to .44 as "moderate", from .45 to .69 as "high", and from .70 upwards as "very high" (Coe & Kime, 2013, p. 18). Cohen's (1988) descriptors remain widely used and refer to an effect size of 0.2 for mean differences as small, 0.5 as medium, and 0.8 as large.

Correlation coefficients

A correlation coefficient describes the strength of the linear relationship between two variables. Correlations are reported on a range from 0 to 1, with 0 representing no relationship between two variables and values approaching 1 (or -1) representing a very strong relationship. A positive correlation indicates that as one variable increases, so does the other, while a negative correlation indicates that one variable decreases in magnitude as the other increases. In this report, the following guidelines can be used to interpret the strength of the correlation coefficients: ±0.1 small/weak, ±0.3 medium/moderate, and ±0.5 large/strong (Cohen, 1988).

Chapter 2:
Experiences in school in Fourth Class

The focus of this chapter is on the experiences in school of Fourth Class pupils. The chapter is divided into three sections. The first section presents details of pupils' absences from school, followed by sense of school belonging and experiences of bullying. For each section, relationships with achievement are presented for the 2023 cycle of TIMSS, followed by findings in relation to pupil gender, school gender, and school DEIS status. Data from 2023 are then compared to those from the previous cycle of TIMSS (2019). The questions and the options presented to pupils in relation to their experiences in school in the 2015 cycle differed substantially to 2019 and 2023 and therefore the data are not presented in this chapter or the next.

Absences from school

Fourth Class pupils were asked about the frequency with which they were absent from school, with the following response options: *once a week, once every two weeks, once a month, once every two months,* and *never or almost never*. Table 2.1 presents the percentages of Fourth Class pupils within each of these categories and their mean mathematics and science achievement. Five percent of Fourth Class pupils reported being absent *once a week*, and a further 7% reported being absent *once every two weeks*. Almost half of the pupils reported that they were *never or almost never* absent. Internationally, 13% of pupils reported absences *once a week*, seven percent reported absences *once every two weeks*, while a little more than half of the students (55%) reported being absent *never or almost never* (von Davier, Kennedy, et al., 2024).

Regular school absences were negatively associated with achievement in mathematics and science (Table 2.1). Fourth Class pupils who were absent *once a week* or *once every two weeks* scored, on average, 460 and 529, respectively, in mathematics, which is significantly lower than the mean score of those who were *never or almost never* absent (549). The effect sizes associated with the differences between *never or almost never* and *once a week* (g = 1.11) was large and for *never or almost never* and *once every two weeks* (g = .26) was small to medium. This pattern was also evident when looking at science achievement. Pupils who reported being absent *once a week* or *once every two weeks*, on average, achieved significantly lower science scores (447 and 512, respectively) than those who were *never or almost never* absent (538). The effect sizes associated with the differences were g = 1.16 and g = .33, respectively.

Table 2.1: Fourth Class pupils' absences from school, percentages and mean mathematics and science achievement (2023)

	%	Mathematics	Science
Never or almost never *(R)*	49	549	538
Once every two months	21	**559**	541
Once a month	18	553	537
Once every two weeks	7	**529**	**512**
Once a week	5	**460**	**447**

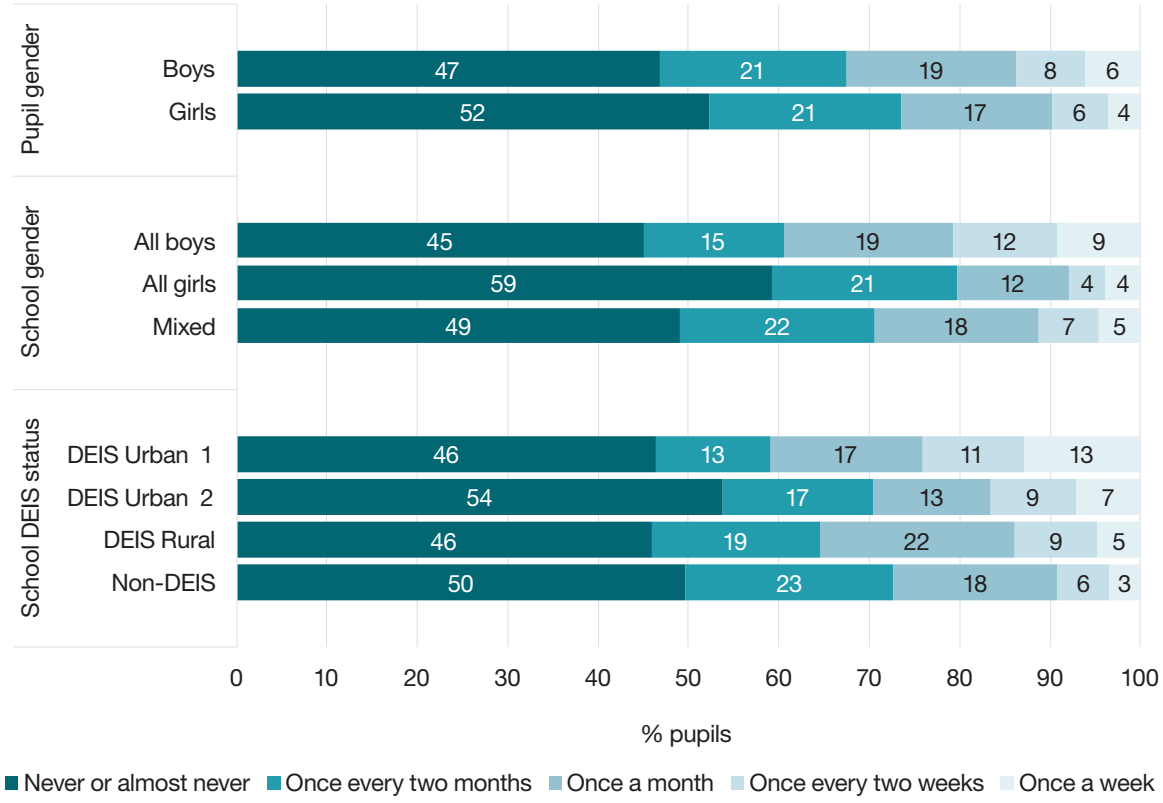
Note. **Bold** indicates statistically significant differences from the reference group *(R)* (p<.05).

Figure 2.1 presents details on the percentages of boys and girls in Fourth Class who reported being absent from school in TIMSS 2023. Boys were slightly more likely than girls to report being absent from school *once a week* (6% and 4%, respectively) and *once every two weeks* (8% and 6%). Additionally, 52% of girls reported that they were *never or almost never* absent, compared to 47% of boys. This suggests a notable decrease in regular

attendance in 2023 compared to 2015, when 71% of girls and 68% of boys indicated that they were *never or almost never* absent (Perkins et al., 2020).

Examining absenteeism in terms of key school characteristics, we find that pupils in boys' schools were slightly more likely than those in girls' and mixed-gender schools to report being absent *once a week* (9%, 4%, and 5%, respectively) and *once every two weeks* (12%, 4%, and 7%). Comparing by school DEIS status, the highest proportion of pupils reporting absence from school *once a week* was noted in DEIS Urban Band 1 schools (13%). The corresponding figure in DEIS Urban Band 2 schools was 7%, with DEIS Rural and non-DEIS schools having slightly lower percentages (5% and 3%, respectively).

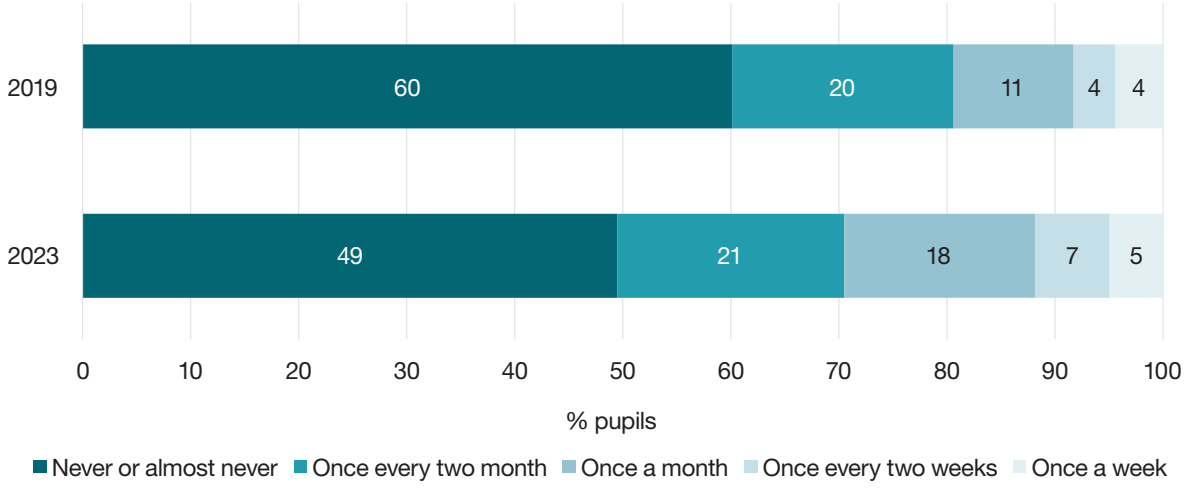
Figure 2.1: Fourth Class pupils' absences from school by pupil gender, school gender, and school DEIS status (2023)



Note. Due to rounding some of the percentages in this figure (or the following Figures/Tables) may not total to 100%.

Figure 2.2 presents the overall absences from school for 2019 and 2023. In TIMSS 2019, Fourth Class pupils were also asked how often they were absent from school, with similar response categories to TIMSS 2023. While similar percentages of pupils reported being absent *once a week* in 2019 and 2023 (4% and 5%, respectively), there has been a large increase in the proportion of pupils who are absent *once a month* (11% and 18%). Accordingly, the proportion of pupils who reported being *never or almost never* absent decreased from 60% in 2019 to 49% in 2023.

Figure 2.2: Fourth Class pupils' absences from school (2019, 2023)



Sense of school belonging

Fourth Class pupils were presented with seven statements relating to how they feel at school:

- *I like being in school;*
- *I feel safe when I am at school;*
- *I feel like I belong at this school;*
- *Teachers at this school care about me;*
- *I am proud to go to this school;*
- *I have friends at this school;*
- *Pupils at this school like me the way I am.*

The response options were *agree a lot, agree a little, disagree a little,* and *disagree a lot*. Six of the statements were combined to form an overall scale of *Students' Sense of School Belonging*.[2,3] In TIMSS 2023, this overall scale was used to create an index that categorised pupils into one of three categories: *high sense of belonging*, *some sense of belonging* or *little sense of belonging* (Figure 2.3). Just over half of pupils in Fourth Class (54%) reported a *high sense of belonging.* At the other end of the scale, 11% of pupils had *little sense of belonging.* On average internationally, 57% were classified as having a *high sense of belonging* and 12% had *little sense of belonging* (von Davier, Kennedy, et al., 2024).

There was a weak positive relationship in Ireland between *sense of school belonging* and mathematics (r = .08) and science (r = .05) achievement in TIMSS 2023 (Appendix Table A2.1). Figure 2.3 shows Fourth Class pupils who had a *high sense of belonging* had a significantly higher mathematics score (552) than those with *little sense of belonging* (524). The associated effect size was g = .34. A similar pattern was observed with

2 The item *'I have friends at this school'* was not included in the scale.

3 The overall scale, *Students' Sense of School Belonging*, was developed at an international level by Boston College. Full details of the construction of the scale, including the items contributing to it, can be found in von Davier, Fishbein, and Kennedy (2024).

science achievement, where pupils with a *high sense of belonging* had a significantly higher science score (535) than those who had *little sense of school belonging* (515), with an effect size *g* = .26 (Appendix Table A2.2).

Figure 2.3: Fourth Class pupils' sense of school belonging, percentages and mean mathematics achievement (2023)

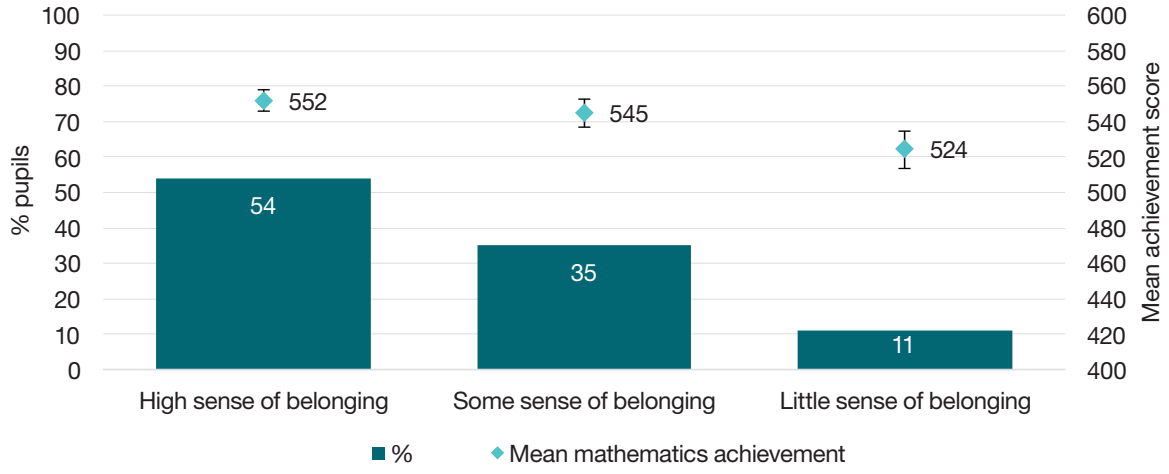


Figure 2.4 presents details on Fourth Class pupils' sense of school belonging categorised by their gender, school gender, and school DEIS status. Girls reported a stronger sense of school belonging compared to boys; 59% of girls and 49% of boys reported a *high sense of belonging*. Accordingly, Fourth Class pupils in girls' schools had the highest sense of belonging (61%) across the school gender categories, with only 6% reporting that they had *little sense of belonging*. Pupils in DEIS Urban Band 2 schools reported the lowest sense of belonging across the school DEIS categories, with 46% reporting *high sense of belonging* and 14% reporting *little sense of belonging*.

Figure 2.4: Fourth Class pupils' sense of school belonging by pupil gender, school gender, and school DEIS status (2023)

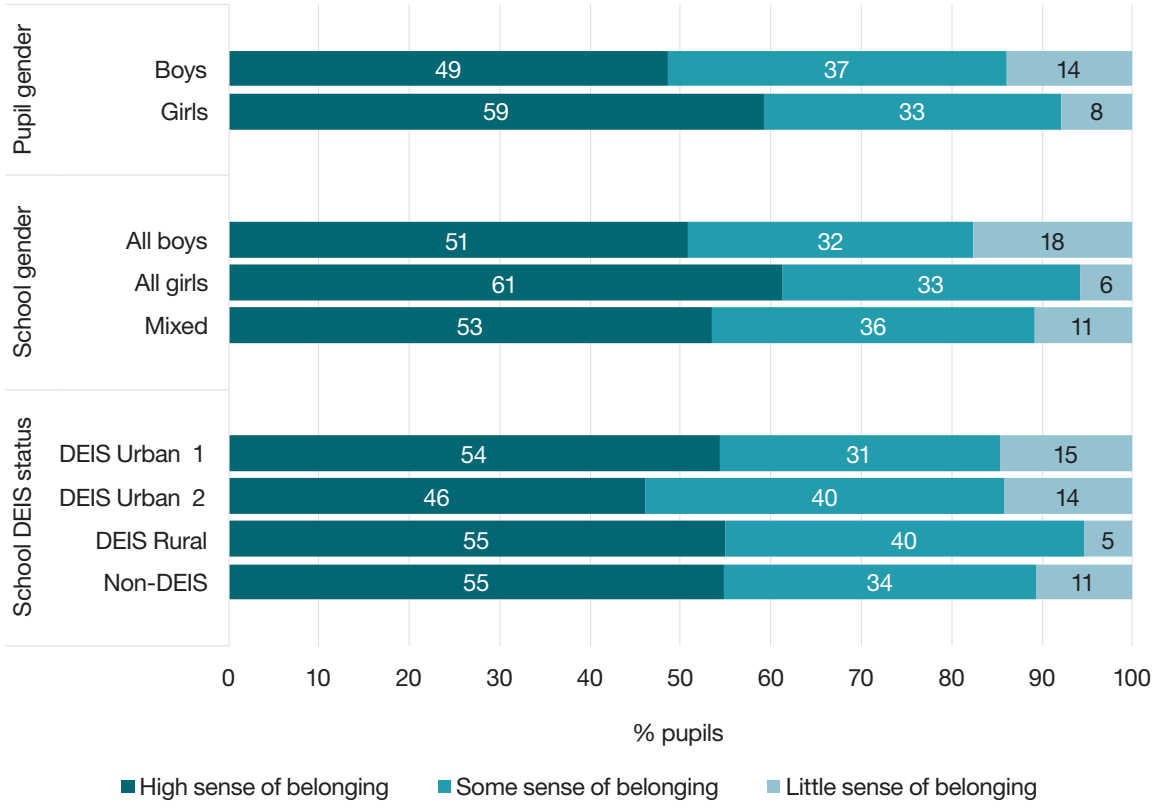
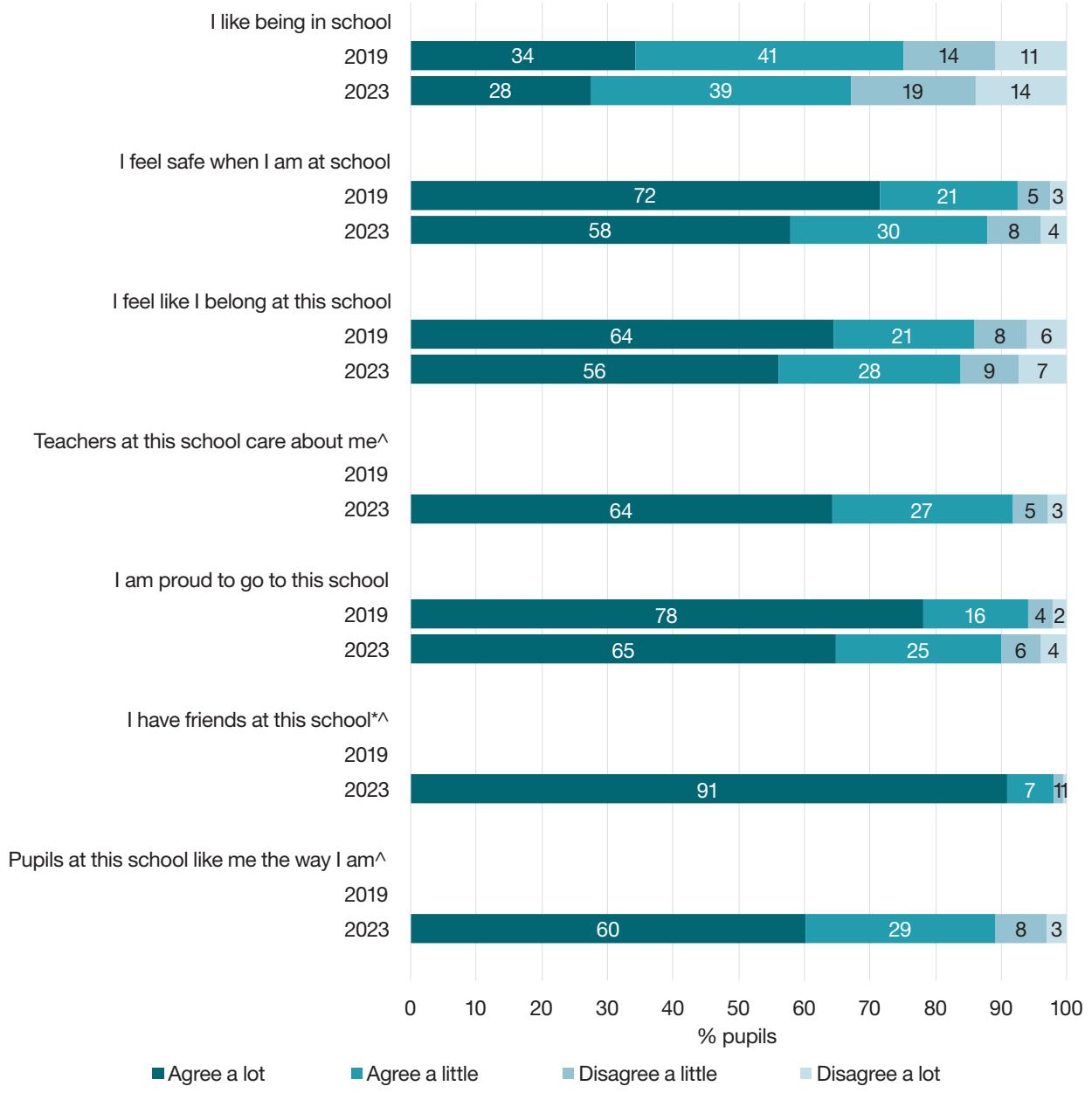


Figure 2.5 presents comparisons between 2019 and 2023 on the responses given by pupils to the seven statements relating to how they feel in their school. Fewer pupils in 2023 (28%) compared to 2019 (34%) *agreed a lot* that they like being in school. Accordingly, the proportion of pupils who *disagreed a lot* or *a little* increased from 25% in 2019 to 33% in 2023, indicating a decline in pupils' enthusiasm for being in school. Similarly, the proportion of pupils who reported feeling safe at school declined between 2019 and 2023 (with 72% and 58%, respectively, *agreeing a lot*). There were also declines between 2019 and 2023 in the proportion of pupils *agreeing a lot* when asked if they felt they belong at school (64% and 56%, respectively) and if they were proud to go to their school (78% and 65%, respectively).

A number of items in relation to friendships and teacher support that were presented to pupils in 2023 were not comparable or not presented to pupils in 2019. Among these, it can be noted that 91% of Fourth Class pupils *agreed a lot* that they have friends at school and 64% *agreed a lot* that they felt their teachers care about them.

Figure 2.5: Fourth Class pupils' endorsement of statements about their feelings to school (2019, 2023)



Note. *Item not included in the scale.
^2023 item not comparable or not presented to pupils in 2019.

Experiences of bullying

Fourth Class pupils were presented with 11 statements relating to various types of bullying experiences and asked how often they experience this behaviour from other pupils:

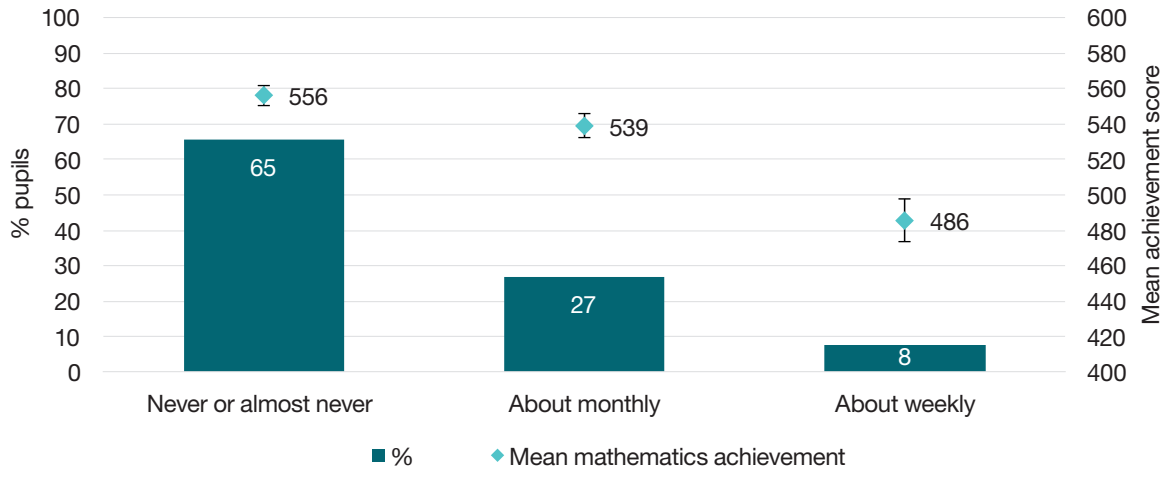
- *Made fun of me or called me names;*
- *Left me out of their games or activities;*
- *Spread lies about me;*

- *Stole something from me;*
- *Damaged something of mine on purpose;*
- *Hit or hurt me (e.g., shoving, hitting, kicking);*
- *Made me do things I didn't want to do;*
- *Sent me nasty or hurtful messages online;*
- *Shared nasty or hurtful things about me online;*
- *Shared embarrassing photos of me online;*
- *Threatened me.*

The response options were *at least once a week*, *once or twice a month*, *a few times a year,* and *never*. These statements were combined to form an overall scale for *Student Bullying*[4] which was grouped into three categories to describe the frequency with which pupils were bullied: *never or almost never, about monthly*, and *about weekly*[5]. Approximately two-thirds of Fourth Class pupils were classified as being bullied *never or almost never* (Figure 2.6). A further 27% were classified as being bullied *about monthly* and 8% as being bullied *about weekly*. Internationally, about half of all Fourth Grade students (53%) were classified as being bullied *never or almost never,* one-third as being bullied *about monthly*, and 15% as being bullied *about weekly* (von Davier, Kennedy, et al., 2024).

There was a weak to moderate negative relationship between students' experiences of bullying and mathematics (r = -.17), and science (r = -.19) achievement in TIMSS 2023 (Appendix Table A2.1). Figure 2.6 shows that frequently experiencing bullying behaviours in school is associated with lower average mathematics achievement. Fourth Class pupils who *never or almost never* experienced bullying had the highest mean mathematics score (556), which is significantly higher than those of pupils who experienced bullying *about monthly* (539) or *about weekly* (486). The effect sizes associated with the differences were g = .22 and g = .90, respectively. A similar pattern was observed with science achievement (Appendix Table A2.3).

Figure 2.6: Fourth Class pupils' experiences of bullying, percentages and mean mathematics achievement (2023)

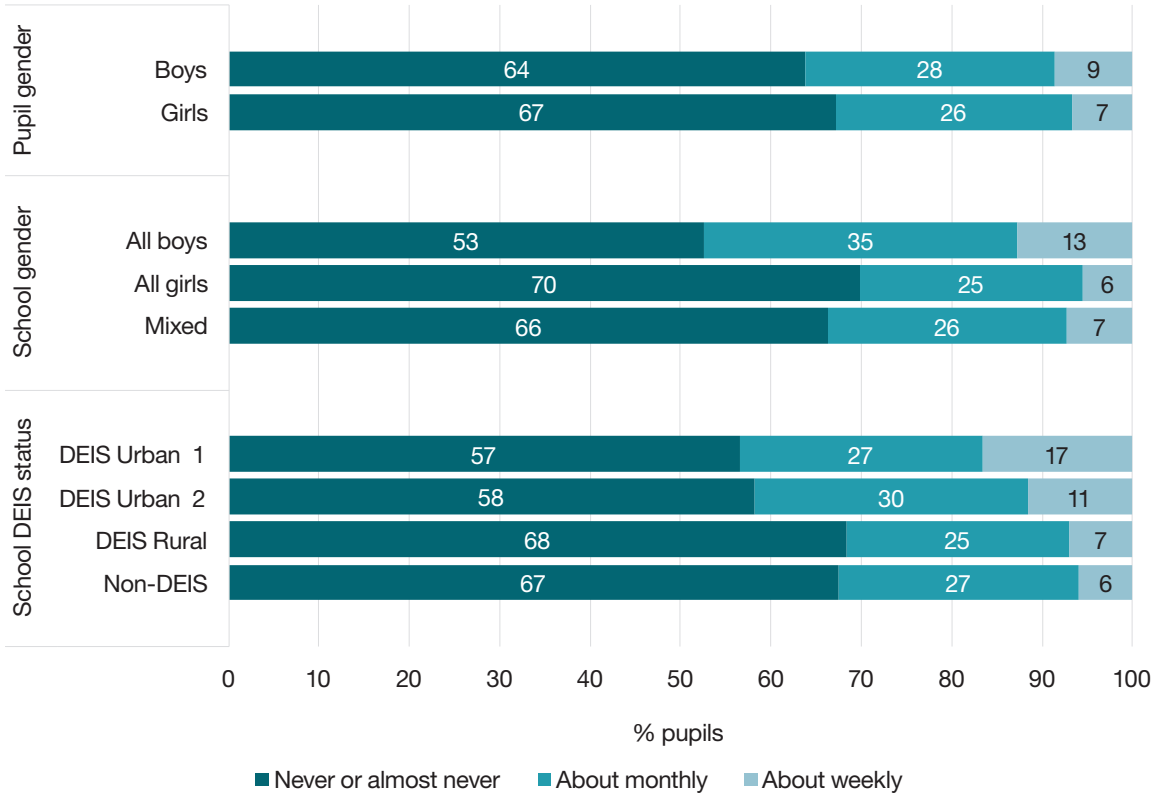


4 The overall scale, *Student Bullying*, was developed at an international level by Boston College. Full details of the construction of the scale, including the items contributing to it, can be found in von Davier, Fishbein, and Kennedy (2024).

5 In TIMSS, Fourth Grade students who are bullied *about weekly* experience six of the 11 bullying behaviours *once or twice a month* and the other five *a few times a year,* on average.

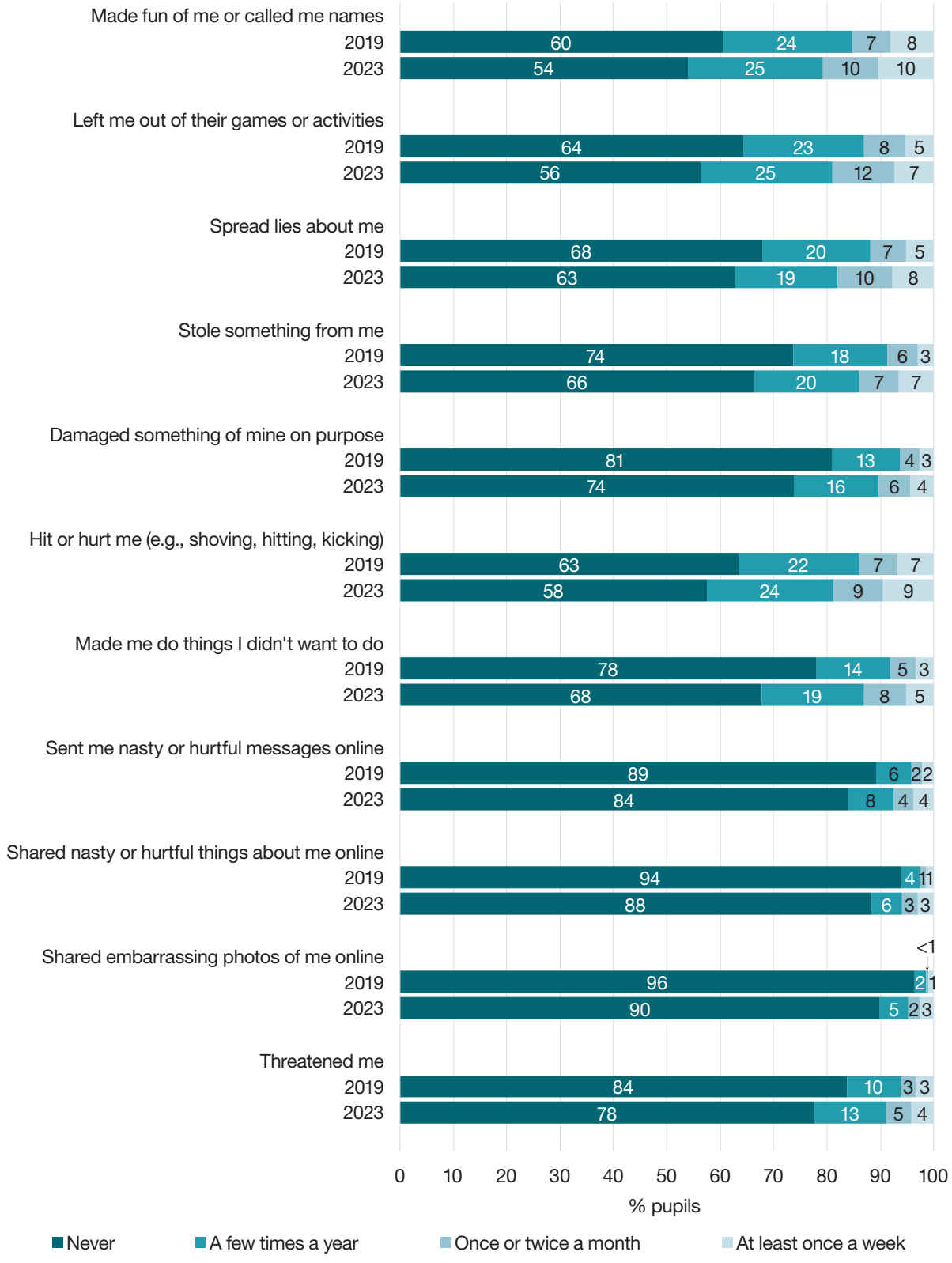
Girls reported experiencing slightly less frequent bullying behaviours than boys, with 67% *never or almost never* experiencing bullying compared to 64% of boys (Figure 2.7). Across the three school gender categories, more frequent bullying *(about weekly)* was reported in boys' schools (13%) compared to girls' schools (6%) and mixed-gender schools (7%). Pupils in DEIS Urban Band 1 schools reported the highest bullying rates, with 17% reporting to have experienced bullying *about weekly*, followed by pupils in DEIS Urban Band 2 schools (11%).

Figure 2.7: Fourth Class pupils' experiences of bullying by pupil gender, school gender, and school DEIS status (2023)



There has been a slight increase in some types of bullying from 2019 to 2023 (Figure 2.8). Slightly more pupils reported being made fun of or called names *at least once a week* (8% in 2019 and 10% in 2023), while exclusion from activities also increased (5% and 7%, respectively). Physical aggression (e.g., hitting, shoving, kicking) also increased slightly, with slightly more pupils in 2023 reporting experiencing such behaviours *at least once a week* (7% in 2019 and 9% in 2023). Receiving nasty messages online was reported *at least once a week* by 4% of Fourth Class pupils in 2023 compared to 2% in 2019, and sharing nasty or hurtful messages online was reported as a weekly occurrence by 3% of pupils in 2023 compared to 1% in 2019. Overall, traditional bullying behaviours (e.g., name-calling, exclusion, physical harm) remain more common than cyberbullying.

Figure 2.8: Fourth Class pupils' reports of various experiences of bullying behaviours (2019, 2023)



Chapter 3:
Experiences in school in Second Year

The focus of this chapter is on the experiences of Second Year students in school. The first section presents details on students' absences, followed by students' sense of school belonging. The third section presents details on students' experiences of bullying.

For each section the relationships of these variables with mathematics and science achievement are presented for the TIMSS 2023 cycle, followed by findings in relation to student gender, school gender, and school DEIS status. Data from TIMSS 2023 are then compared to those from the previous cycle of TIMSS (2019).

Absences from school

Second Year students were asked about the frequency with which they were absent from school: *once a week, once every two weeks, once a month, once every two months,* or *never or almost never*. In TIMSS 2023, 6% of Second Year students reported being absent *once a week*, and a further 15% were absent *once every two weeks* (Figure 3.1). Slightly less than one-third of students reported that they were *never or almost never* absent. Internationally, 12% of pupils reported absences *once a week*, 10% reported absences *once every two weeks*, and 46% of the students reported being absent *never or almost never* (von Davier, Kennedy, et al., 2024).

Figure 3.1 also presents the association of school absence with mathematics achievement. Second Year students who reported being absent *once a week, once every two weeks*, and *once a month* had significantly lower mathematics scores (455, 502, and 524, respectively) than those who reported being *never or almost never* absent (539). The associated effect sizes were medium to large for differences between *never or almost never* and *once a week* (g = 1.07) and *once every two weeks* (g = .47), and small for *once a month* (g = .19). A similar pattern was also found when examining absenteeism and science achievement (Appendix Table A3.1).

Figure 3.1: Second Year students' absences from school, percentages and mean mathematics achievement (2023)

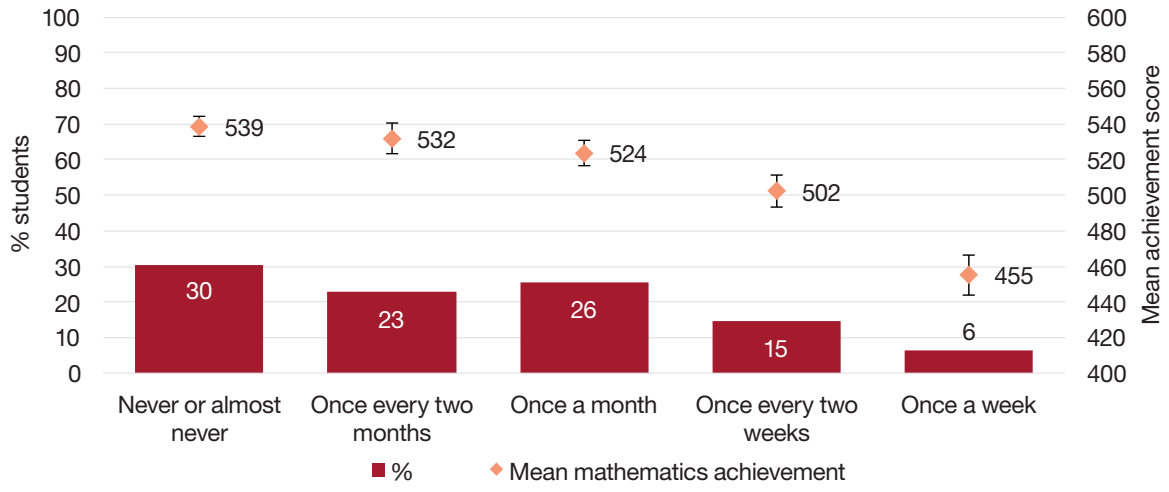
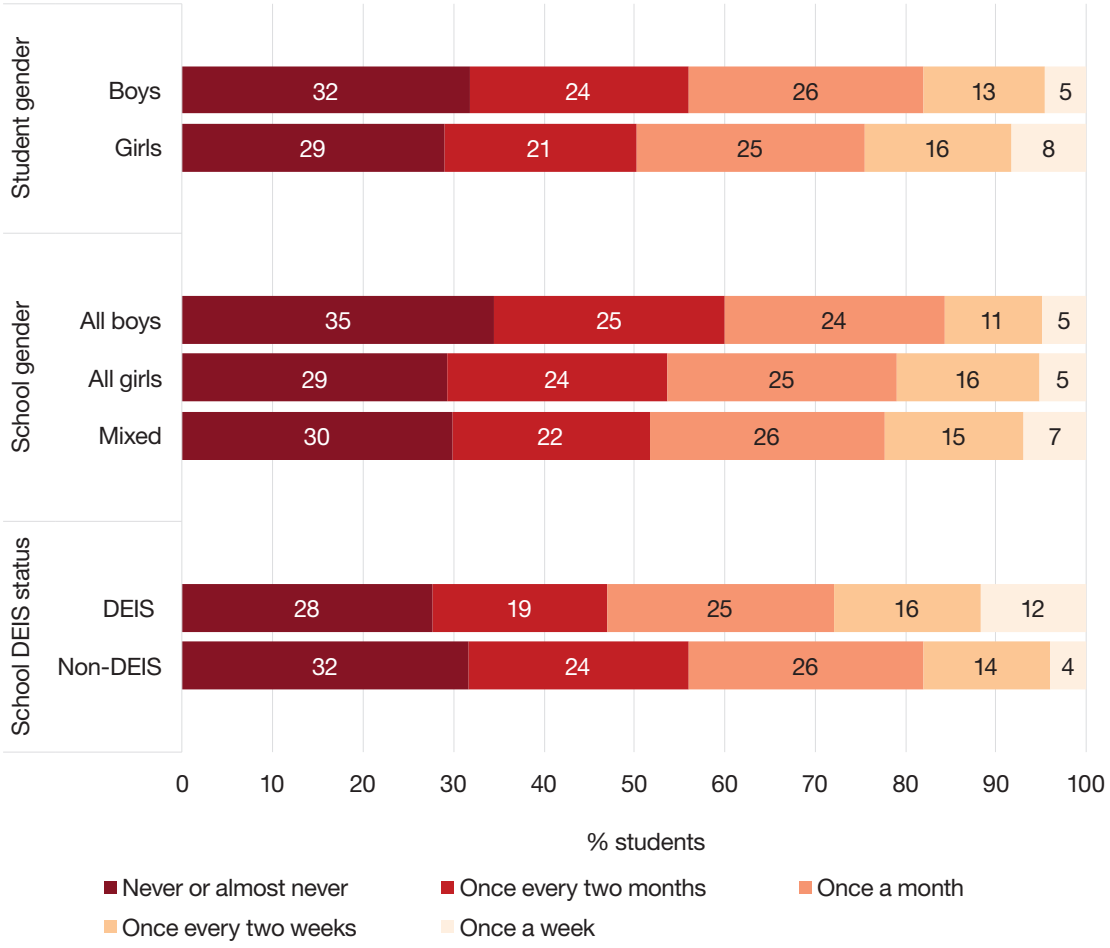


Figure 3.2 presents details on student absences in Second Year categorised by student gender, school gender, and DEIS status. Second Year girls were slightly more likely than boys to report being absent from

school *once a week* (8% and 5%, respectively) and *once every two weeks* (16% and 13%). Accordingly, a slightly lower proportion of girls were *never or almost never* absent (29%) compared to boys (32%). This is a decrease from 2015, when 64% of girls and 62% of boys indicated that they were *never or almost never* absent (Perkins et al., 2020). However, the category *once every two months* was not an option in 2015, which may account for some of the decrease.

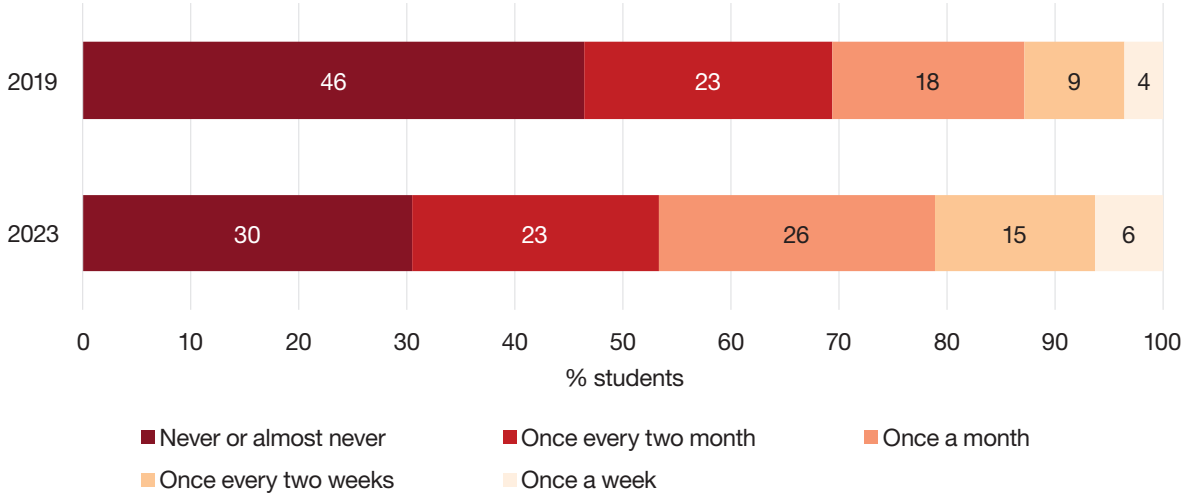
At the school level, absenteeism in girls' schools and mixed-gender schools was more frequent than in boys' schools. A higher proportion of students in girls' schools and mixed-gender schools were absent at least once every two weeks (21% and 22%, respectively) compared to students in boys' schools (16%). Approximately 12% of students in DEIS schools reported being absent from school *once a week* and a further 16% were absent *once every two weeks*. This compares to 4% and 14%, respectively, in non-DEIS schools.

Figure 3.2: Second Year students' absences from school by student gender, school gender, and school DEIS status (2023)



Student absenteeism increased notably between 2019 and 2023 (Figure 3.3). The proportion of students who reported being absent from school *once a week* and *once every two weeks* increased from 13% in 2019 to 21% in 2023. Accordingly, the proportion of Second Year students who were *never or almost never* absent dropped from 46% in 2019 to 30% in 2023.

Figure 3.3: Second Year students' absences from school (2019, 2023)



Sense of school belonging

Second Year students were presented with eight statements relating to how they feel at school:

- *I like being in school;*
- *I feel safe when I am at school;*
- *I feel like I belong at this school;*
- *Teachers at this school care about me;*
- *I am proud to go to this school;*
- *I have friends at this school;*
- *Students in this school respect me;*
- *Students at this school like me the way I am*.

The response options were *agree a lot, agree a little, disagree a little,* and *disagree a lot*. Seven of these statements[6] were combined to form an overall measure of *Students' Sense of School Belonging.*[7] In TIMSS 2023, this scale was used to create three categories: *high sense of belonging*, *some sense of belonging,* and *little sense of belonging*. Figure 3.4 shows that approximately one-fifth of Second Year students were reported to have a *high sense of belonging,* with a further 53% having *some sense of belonging*. On average internationally, 30% were classified as having a *high sense of belonging* and 49% had *some sense of belonging* (von Davier, Kennedy, et al., 2024).

In TIMSS 2023, sense of school belonging had a weak to moderate correlation with mathematics (r = .21) and science (r = .15) achievement (Appendix A2.1). Figure 3.4 shows that Second Year students who had a *high sense of belonging* had a significantly higher mathematics score (541) than those who had *some sense of belonging* (528) and *little sense of belonging* (499). When comparing mathematics achievement by sense

6 The item '*I have friends at this school*' was not included in the scale.

7 The overall scale, *Students' Sense of School Belonging*, was developed at an international level by Boston College. Full details of the construction of the scale, including the items contributing to it, can be found in von Davier, Fishbein, and Kennedy (2024).

of belonging, the associated effect sizes were small (*g* = .18) for *high sense of belonging* and *some sense of belonging,* and medium (*g* = .53) for *high sense of belonging* and *little sense of belonging.* A similar pattern was observed with science achievement (Appendix Table A3.2).

Figure 3.4: Second Year students' sense of school belonging, percentages and mean mathematics achievement (2023)

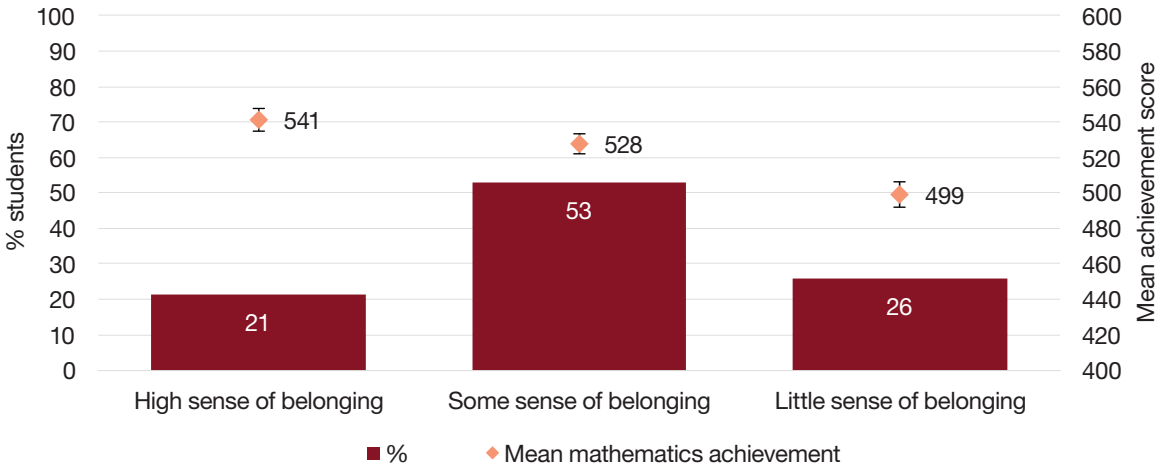


Figure 3.5 presents students' sense of school belonging by student gender, school gender, and school DEIS status. Second Year boys reported a slightly stronger sense of school belonging than girls; for example, 23% of boys compared to 19% of girls reported a *high sense of belonging.* Correspondingly, students in boys' schools had the highest sense of belonging (28%) across the school gender categories, followed by 23% of students in girls' schools and 19% in mixed-gender schools. Approximately 31% of Second Year students in DEIS schools reported *little sense of belonging* compared to 23% of students in non-DEIS schools.

Figure 3.5: Second Year students' sense of school belonging by student gender, school gender, and school DEIS status (2023)

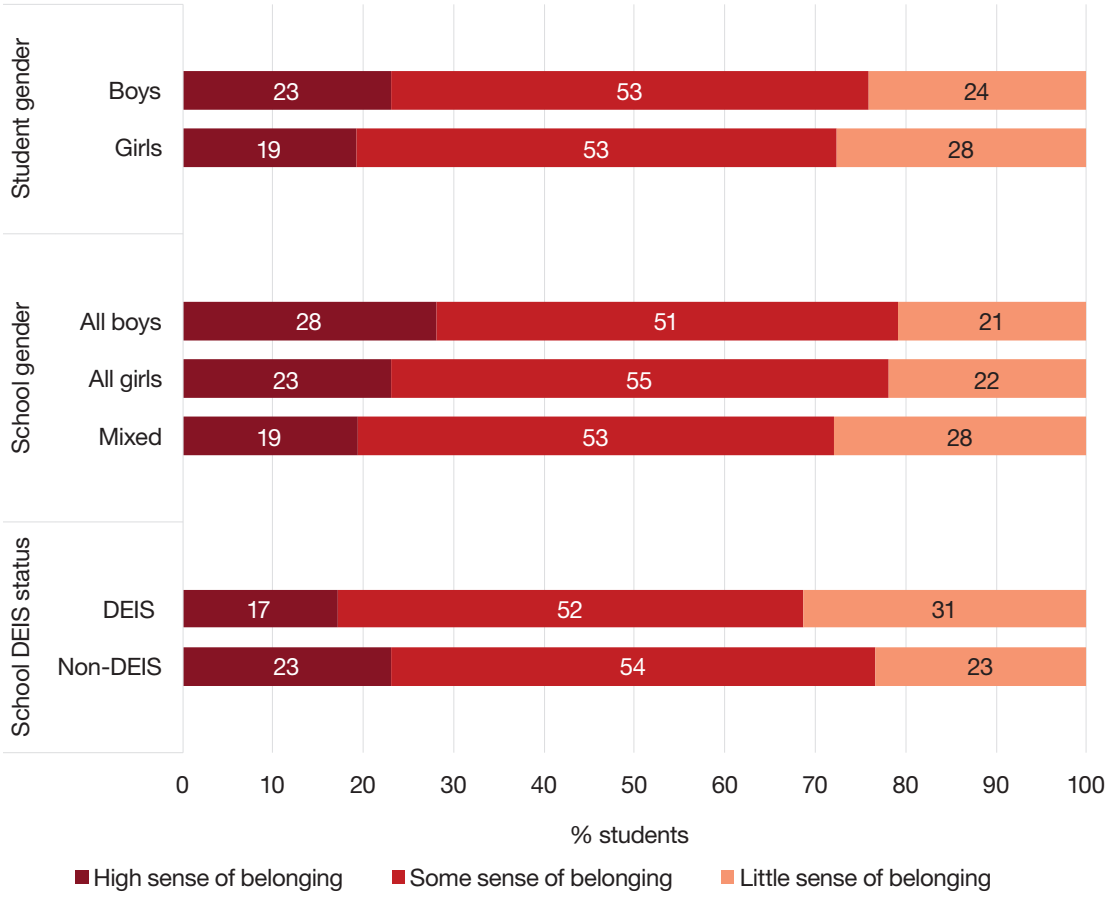
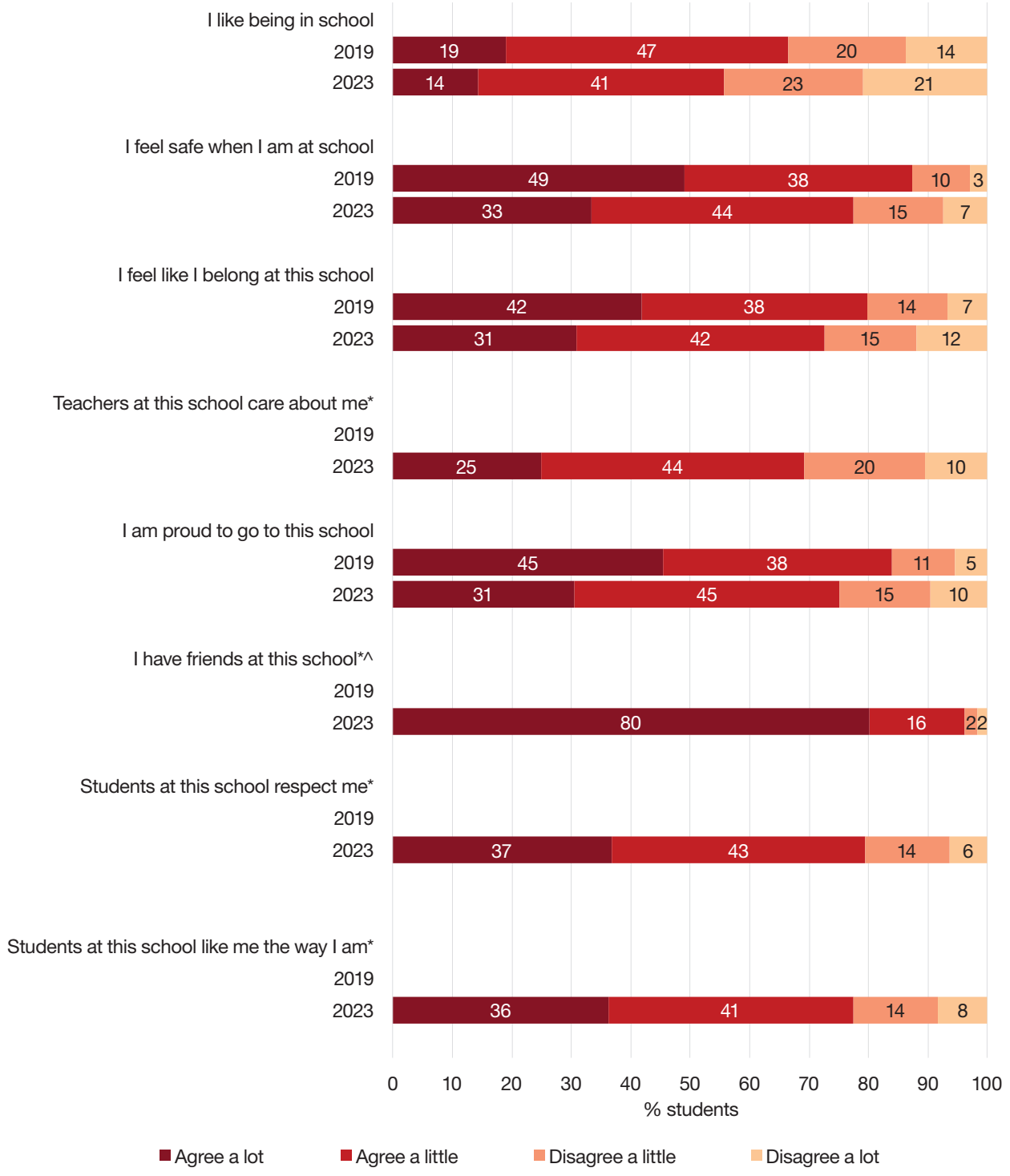


Figure 3.6 presents comparisons between 2019 and 2023 on the responses given by Second Year students to the eight statements relating to their feelings about school. Fewer students in 2023 (14%) than in 2019 (19%) *agreed a lot* that they like being in school. Correspondingly, the proportion of students who *disagreed a lot* or *a little* that they like being in school increased from 34% in 2019 to 44% in 2023. There were also declines between 2019 and 2023 in the proportion of students *agreeing a lot* that they belong at school (from 42% to 31%) and that they were proud to go to their school (from 45% to 31%).

A further four items in relation to friendships and teacher support were presented to students in 2023 which were not comparable or not presented to students in 2019. In 2023, nearly all students agreed (80% *a lot* and 16% *a little*) that they have friends at school. However, smaller proportions agreed that students at the school respect them (37% *a lot* and 43% *a little*) or like them the way they are (36% *a lot* and 41% *a little*).

Figure 3.6: Second Year students' endorsement of statements about their feelings to school (2019, 2023)



Note. *Item not included in the scale.
^2023 item not comparable or not presented to students in 2019.

Experience of bullying

Second Year students were presented with 14 statements relating to various types of bullying experiences and asked how often they experience this behaviour from other students:

- *Said mean things about my physical appearance (e.g., my hair, my size);*
- *Spread lies about me;*
- *Shared my secrets with others;*
- *Refused to talk to me;*
- *Said hurtful things to or about me because of my cultural background (e.g., race, ethnicity, religion);*
- *Stolen something from me;*
- *Made me do things I didn't want to do;*
- *Sent me nasty or hurtful messages online;*
- *Shared nasty or hurtful things about me online;*
- *Shared embarrassing photos of me online;*
- *Threatened me;*
- *Physically hurt me;*
- *Excluded me from their group (e.g., parties, messaging);*
- *Damaged something of mine on purpose.*

The response options were *at least once a week*, *once or twice a month*, *a few times a year,* and *never*. These statements were combined to form an overall scale of *Student Bullying*[8] which was grouped into three categories representing being bullied: *never or almost never, about monthly*, and *about weekly*[9]. Approximately two-thirds of Second Year students were classified as being bullied *never or almost never* (Table 3.1). A further 25% were bullied *about monthly* and 9% of Second Year students were classified as being bullied *about weekly*. Internationally, 60% of all Eighth Grade students were classified as being bullied *never or almost never,* 27% *about monthly*, and 13% as being bullied *about weekly* (von Davier, Kennedy, et al., 2024).

Table 3.1 shows that frequently experiencing bullying behaviours in school is associated with lower average achievement. Second Year students who *never or almost never* experienced bullying had the highest mean mathematics score (528), which is significantly higher than those of students who experienced bullying *about monthly* (519) or *about weekly* (500). The associated effect sizes were g = .10 and g = .35, respectively. The pattern is slightly different in relation to science achievement. Students who *never or almost never* experienced bullying had a non-significantly higher science score (532) compared to students who experienced bullying *about monthly* (526), but significantly higher than those who experienced bullying *about weekly* (496), with an effect size g = .42. There was a weak negative relationship between students' experiences of bullying and their mathematics (r = -.05) and science (r = -.05) achievement (Appendix Table A2.1).

8 The overall scale, *Student Bullying*, was developed at an international level by Boston College. Full details of the construction of the scale, including the items contributing to it, can be found in von Davier, Fishbein, and Kennedy (2024).

9 In TIMSS, Eighth Grade students who are bullied *about weekly* experience seven of the 14 behaviours *once or twice a month* and the other seven *a few times a year*, on average.

Table 3.1: Second Year students' experience of bullying and mean mathematics and science achievement (2023)

	%	Mathematics	Science
Never or almost never *(R)*	67	528	532
About monthly	25	**519**	526
About weekly	9	**500**	**496**

Note. **Bold** indicates statistically significant differences from the reference group *(R)* ($p < .05$).

Figure 3.7 presents Second Year students' experience of bullying by student gender, school gender, and school DEIS status. Two-thirds of girls and a similar proportion of boys reported *never or almost never* experiencing bullying behaviours. At the school level, 4% of students in girls' schools reported experiencing bullying *about weekly*, which was lower than the 8% of students in boys' schools and 10% of students in mixed-gender schools. A slightly higher proportion of students in DEIS schools (11%) experienced bullying *about weekly* compared to students in non-DEIS schools (8%).

Figure 3.7: Second Year students' experience of bullying by student gender, school gender, and school DEIS status (2023)

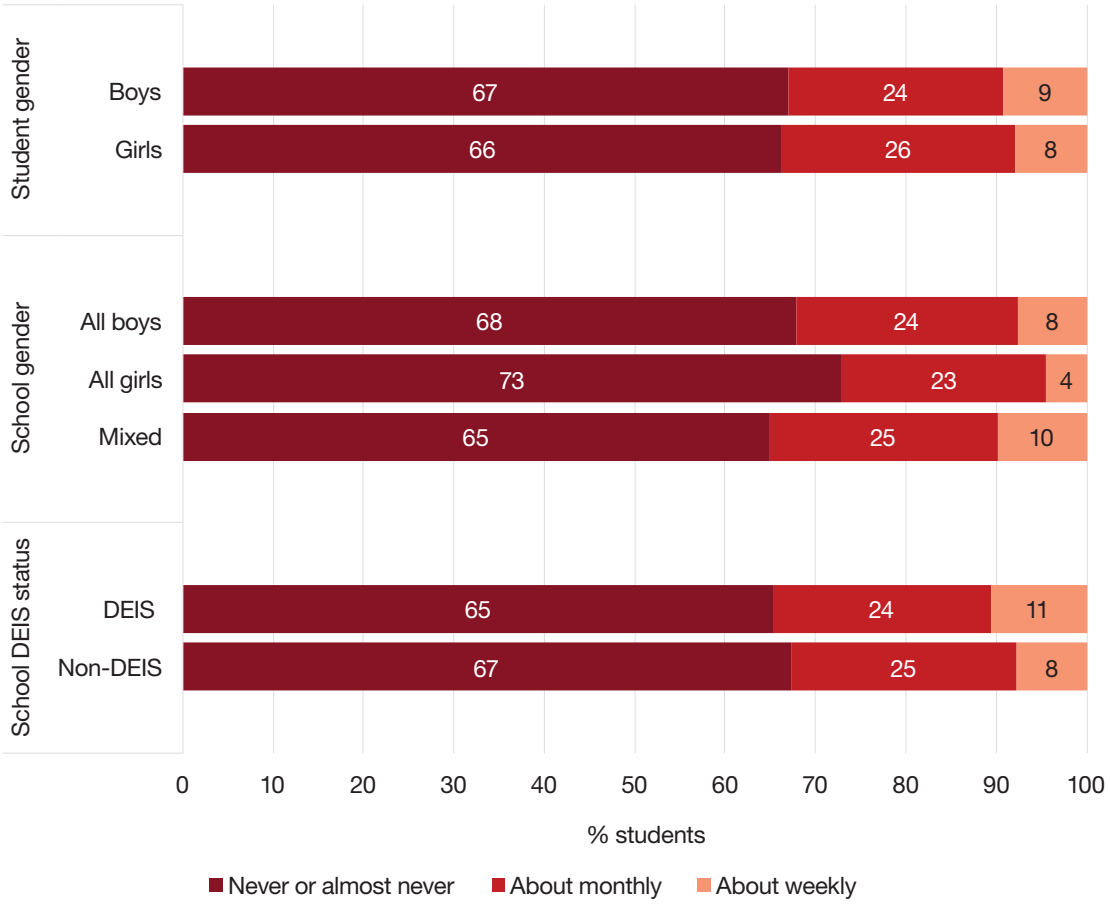
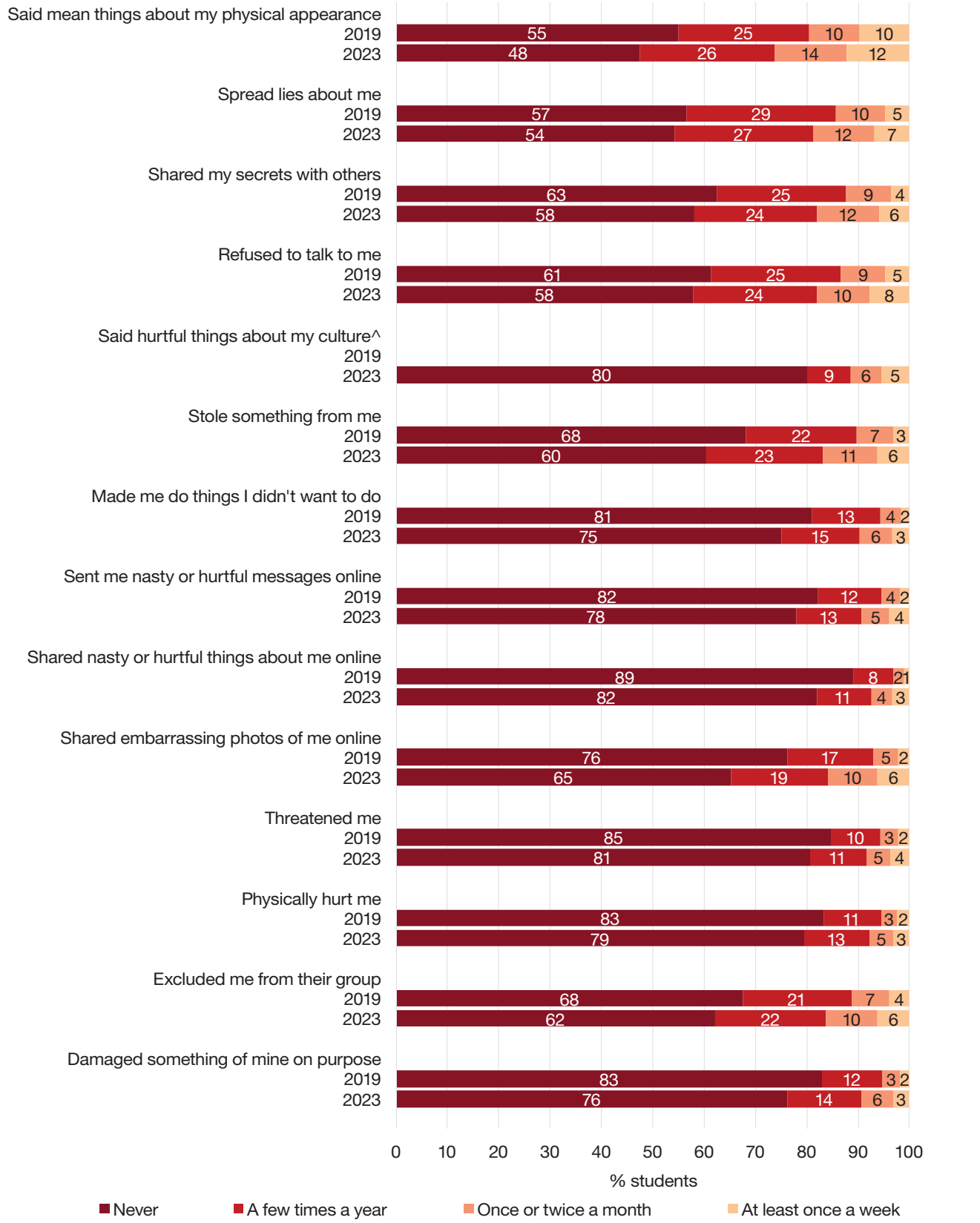


Figure 3.8 compares the bullying behaviours experienced by Second Year students in TIMSS 2019 and TIMSS 2023. The most notable difference between 2019 and 2023 was in relation to online bullying behaviours. There was a four-percentage-point increase in the proportion of students reporting that they experienced having embarrassing photos shared online *at least once a week* and a five-percentage-point increase in students experiencing this behaviour *once or twice a month*. Two other cyberbullying behaviours – sending nasty or hurtful messages online and sharing nasty or hurtful things online – also saw a slight increase (2% for each behaviour) in the proportion of students experiencing these behaviours *at least once a week*.

Two traditional bullying behaviours (which could be committed in combination with online bullying behaviours) – saying mean things about someone's physical appearance such as their hair or size, and sharing someone's secrets with other people – also saw increases between 2019 and 2023 (3% [rounded] and 2% increases *at least once a week*, respectively). Physical aggression remains among the least commonly reported bullying experiences.

Figure 3.8: Second Year students' reports of various experiences of bullying behaviour (2019, 2023)



Note. ^2023 item not comparable or not presented to students in 2019.
Text for some of the items has been shortened; the full text can be found at the beginning of the *Experience of bullying* section.

Chapter 4:
Attitudes towards mathematics in Fourth Class

This chapter focuses on Fourth Class pupils' attitudes towards mathematics, drawing on two contextual scales: *Students Like Learning Mathematics* and *Students Confident in Mathematics*. For each of these scales, the percentages of pupils in each scale category and their mean achievement scores for 2023 are presented. Next, the percentages of pupils in each scale category are presented by pupil gender, school gender, and school DEIS status. For trend analysis, the items from these scales are presented across the past three cycles of TIMSS (2015, 2019, and 2023).

Like learning mathematics

The extent to which Fourth Class pupils liked learning mathematics was captured through nine items in the pupil questionnaire:

- *I enjoy learning maths;*
- *I do not like doing maths;*[10]
- *Maths is boring;*
- *I learn interesting things in maths;*
- *I like maths;*
- *I like any schoolwork that involves numbers;*
- *I like to solve maths problems;*
- *I look forward to maths lessons;*
- *Maths is one of my favourite subjects.*

Pupils were asked how much they agreed with each of these statements. Pupils' responses to seven of these items[11] were used to create the TIMSS *Students Like Learning Mathematics* scale,[12] on the basis of which pupils were classified into three categories: *very much like learning mathematics, somewhat like learning mathematics,* or *do not like learning mathematics.*

Figure 4.1 presents the percentages and mean mathematics achievement of Fourth Class pupils in each category in 2023. More than one-quarter of pupils (28%) indicated that they *very much liked learning mathematics*, 35% *somewhat liked learning mathematics*, and 37% *did not like learning mathematics*. Internationally, 44% of Fourth Grade students reported that they *very much liked learning mathematics*, 32% *somewhat liked learning mathematics*, and 24% *did not like learning mathematics* (von Davier, Kennedy, et al., 2024). Although Fourth Class pupils who *very much liked learning mathematics* had a higher mathematics score than those who *somewhat liked learning mathematics*, that difference was not statistically significant (558 and 550 points, respectively).

10 In 2023, pupils were presented with '*I do not like doing maths'* while in 2019 and 2015, they were presented with '*I wish I did not have to study maths*'.

11 The items '*I do not like doing maths' and 'Maths is boring'* were not included in the scale.

12 The overall scale, *Students like Learning Mathematics,* was developed at an international level by Boston College. Full details of the construction of the scale, including the items contributing to it, can be found in von Davier, Fishbein, and Kennedy (2024).

However, pupils who *very much liked learning mathematics* achieved a statistically significantly higher mean mathematics score than those who *did not like learning mathematics* (534) with an effect size *g* = .29. There is a weak positive correlation (*r* = .13) between the extent to which Fourth Class pupils like learning mathematics and mathematics achievement (Appendix Table A2.1).

Figure 4.1: Fourth Class pupils' liking of learning mathematics, percentages and mean mathematics achievement (2023)

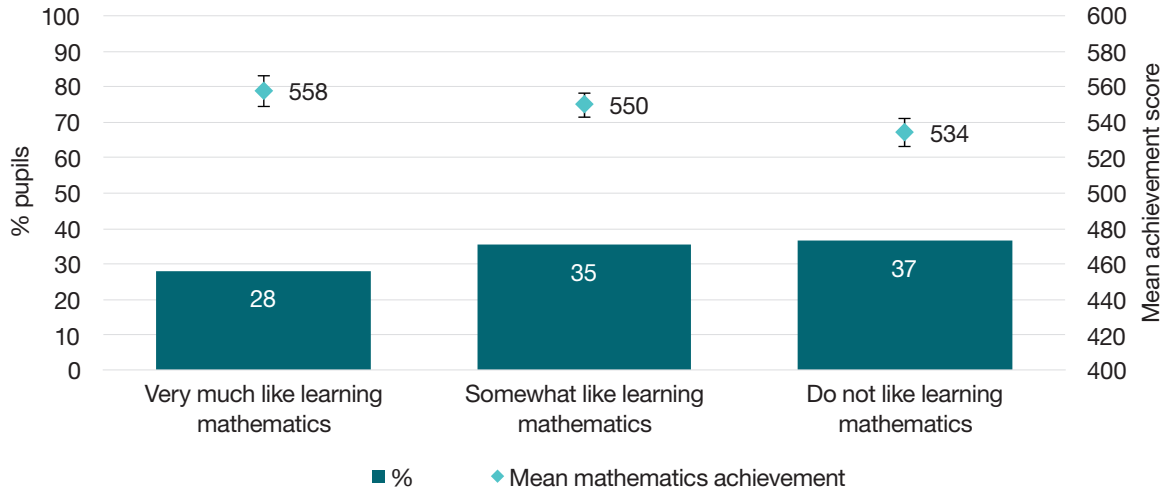


Figure 4.2 presents the percentages of pupils in each category of the TIMSS *Students Like Learning Mathematics* scale in 2023 by pupil gender, school gender, and school DEIS status. Almost one-third of boys (32%) *very much liked learning mathematics* compared to one-quarter of girls (24%). Correspondingly, more girls (41%) than boys (33%) *did not like learning mathematics*. A higher proportion of pupils who *very much liked learning mathematics* was also observed in boys' schools (35%) compared to girls' schools (29%) and mixed-gender schools (27%). However, the proportion of pupils who *did not like learning mathematics* was slightly lower in girls' schools (33%) than in boys' schools (36%) or mixed-gender schools (37%). In terms of school DEIS status, the highest proportion of pupils who *very much liked learning mathematics* was noted in DEIS Urban Band 1 schools (35%), followed by DEIS Urban Band 2 schools (31%). DEIS Rural and non-DEIS schools had somewhat similar proportions of pupils who *very much liked learning mathematics*, which in both cases was lower than those observed in DEIS Urban schools. There was very little difference in the proportions of pupils who *did not like learning mathematics* in each of the four school DEIS categories.

Figure 4.2: Fourth Class pupils' liking of learning mathematics by pupil gender, school gender, and school DEIS status (2023)

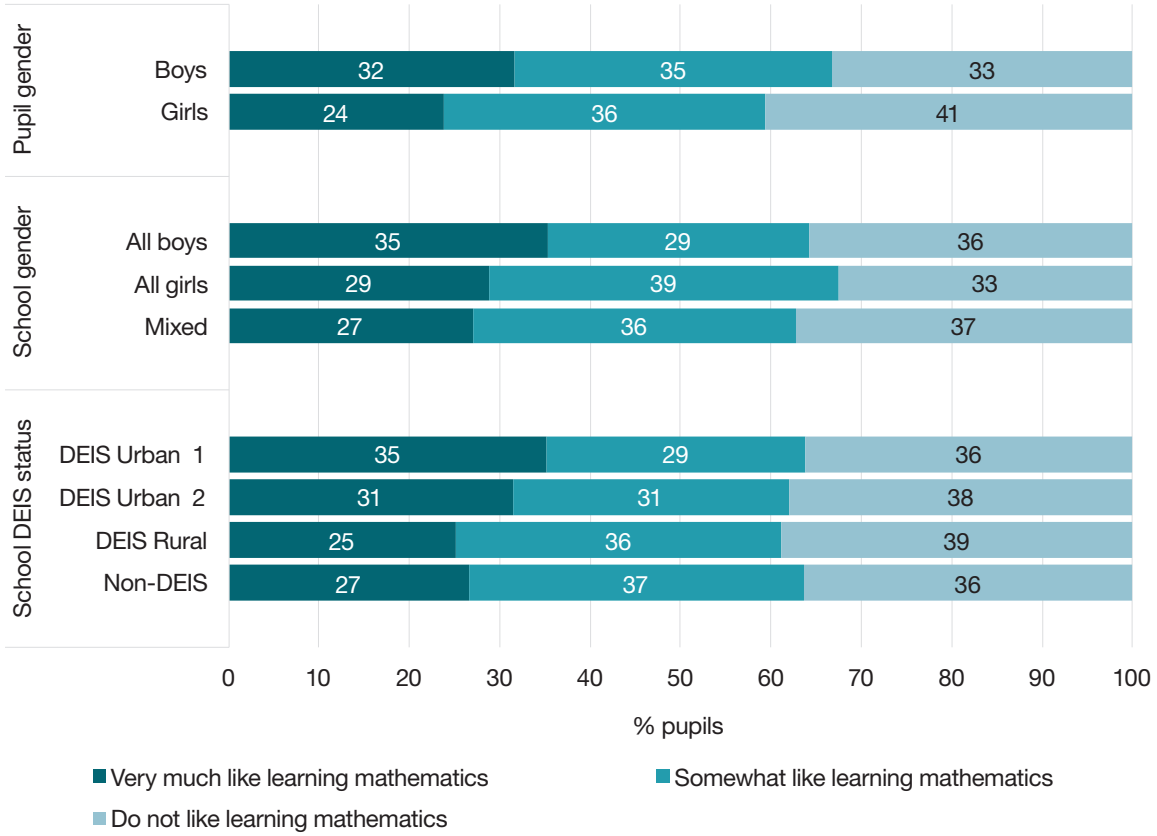
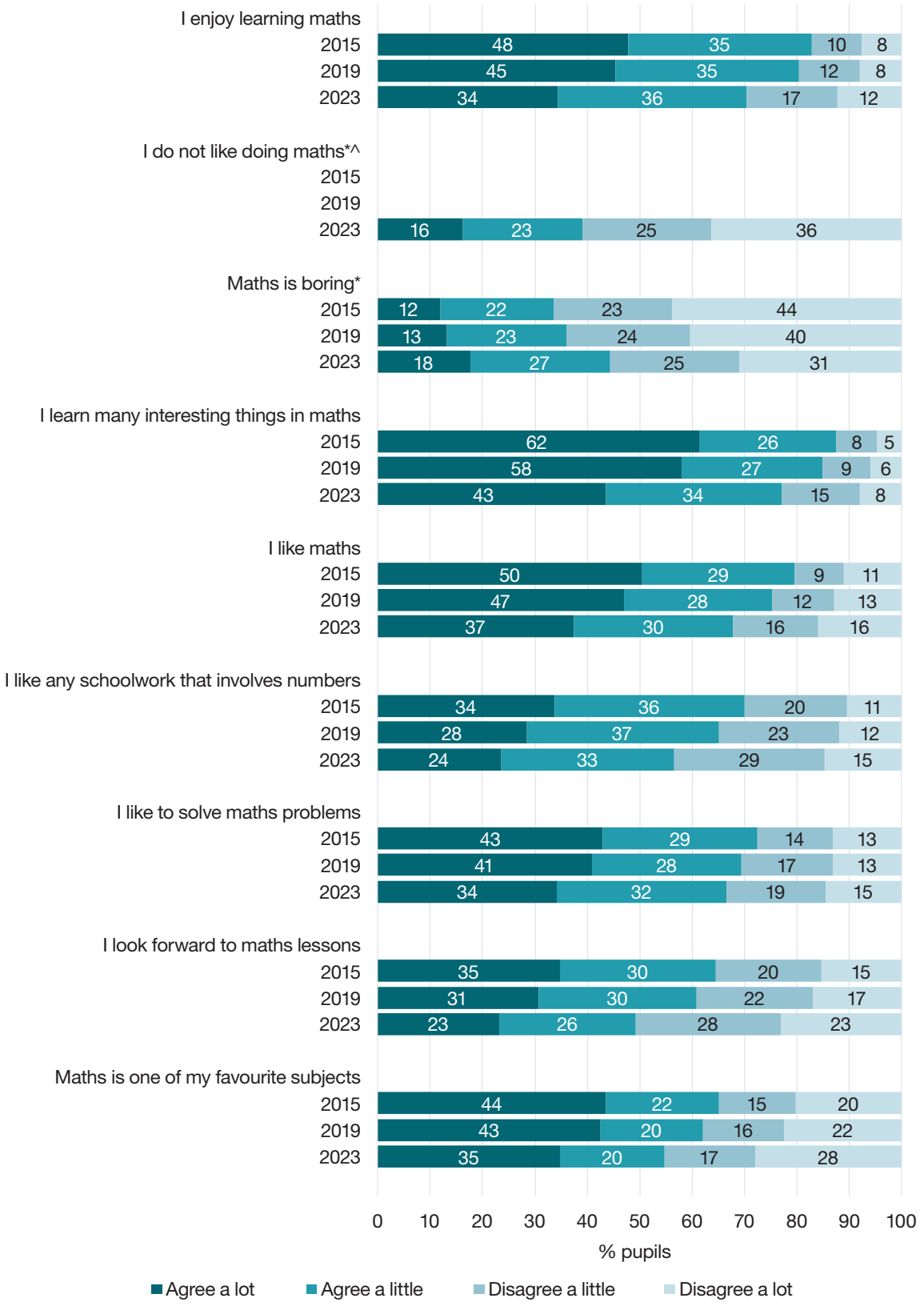


Figure 4.3 presents the percentages of Fourth Class pupils by their level of agreement with statements related to liking learning mathematics in the past three cycles of TIMSS (2015, 2019, and 2023). Across all items, there has been a noticeable and incremental decline in pupils' liking of learning mathematics from 2015 to 2023. This can be observed by a consistent decrease in the percentages of pupils agreeing with positive statements about learning mathematics, and a corresponding increase in the percentages of pupils agreeing with negative statements about learning mathematics.

The largest decrease was observed for the statement 'I learn many interesting things in maths', where the percentage of pupils *agreeing a lot* fell from 62% in 2015 and 58% in 2019 to 43% in 2023. For each of the positive statements, the proportion of pupils *agreeing a lot* has decreased by between nine and 18 percentage points (rounded). The proportion of pupils who *disagreed a lot* that they look forward to maths lessons and that maths is one of their favourite subjects increased by eight percentage points from 2015 to 2023.

Figure 4.3: Fourth Class pupils' endorsement of various statements about liking of learning mathematics (2015, 2019, 2023)



Note. *Item not included in the scale.
^2023 item not comparable or not presented to pupils in 2019 or 2015.

Confidence in mathematics

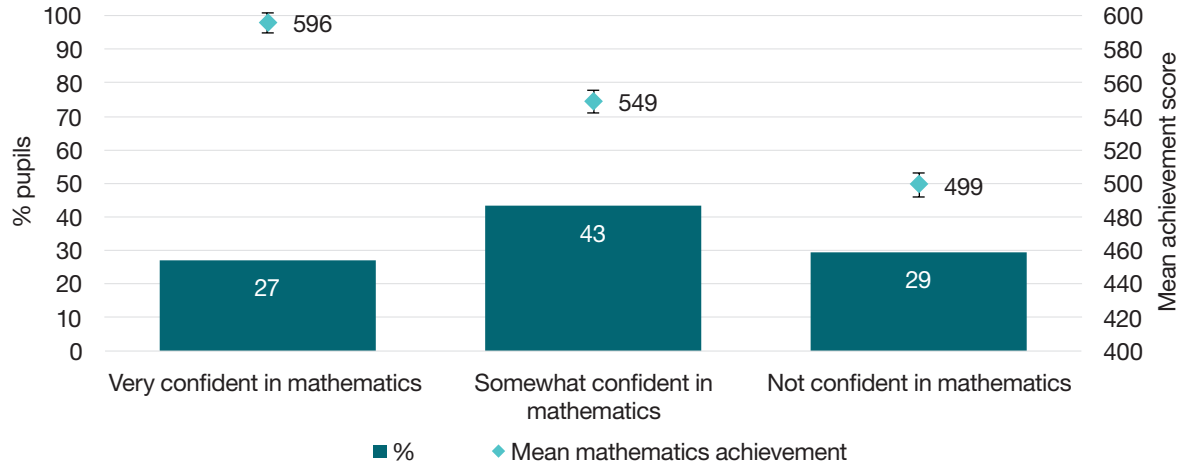
The extent to which Fourth Class pupils felt confident in mathematics was captured through seven items in the pupil questionnaire:

- *I usually do well in maths;*
- *Maths is harder for me than for many of my classmates;*
- *I am just not good at maths;*
- *Maths is easy for me;*[13]
- *I am good at working out difficult maths problems;*
- *Maths is harder for me than any other subject;*
- *Maths makes me confused.*

Pupils were asked how much they agreed or disagreed with each of these statements. Pupils' responses to these seven items were used to create the TIMSS *Students Confident in Mathematics* scale,[14] on the basis of which pupils were classified into three categories: *very confident in mathematics, somewhat confident in mathematics,* or *not confident in mathematics.*

Figure 4.4 presents the percentages and mean achievement of Fourth Class pupils in each category in 2023. More than one-quarter of pupils (27%) indicated that they felt *very confident in mathematics*, 43% felt *somewhat confident in mathematics*, and 29% were *not confident in mathematics*. The corresponding internationally averages were 27%, 42%, and 31%, respectively (von Davier, Kennedy, et al., 2024). Pupils who felt *very confident in mathematics* achieved a significantly higher mean score in mathematics (596) compared to those who felt *somewhat confident* in mathematics (549) and *not confident in mathematics* (499). The associated effect sizes were large (g = .66 and g = 1.36, respectively). There is a moderate to strong positive correlation (r = .46) between the extent to which Fourth Class pupils are confident in mathematics and mathematics achievement (Appendix Table A2.1).

Figure 4.4: Fourth Class pupils feeling confident in mathematics, percentages and mean mathematics achievement (2023)



13 In 2023, pupils were presented with *'Maths is easy for me'* while in 2019 and 2015, they were presented with '*Maths makes me nervous*'.

14 The overall scale, *Students Confident in Mathematics,* was developed at an international level by Boston College. Full details of the construction of the scale, including the items contributing to it, can be found in von Davier, Fishbein, and Kennedy (2024).

Figure 4.5 presents the percentages of pupils in each category of the TIMSS *Students Confident in Mathematics* scale in 2023 by pupil gender, school gender, and school DEIS status. A higher proportion of boys (32%) than girls (22%) felt *very confident in mathematics* and more girls (34%) than boys (25%) were *not confident in mathematics*. There is very little difference in the proportions of pupils in boys', girls', and mixed-gender schools in each of the confidence categories. Higher proportions of pupils in DEIS Urban Band 1 schools (35%) and DEIS Urban Band 2 schools (39%) were *not confident in mathematics*, compared to pupils in non-DEIS schools (27%). The proportions in each of the categories for DEIS Rural schools were relatively similar to those reported for non-DEIS schools.

Figure 4.5: Fourth Class pupils feeling confident in mathematics by pupil gender, school gender, and school DEIS status (2023)

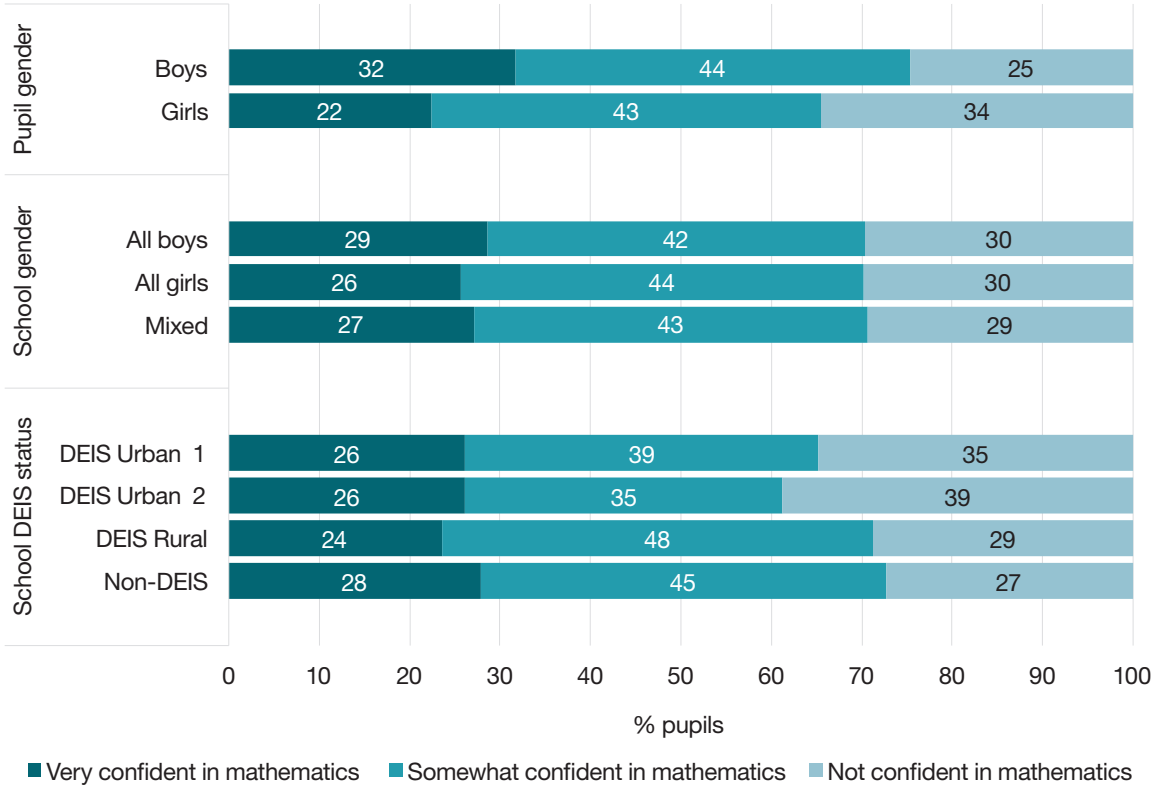
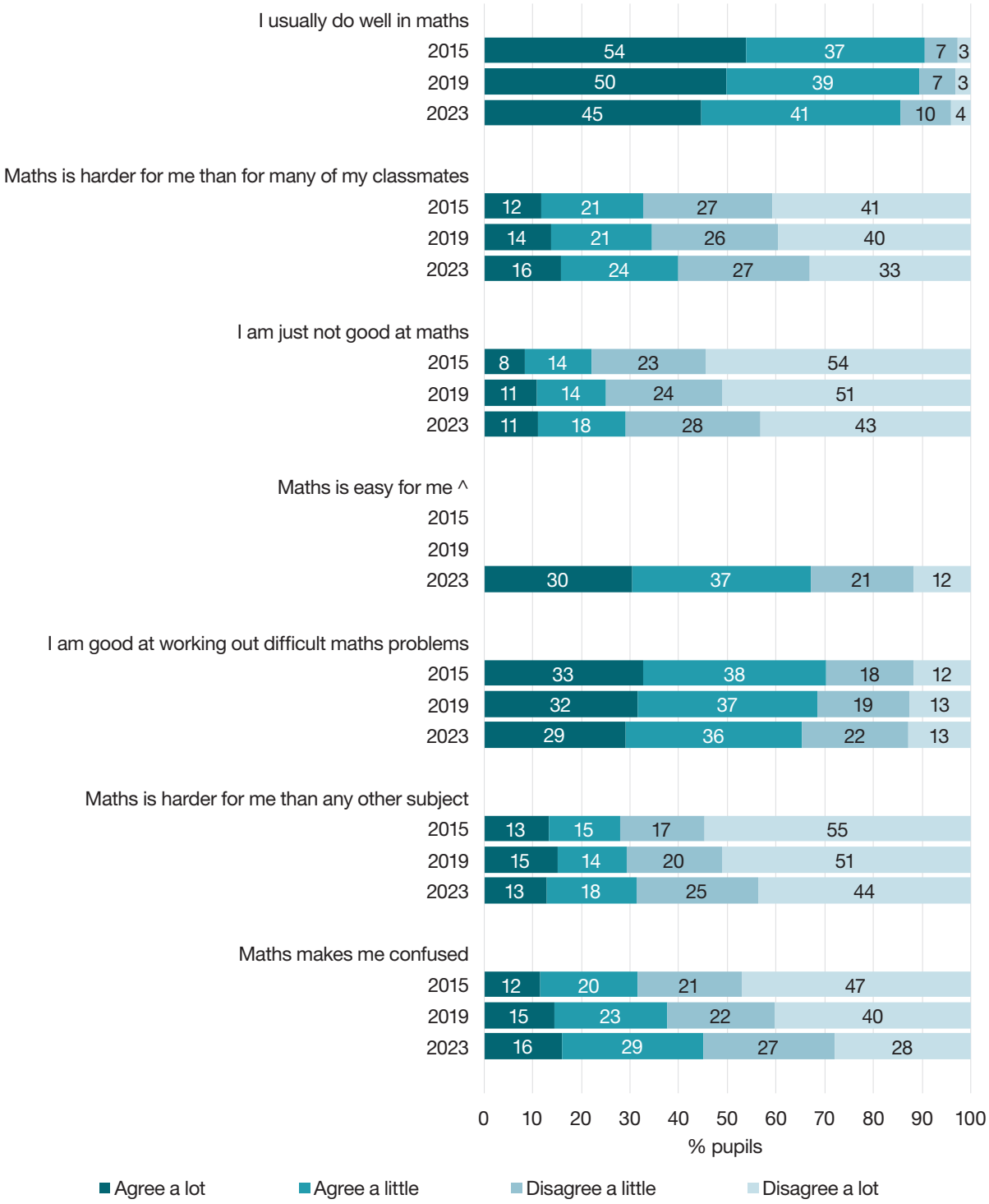


Figure 4.6 presents the percentages of Fourth Class pupils by their level of agreement with statements relating to feeling confident in mathematics over the past three cycles of TIMSS (2015, 2019, and 2023). Similar to the trends for pupils' liking of learning mathematics described in the previous section, there is a noticeable decline in the extent to which pupils felt confident in mathematics from 2015 to 2023. This is evident from consistent decreases in the percentages of pupils agreeing with positive statements about mathematics and consistent increases in the percentages of pupils agreeing with negative statements about mathematics. The largest decrease is observed for the statement 'I usually do well in maths', where the percentage *agreeing a lot* fell from 54% in 2015 to 45% in 2023. Additionally, the proportion of pupils who agreed (either *a lot* or *a little*) that 'maths makes them confused' increased from one-third (32%) in 2015 to nearly half (45%) in 2023.

Figure 4.6: Fourth Class pupils' endorsement of various statements about feeling confident in mathematics (2015, 2019, 2023)



Note. ^2023 item not comparable or not presented to pupils in 2019 or 2015.

Chapter 5:
Attitudes towards mathematics in Second Year

This chapter focuses on Second Year students' attitudes towards mathematics, drawing on three contextual scales: *Students Like Learning Mathematics*, *Students Confident in Mathematics*, and *Students Value Mathematics*. For each of these scales, percentages of students and their associated mean achievement in mathematics are presented for 2023. Next, the percentages of students in each of the categories are presented by student gender, school gender, and school DEIS status. Finally, the items relating to the scale which were presented to students are reported for the past three cycles of TIMSS (2015, 2019, and 2023).

Like learning mathematics

The extent to which Second Year students liked learning mathematics was captured through nine items in the student questionnaire:

- *I enjoy learning mathematics;*
- *I wish I did not have to study maths;*
- *Maths is boring;*
- *I learn interesting things in maths;*
- *I like maths;*
- *I like any schoolwork that involves numbers;*
- *I like to solve maths problems;*
- *I look forward to maths lessons;*
- *Maths is one of my favourite subjects.*

Students were asked how much they agreed or disagreed with each of these statements. Students' responses to seven of these items[15] were used to create the TIMSS *Students Like Learning Mathematics* scale,[16] on the basis of which students were classified into three categories: *very much like learning mathematics, somewhat like learning mathematics,* or *do not like learning mathematics.*

Figure 5.1 presents the percentages and mean mathematics achievement of Second Year students in each category in 2023. Approximately one-tenth of students (11%) indicated that they *very much like learning mathematics*, 30% that they *somewhat like learning mathematics*, and 59% that they *do not like learning mathematics*. When compared to the international average, 21% of Eighth Grade students reported that they *very much like learning mathematics*, 32% *somewhat like learning mathematics* and almost half (46%) indicated that they *did not like learning mathematics* (von Davier, Kennedy, et al., 2024). Second Year students who *very much liked learning mathematics* achieved a statistically significantly higher mean score in mathematics (566) than those who *somewhat liked learning mathematics* (544) (g = .29), and those who *did not like learning mathematics* (505) (g =

15 The items '*I wish I did not have to study maths'* and *'Maths is boring'* were not included in the scale.

16 The overall scale, *Students Like Learning Mathematics,* was developed at an international level by Boston College. Full details of the construction of the scale, including the items contributing to it, can be found in von Davier, Fishbein, and Kennedy (2024).

.82). There is a moderate positive correlation (r = .34) between the extent to which Second Year students like learning mathematics and mathematics achievement (Appendix Table A2.1).

Figure 5.1: Second Year students' liking of learning mathematics, percentages and mean mathematics achievement (2023)

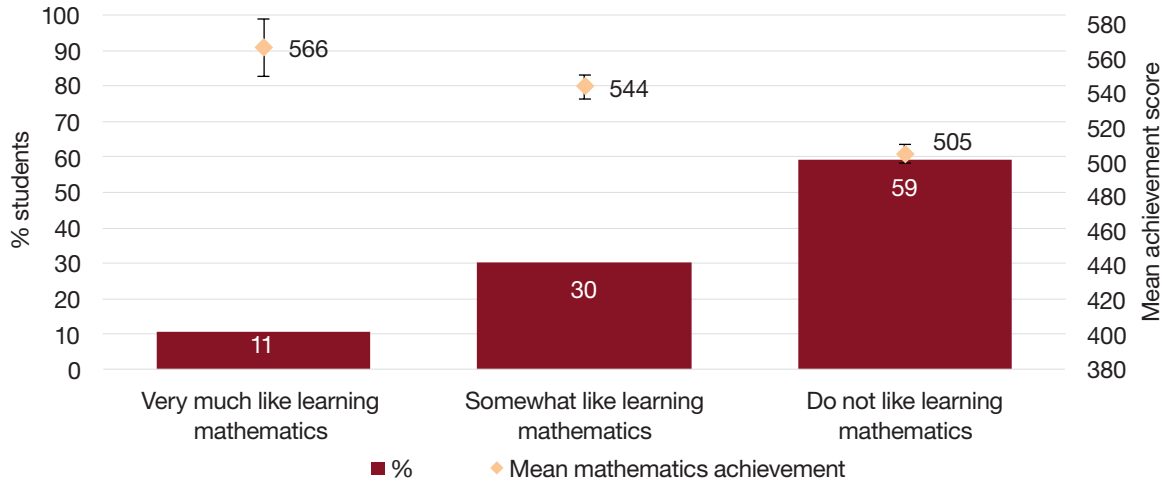


Figure 5.2 presents the percentages of students in each category of the TIMSS *Students Like Learning Mathematics* scale in 2023 by student gender, school gender, and school DEIS status. Slightly more boys (12%) than girls (9%) *very much liked learning mathematics,* while more girls (62%) than boys (56%) *did not like learning mathematics*. There was little variation in the proportions of students in each of the categories by school gender. Very similar proportions of students (11%) in DEIS and non-DEIS schools *very much liked learning mathematics,* while slightly higher proportions of students in DEIS schools (63%) *did not like learning mathematics* compared to those in non-DEIS schools (58%).

Figure 5.2: Second Year students' liking of learning mathematics by student gender, school gender, and school DEIS status (2023)

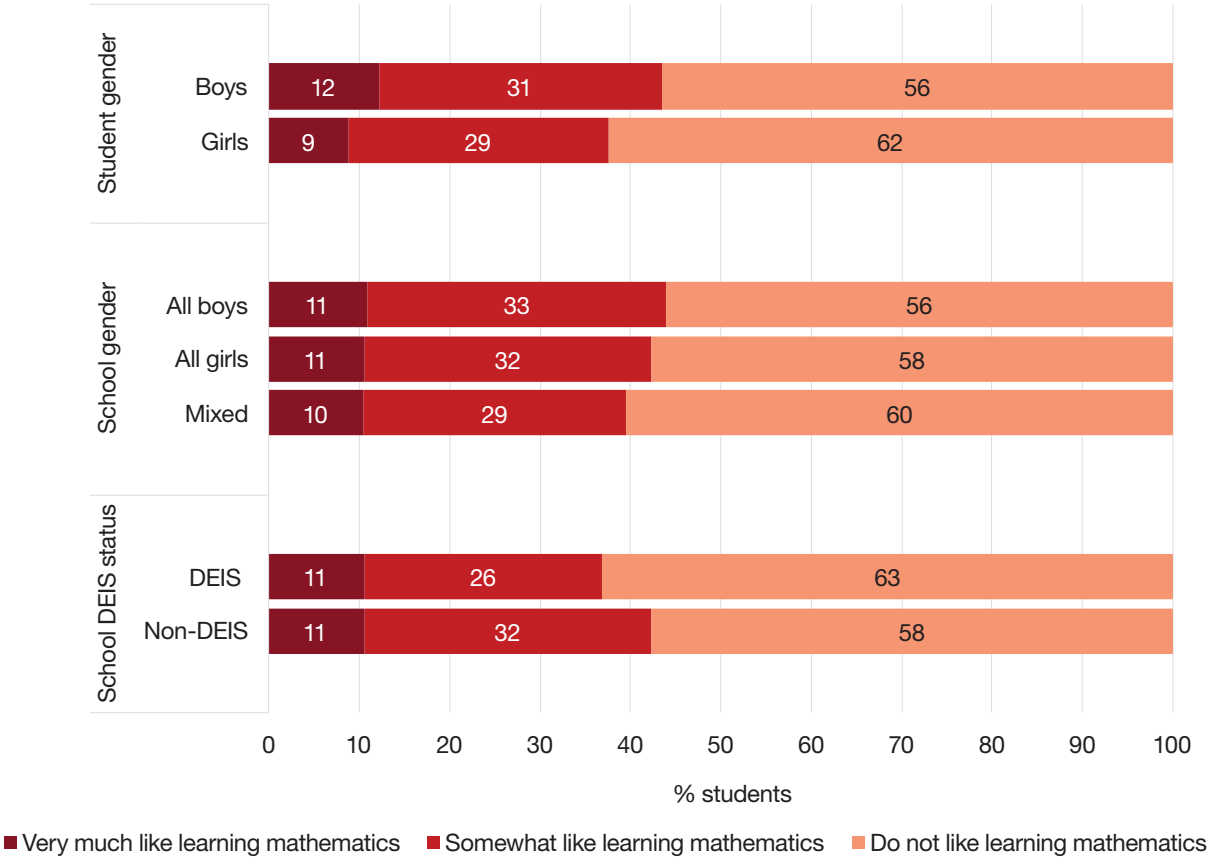
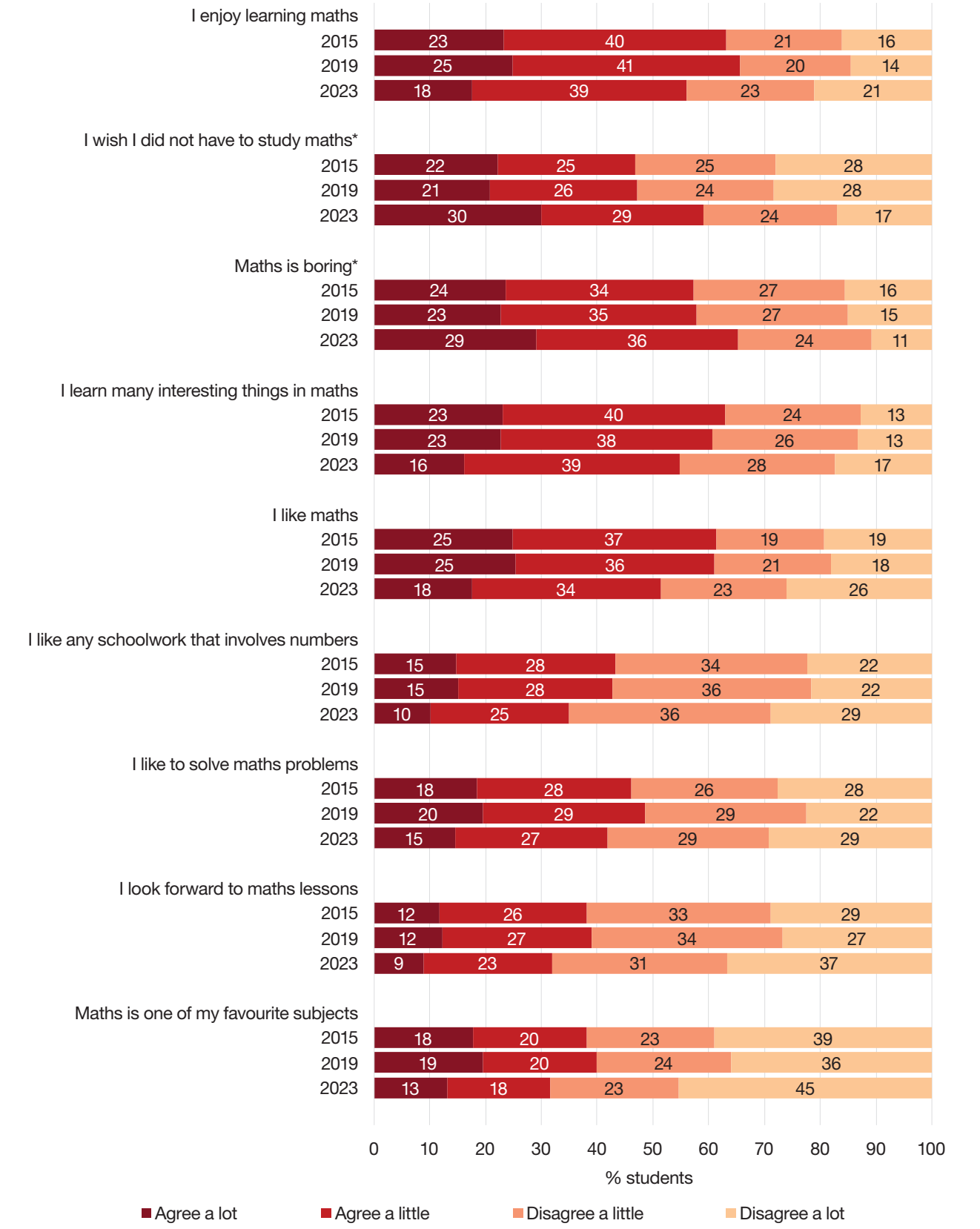


Figure 5.3 presents the percentages of Second Year students by their level of agreement with statements relating to the liking of learning mathematics in the past three cycles of TIMSS (2015, 2019, and 2023). Although response patterns tended to be similar in 2015 and 2019 for many of the statements, it is clear that there has been a decrease in students' liking of mathematics since 2019. This can be seen in the consistent decreases in agreement with positive statements about learning mathematics and increases in agreement with negative statements about learning mathematics. The largest decrease is observed for the statements 'I like maths' and 'I enjoy learning maths', where the levels of agreement (*a lot* or *a little*) decreased by 10 percentage points (rounded) between 2019 and 2023. The largest increase in the levels of agreement (*a lot* or *a little*) is observed for the statement 'I wish I did not have to study science' (a 12-percentage-point increase between 2019 and 2023).

Figure 5.3: Second Year students' endorsement of various statements about their liking of learning mathematics (2015, 2019, 2023)



Note. *Item not included in the scale.

Confidence in mathematics

The extent to which Second Year students felt confident in mathematics was captured through eight items in the student questionnaire:

- *I usually do well in maths;*
- *Maths is harder for me than for many of my classmates;*
- *Maths is not one of my strengths;*
- *Maths is easy for me;*
- *I am good at working out difficult maths problems;*
- *I am good at explaining maths to others;*
- *Maths is harder for me than any other subject;*
- *Maths makes me confused.*

Students were asked how much they agreed or disagreed with each of these statements. Their responses to these eight items were used to create the TIMSS *Students Confident in Mathematics* scale,[17] on the basis of which students were classified into three categories: *very confident in mathematics, somewhat confident in mathematics,* or *not confident in mathematics.*

Figure 5.4 presents the percentages and mean achievement of Second Year students in each category in 2023. Approximately one-tenth of students (12%) felt *very confident in mathematics*, 35% felt *somewhat confident in mathematics*, and 53% *did not feel confident in mathematics*. These proportions are comparable to the international averages, 13%, 32%, and 55%, respectively (von Davier, Kennedy, et al., 2024). Second Year students who felt *very confident in mathematics* achieved a significantly higher mean mathematics score (595) compared to those who felt *somewhat confident in mathematics* (547) and *not confident in mathematics* (490). The associated effect sizes were large (g = .68 and g = 1.55, respectively). Students who felt *somewhat confident in mathematics* also achieved a significantly higher mean mathematics score compared to those who were *not confident in mathematics*. There is a moderate to strong positive correlation (r = .48) between the extent to which Second Year students are confident in mathematics and mathematics achievement (Appendix Table A2.1).

17 The overall scale, *Students Confident in Mathematics*, was developed at an international level by Boston College. Full details of the construction of the scale, including the items contributing to it, can be found in von Davier, Fishbein, and Kennedy (2024).

Figure 5.4: Second Year students feeling confident in mathematics, percentages and mean mathematics achievement (2023)

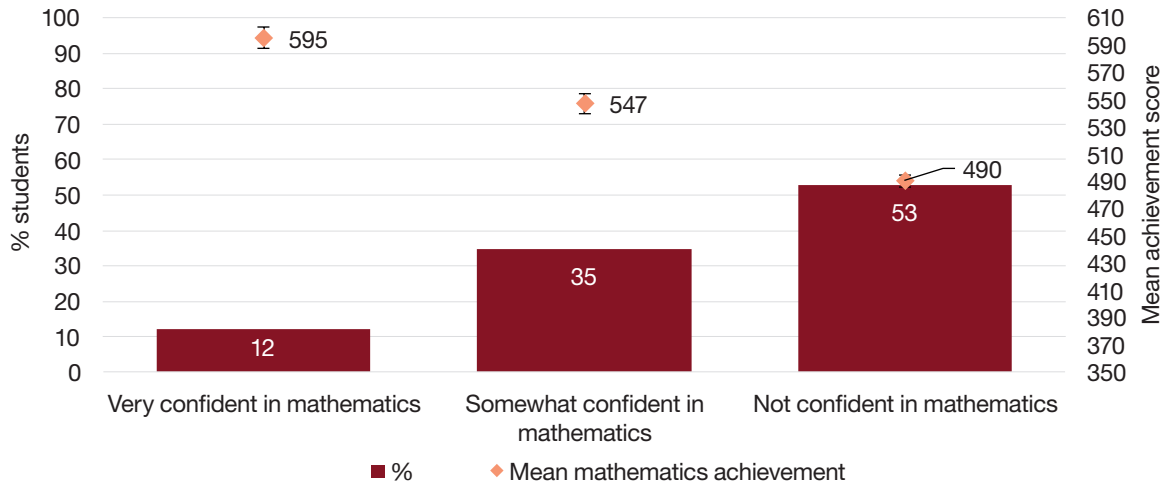


Figure 5.5 presents the percentages of students in each category by student gender, school gender, and school DEIS status. More boys (15%) than girls (10%) felt *very confident in mathematics,* while more girls (58%) than boys (48%) *did not feel confident in mathematics*. Slightly higher proportions of students in boys' schools (15%) felt *very confident in mathematics* compared to girls' and mixed-gender schools (12% for both). Correspondingly, lower proportions in boys' schools (46%) were *not confident in mathematics* than in girls' and mixed-gender schools (55% and 54%, respectively). Higher proportions of students in DEIS schools (57%) were *not confident in mathematics* compared to the proportion in non-DEIS schools (51%), while the proportion of students in DEIS and non-DEIS schools who felt *very confident in mathematics* were comparable (11% and 13%, respectively).

Figure 5.5: Second Year students feeling confident in mathematics by student gender, school gender, and school DEIS status (2023)

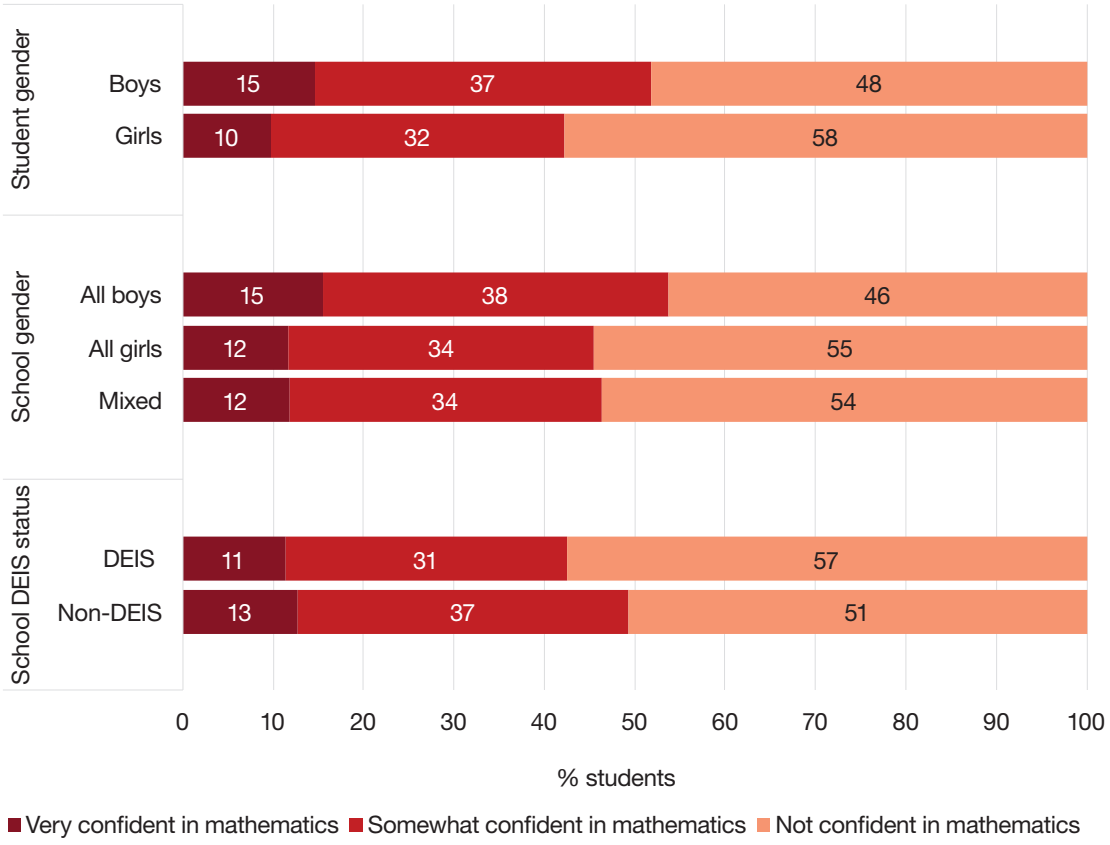
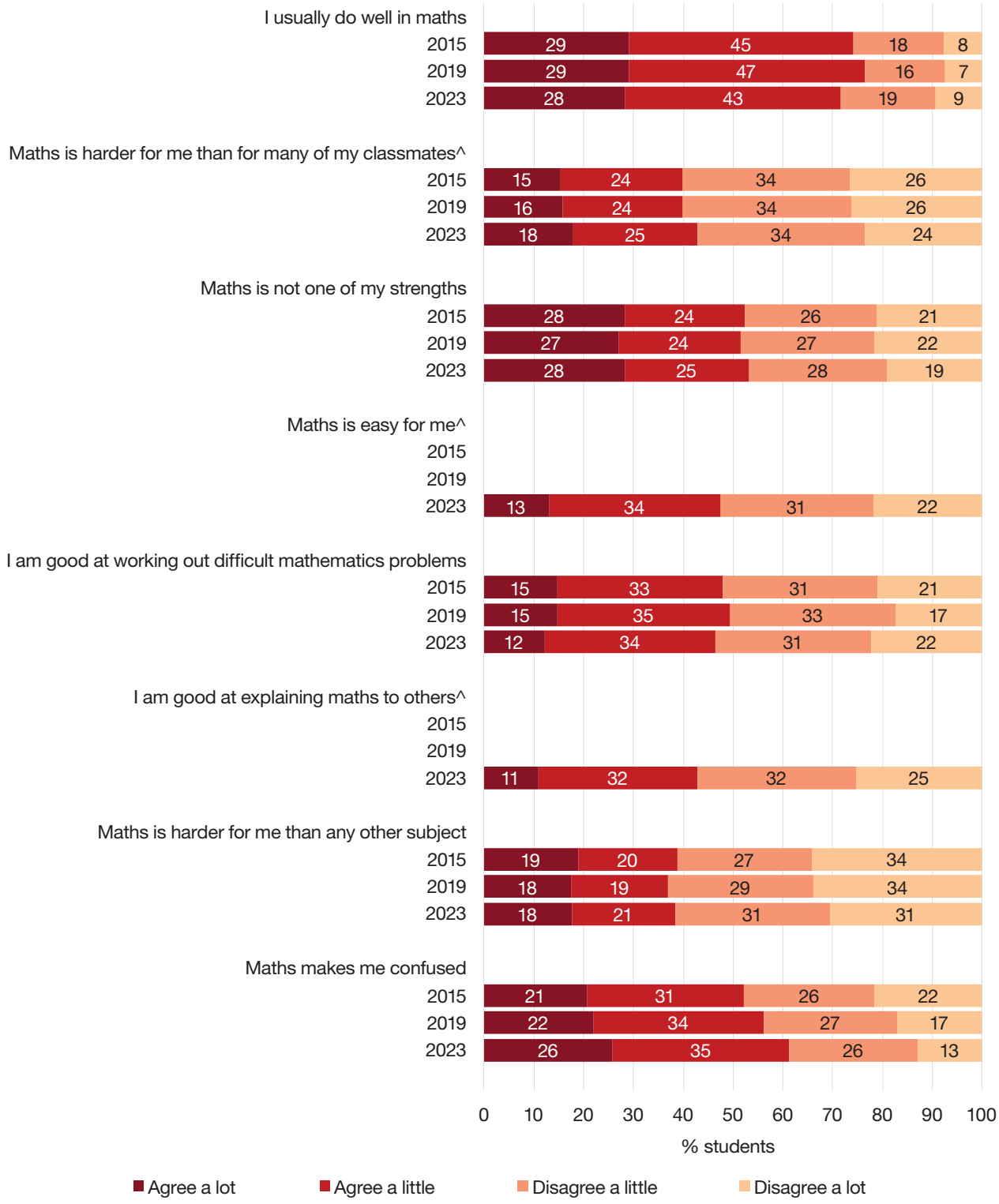


Figure 5.6 presents the percentages of Second Year students by their level of agreement with various statements relating to feeling confident in mathematics over the past three cycles of TIMSS (2015, 2019, and 2023). While there was a noticeable decrease in students' enjoyment of learning mathematics from 2019 (see Figure 5.3, above), there are fewer differences across the items relating to their confidence in mathematics (Figure 5.6). Similar proportions of students *agreed a lot* across each of the cycles (2015, 2019, and 2023) that they 'usually do well in mathematics', that 'maths is one of their strengths', and that 'maths is harder for them than any other subject'. However, there has been a gradual increase in the proportion of students agreeing (*a lot* or *a little*) that 'maths makes them confused': rising from 52% in 2015, to 56% in 2019, to 61% in 2023.

Figure 5.6: Second Year students' endorsement of various statements about feeling confident in mathematics (2015, 2019, 2023)



Note. ^2023 item not comparable or not presented to students in 2019 or 2015.[18]

18 The item 'Maths is harder for me than for many of my classmates' was changed slightly in 2023 from 'Maths is more difficult for me than for many of my classmates' in 2019 and 2015. As the change in wording is more cosmetic than substantive, the data have been included for all cycles.

Value mathematics

The extent to which Second Year students value mathematics was captured through nine items in the student questionnaire:

- *I think learning maths will help me in my daily life;*
- *I need maths to learn other school subjects;*
- *I need to do well in maths to get into the college of my choice;*
- *I need to do well in maths to get the job I want;*
- *I would like a job that involves using maths;*
- *It is important to learn about maths to get ahead in the world;*
- *Learning maths will give me more opportunities when I am an adult;*
- *My parent(s)/guardian(s) think that it is important that I do well in maths;*
- *It is important to do well in maths.*

Students were asked how much they agreed with each of these statements. Students' responses to eight of these items[19] were used to create the TIMSS *Students Value Mathematics scale,*[20] on which the basis of which students were classified into three categories: *strongly value mathematics, somewhat value mathematics,* or *do not value mathematics.*

Figure 5.7 presents the percentages and mean mathematics achievement of Second Year students in each category in 2023. One-quarter of students (25%) *strongly value mathematics*, 45% *somewhat value mathematics,* and 30% *do not value mathematics*. Internationally, 34% of Eighth Grade students reported that they *strongly value mathematics*, while a further 41% indicated that they *somewhat value mathematics*, and 24% *do not value mathematics* (von Davier, Kennedy, et al., 2024). Second Year students who *strongly value mathematics* achieved a statistically significantly higher mean score in mathematics (542) than those who *somewhat value mathematics* (530) and those who *do not value mathematics* (499). The associated effect sizes were g = .15 and g = .55, respectively. There is a weak to moderate positive correlation (r = .22) between the extent to which Second Year students value mathematics and mathematics achievement (Appendix Table A2.1).

19 The item '*My parent(s)/guardian(s) think that it is important that I do well in maths'* was not included in the scale.

20 The overall scale, *Students Value Mathematics*, was developed at an international level by Boston College. Full details of the construction of the scale, including the items contributing to it, can be found in von Davier, Fishbein, and Kennedy (2024).

Figure 5.7: Second Year students' valuing of mathematics, percentages and mean mathematics achievement (2023)

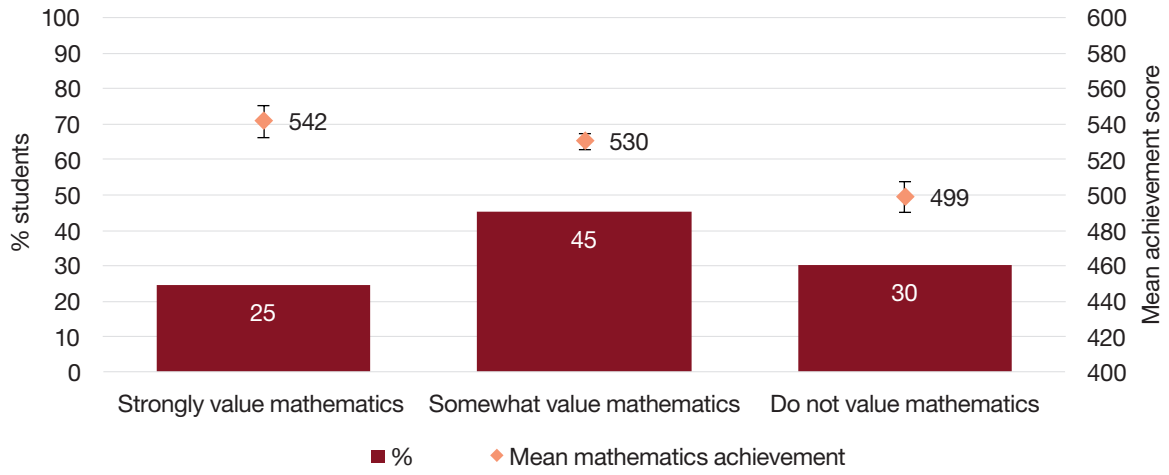


Figure 5.8 presents the percentages of students in each category by student gender, school gender, and school DEIS status. Very similar proportions of boys and girls *strongly value* (25% and 24% respectively), *somewhat value* (45%), and *do not value mathematics* (30%).[21] Similar proportions across the three categories were reported in boys' schools and mixed-gender schools, with slightly higher proportions of students valuing mathematics in girls' schools. The proportion of students who *do not value mathematics* was higher in DEIS schools (36%) than in non-DEIS schools (28%).

21 Due to rounding, the percentages given for girls total to 99% rather than 100%.

Figure 5.8: Second Year students' valuing of mathematics by student gender, school gender, and school DEIS status (2023)

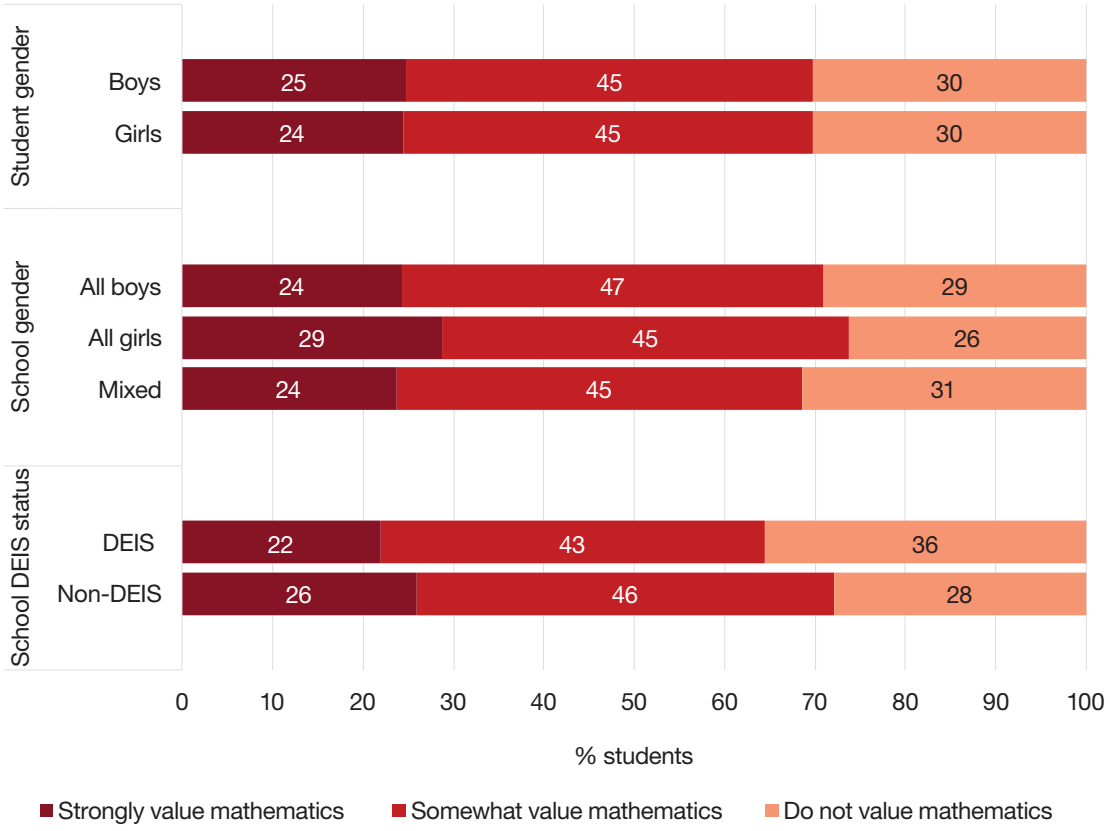
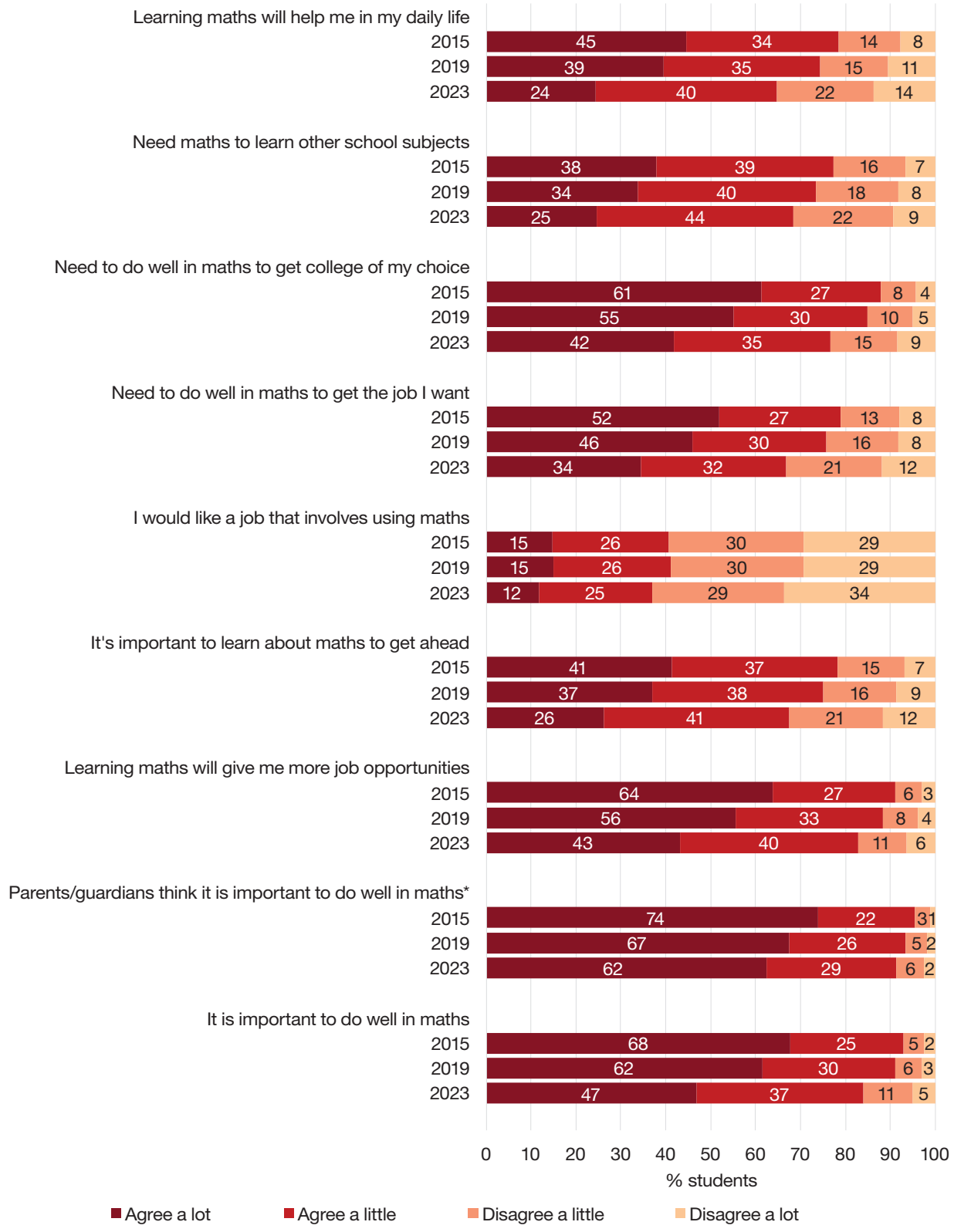


Figure 5.9 presents the percentages of Second Year students by their level of agreement with statements relating to valuing mathematics over the past three cycles of TIMSS (2015, 2019, and 2023). There is a clear and gradual decline in students' valuing mathematics over the period from 2015 to 2023. Across the majority of the statements, this decline can be observed by a consistent decrease in the percentages of students in each cycle *agreeing a lot* or *a little*. The decrease in the proportions *agreeing a lot* between 2015 and 2023 ranged from 11 percentage points (rounded) for the statement 'my parent(s)/guardian(s) think that it is important that I do well in maths' to 21 percentage points for both 'it is important to do well in maths' and 'learning maths will give me more job opportunities when I am an adult'. However, one statement, 'I would like a job that involves using maths', had comparable proportions of students *agreeing a lot* across 2015, 2019, and 2023 (15%, 15%, and 12%, respectively).

Figure 5.9: Second Year students' endorsement of various statements about valuing mathematics (2015, 2019, 2023)



Note: *Item not included in the scale.
Text for some of the items has been shortened; the full text can be found at the beginning of the *Value mathematics* section.

Chapter 6:
Attitudes towards science in Fourth Class

This chapter focuses on Fourth Class pupils' attitudes towards science, drawing on two contextual scales: *Students Like Learning Science* and *Students Confident in Science*. For each of these scales, the percentages of pupils in each category and their mean science achievement scores for 2023 are presented. Next, the percentages of pupils in each scale category are presented by pupil gender, school gender, and school DEIS status. For trend analysis, the items from these scales are presented across the past three cycles of TIMSS (2015, 2019, and 2023).

Like learning science

The extent to which Fourth Class pupils liked learning science was captured through nine items in the TIMSS 2023 pupil questionnaire:

- *I enjoy learning science*;
- *I wish I did not have to study science*;
- *Science is boring*;
- *I learn many interesting things in science*;
- *I like science*;
- *I look forward to learning science in school*;
- *Science teaches me how things in the world work*;
- *I like to do science experiments*;
- *Science is one of my favourite subjects*.

Pupils were asked to rate their agreement or disagreement with each of these statements. Responses to six of these items[22] were used to create the TIMSS *Students Like Learning Science* scale,[23] on the basis of which pupils were grouped into three categories: *very much like learning science*, *somewhat like learning science*, or *do not like learning science*.

Figure 6.1 presents the percentages and mean science achievement of Fourth Class pupils in each category in 2023. Just under half of pupils (45%) reported that they *very much liked learning science*, 34% that they *somewhat liked learning science*, and 21% that they *did not like learning science*. On average, internationally, 53% of Fourth Grade students indicated that they *very much liked learning science*, 29% *somewhat liked learning science*, and 18% *did not like learning science* (von Davier, Kennedy, et al., 2024). Fourth Class pupils who *very much liked learning science* and those who *somewhat liked learning science* achieved very similar mean science scores (537 and 536, respectively). However, pupils who *very much liked learning science* achieved a statistically significantly higher mean science score than those who *did not like learning science* (519) with an effect size *g* = .21. There is a weak

22 The items '*I wish I did not have to study science', 'Science is boring',* and *'I like to do science experiments'* were not included in the scale.

23 The overall scale, *Students Like Learning Science*, was developed at an international level by Boston College. Full details of the construction of the scale, including the items contributing to it, can be found in von Davier, Fishbein, and Kennedy (2024).

positive correlation (r = .08) between the extent to which Fourth Class pupils like learning science and science achievement (Appendix Table A2.1).

Figure 6.1: Fourth Class pupils' liking of learning science, percentages and mean science achievement (2023)

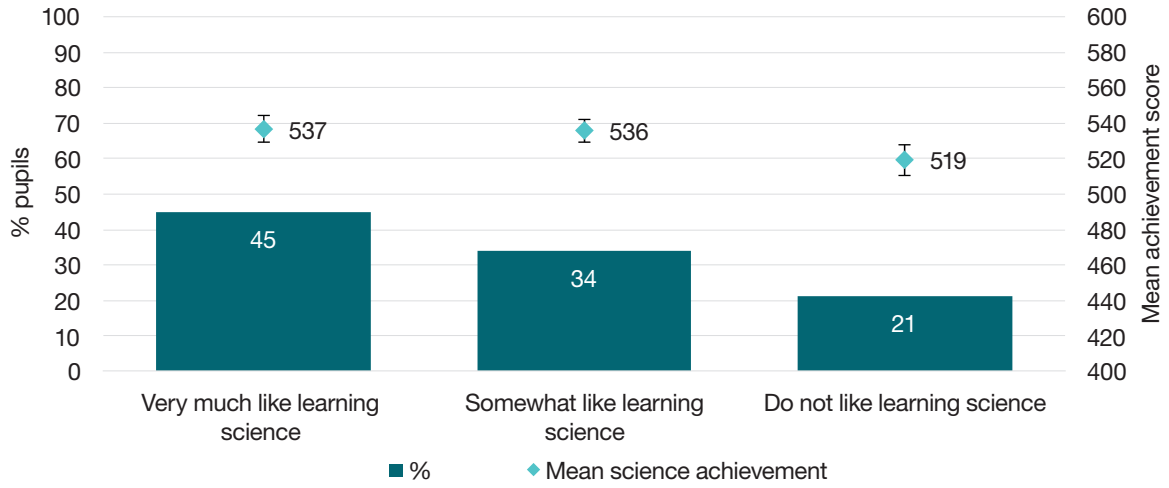


Figure 6.2 presents the percentages of pupils in each category of the TIMSS *Students Like Learning Science* scale in 2023, broken down by pupil gender, school gender, and school DEIS status. A higher percentage of boys reported *very much liking learning science* (49%) compared to girls (41%), although the percentages of boys and girls who *do not like learning science* were similar. Among different school types, a higher proportion of pupils who *very much liked learning science* was observed in boys' schools (56%) compared to girls' schools (45%) and mixed-gender schools (44%). Among DEIS categories, the highest percentage of pupils who *very much liked learning science* was found in DEIS Urban Band 1 schools (59%), followed by DEIS Urban Band 2 schools (51%), while DEIS Rural and non-DEIS schools had lower proportions of pupils who *very much liked learning science* (39% and 43%, respectively). Accordingly, there were higher proportions of pupils in DEIS Rural and non-DEIS schools who *did not like learning science* (24% and 22%, respectively) than in DEIS Urban schools.

Figure 6.2: Fourth Class pupils' liking of learning science by pupil gender, school gender, and school DEIS status (2023)

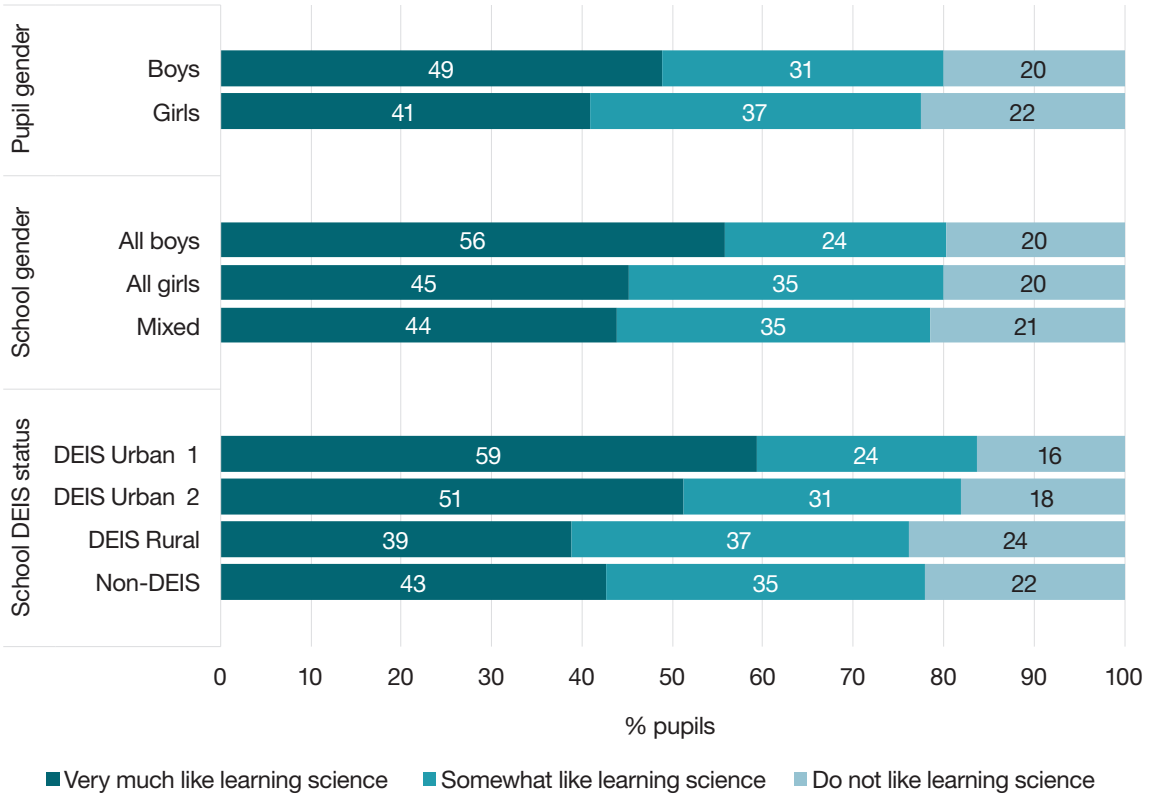
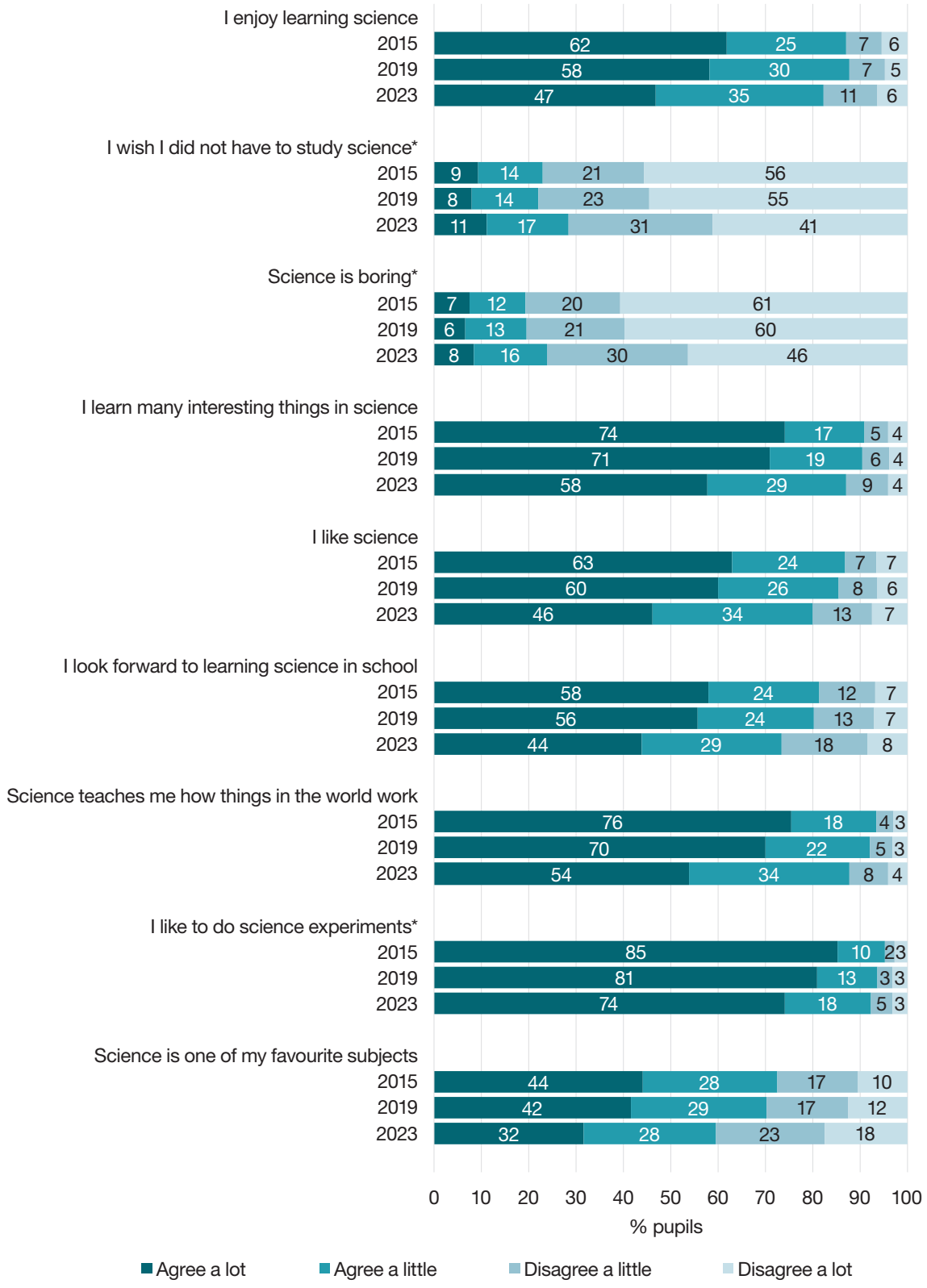


Figure 6.3 presents the percentages of Fourth Class pupils by their level of agreement with statements about their liking of learning science in TIMSS 2015, 2019, and 2023. Overall, a noticeable and gradual decline in pupils' liking of learning science is observed between 2015 and 2023, with more noticeable decline between 2019 and 2023.This decline is marked by a consistent decrease in the percentages of pupils agreeing with positive statements about learning science, coupled with an increase in the percentages agreeing with negative statements. The largest decrease is observed for the statement 'Science teaches me how things in the world work', where the percentage of pupils *agreeing a lot* fell from 76% in 2015, 70% in 2019, to 54% in 2023. On the other hand, more pupils agreed *(a lot* and *a little)* that they wish they did not have to study science (28%) or find science boring (24%) in 2023 compared to 2019 (22% and 19%, respectively) and 2015 (23% and 19%, respectively).

Figure 6.3: Fourth Class pupils' endorsement of various statements about liking of learning science (2015, 2019, 2023)



Note. *Item not included in the scale.

Confidence in science

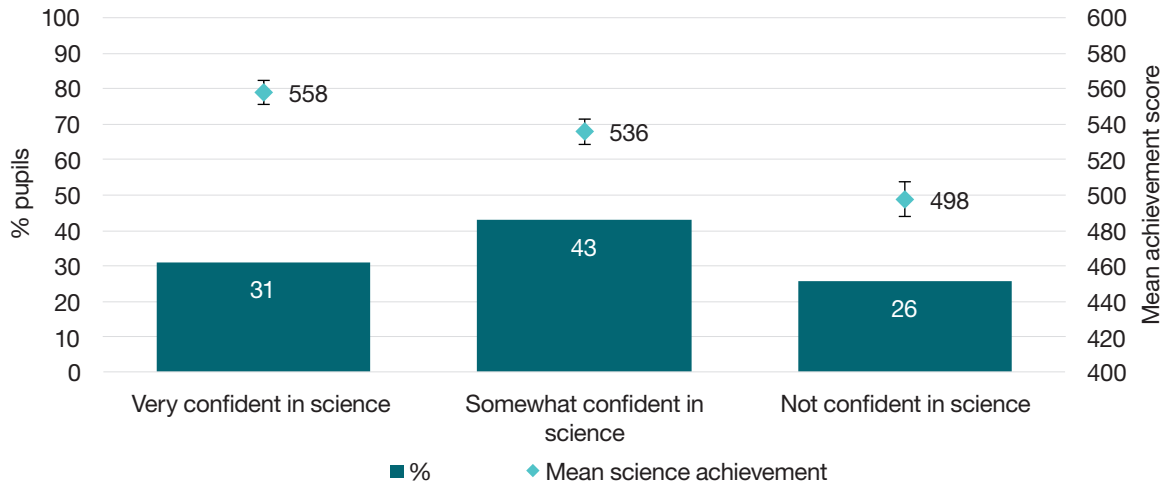
The extent to which Fourth Class pupils felt confident in science was captured through six items in the TIMSS 2023 pupil questionnaire:

- *I usually do well in science*;
- *Science is harder for me than for many of my classmates*;
- *I am just not good at science;*
- *Science is easy for me*;
- *Science is harder for me than any other subject*;
- *Science makes me confused*.

Pupils were asked to rate their agreement or disagreement with each of these statements. Responses to these six items were used to create the TIMSS *Students Confident in Science scale,*[24] on the basis of which pupils were grouped into three categories: *very confident in science*, *somewhat confident in science*, or *not confident in science*.

Figure 6.4 presents the percentages and mean science achievement of Fourth Class pupils in each category. Approximately one-third of pupils (31%) reported that they felt *very confident in science*, 43% indicated that they felt *somewhat confident in science*, and 26% were *not confident in science*. Internationally, this compares to 34%, 35%, and 31%, respectively (von Davier, Kennedy, et al., 2024). Fourth Class pupils who felt *very confident in science* achieved a statistically significantly higher mean science score (558) than their peers who felt *somewhat confident* (536) with a small to medium effect size (g = .30) and *not confident in science* (498) with a large effect size (g = .78). There is a weak to moderate positive correlation (r = .26) between the extent to which Fourth Class pupils are *confident in science* and science achievement (Appendix Table A2.1).

Figure 6.4: Fourth Class pupils feeling confident in science, percentages and mean science achievement (2023)



24 The overall scale, *Students Confident in Science*, was developed at an international level by Boston College. Full details of the construction of the scale, including the items contributing to it, can be found in von Davier, Fishbein, and Kennedy (2024).

Figure 6.5 presents the percentages of pupils in each category by pupil gender, school gender, and school DEIS status. Boys and girls equally reported feeling *very confident in science* (31%). Although the percentages of pupils feeling *very confident in science* were similar in each of the three school gender types, a higher proportion of pupils in boys' schools reported feeling *not confident in science* (31%) compared to girls' (24%) and mixed-gender schools (25%). The highest proportion of pupils who felt *very confident in science* was observed in DEIS Urban Band 1 schools (34%), followed by DEIS Urban Band 2 and non-DEIS schools (both 31%), with the lowest proportion in DEIS Rural (25%). The lowest proportion of pupils who felt *not confident in science* was found in non-DEIS schools (24%).

Figure 6.5: Fourth Class pupils feeling confident in science by pupil gender, school gender, and school DEIS status (2023)

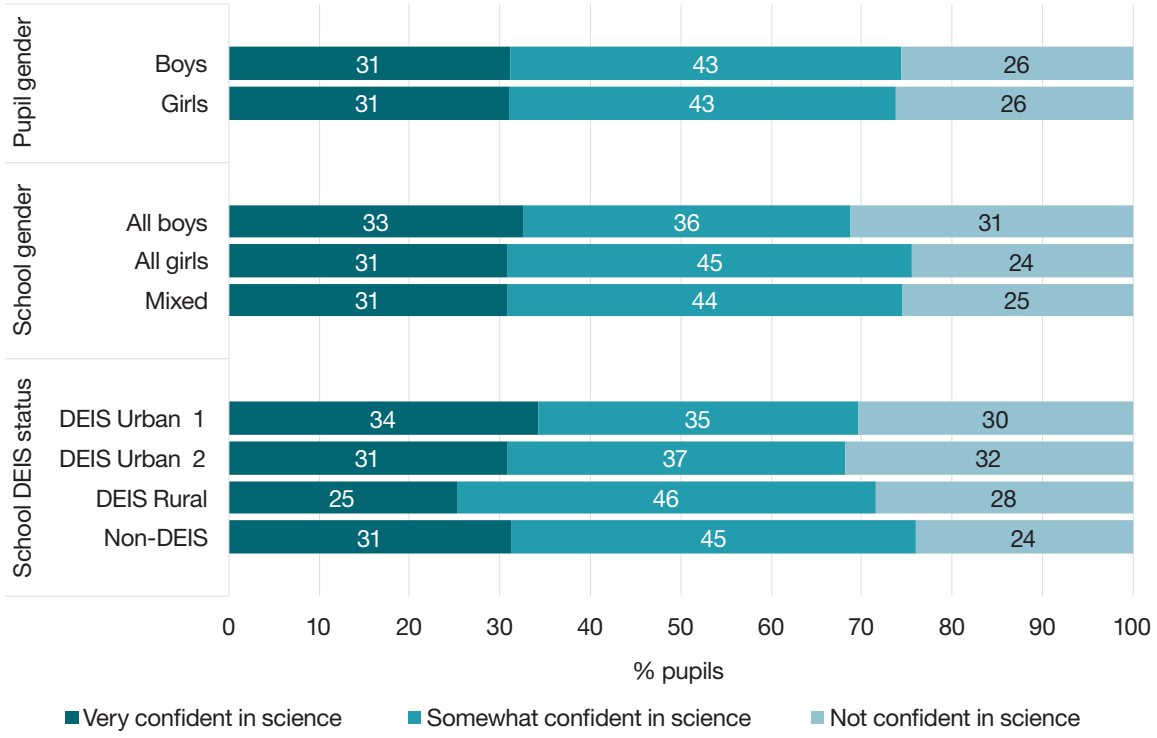
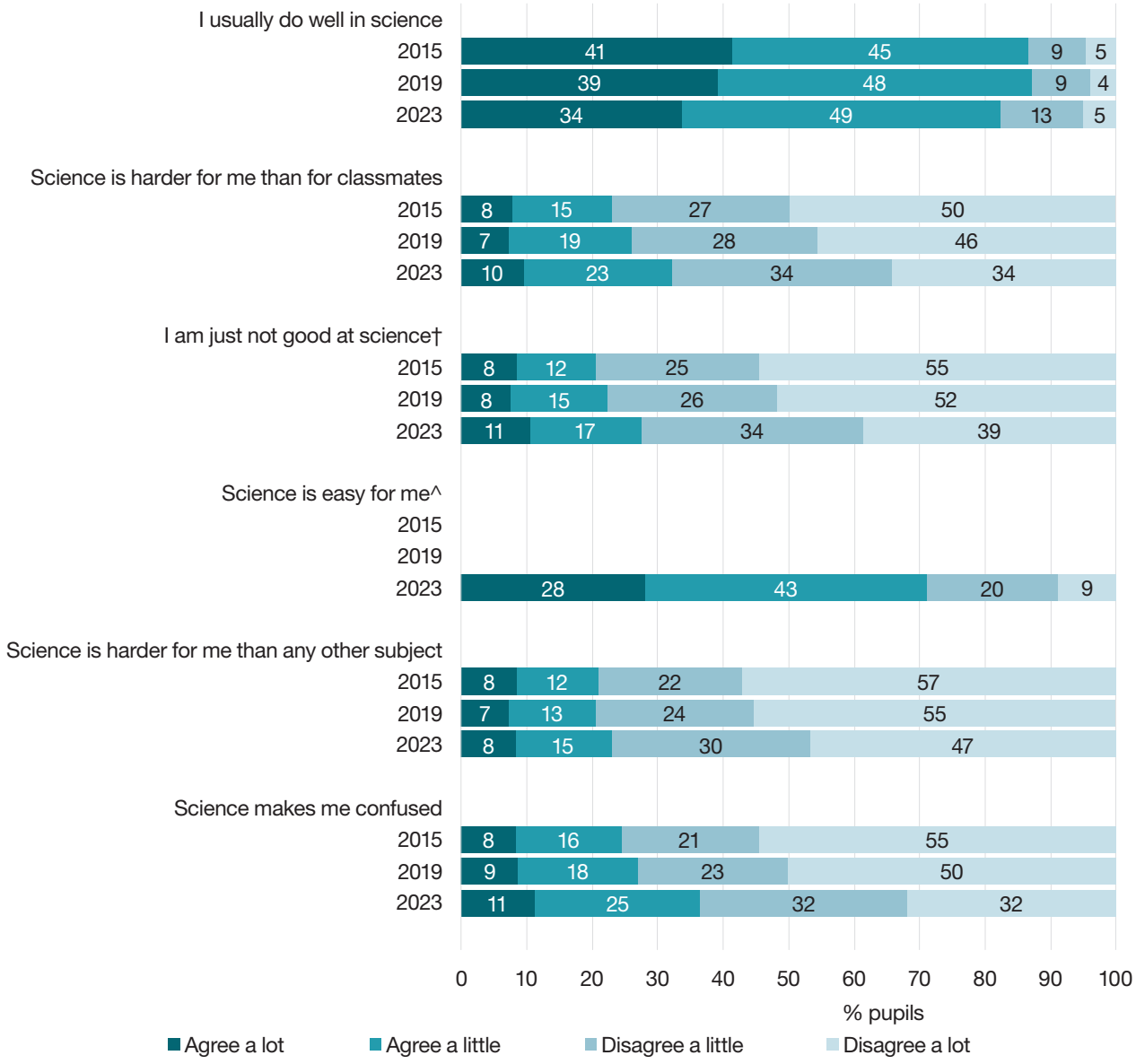


Figure 6.6 presents the percentages of Fourth Class pupils by their level of agreement with various statements about the extent to which they felt confident in science in TIMSS 2015, 2019, and 2023. Overall, a gradual decline can be seen in the extent to which pupils felt confident in science between 2015 and 2019, and more noticeably between 2019 to 2023, albeit to a lesser extent than for the same pupils' liking of science (see Figure 6.3). The most noticeable change is observed for the statement 'science makes me confused', where the percentage of pupils agreeing (*a lot* or *a little)* increased from 24% in 2015, 27% in 2019 to 36% in 2023. Similarly, there has been a nine-percentage-point (rounded) increase between 2015 and 2023 in students agreeing that 'science is harder for me than for many of my classmates' and a seven-percentage-point (rounded) increase in students agreeing that 'I am just not good at science'. Accordingly, when pupils were presented with the positive statement 'I usually do well in science', 41% of pupils in 2015 *agreed a lot*, and this fell to 39% in 2019 and 34% in 2023.

Figure 6.6: Fourth Class pupils' endorsement of various statements about feeling confident in science (2015, 2019, 2023)



Note. ^2023 item not comparable or not presented to pupils in 2019 or 2015.
†Internationally, the item wording was: *Science is not one of my strengths*. Pupils in Ireland were presented with: *I am just not good at science*.
Text for some of the items has been shortened; the full text can be found at the beginning of the *Confidence in science* section.

Chapter 7: Attitudes towards science in Second Year

This chapter focuses on Second Year students' attitudes towards science, drawing on three contextual scales: *Students Like Learning Science*, *Students Confident in Science*, and *Students Value Science*. For each of these scales, the percentages of students in each scale category and their mean achievement scores for 2023 are presented. Next, the percentages of students in each scale category are presented by student gender, school gender, and school DEIS status. For trend analysis, the items from these scales are presented across the past three cycles of TIMSS (2015, 2019, and 2023).

Like learning science

The extent to which Second Year students liked learning science was captured through nine items in the TIMSS 2023 student questionnaire:

- *I enjoy learning science;*
- *I wish I did not have to study science;*
- *Science is boring;*
- *I learn many interesting things in science;*
- *I like science;*
- *I look forward to learning science in school;*
- *Science teaches me how things in the world work;*
- *I like to conduct science experiments;*
- *Science is one of my favourite subjects.*

Students were asked to rate their agreement or disagreement with each of these statements. Responses to six of these items[25] were used to create the TIMSS *Students Like Learning Science* scale,[26] on the basis of which students were grouped into three categories: *very much like learning science*, *somewhat like learning science*, or *do not like learning science*.

Figure 7.1 presents the percentages and mean science achievement of Second Year students in each category. Approximately three in ten students (28%) indicated that they *very much liked learning science*, 36% that they *somewhat liked learning science*, and 36% that they *did not like learning science*. On average, internationally, a larger proportion of students indicated that they *very much like learning science* (40%), a further 34% indicated that they *somewhat liked learning science*, and 26% that they *did not like learning science* (von Davier, Kennedy, et al., 2024). Second Year students who *very much liked learning science* achieved a significantly higher mean science score (562) than their peers who *somewhat liked learning science* (539) with a small to medium effect size (g = .27), and than those who *did not like learning science* (509) with a medium to large effect size (g = .67).

25 The items '*I wish I did not have to study science', 'Science is boring',* and *'I like to conduct science experiments'* were not included in the scale.

26 The overall scale, *Students Like Learning Science,* was developed at an international level by Boston College. Full details of the construction of the scale, including the items contributing to it, can be found in von Davier, Fishbein, and Kennedy (2024).

There is a weak to moderate positive correlation (r = .21) between the extent to which Second Year students like learning science and science achievement (Appendix Table A2.1).

Figure 7.1: Second Year students' liking of learning science, percentages and mean science achievement (2023)

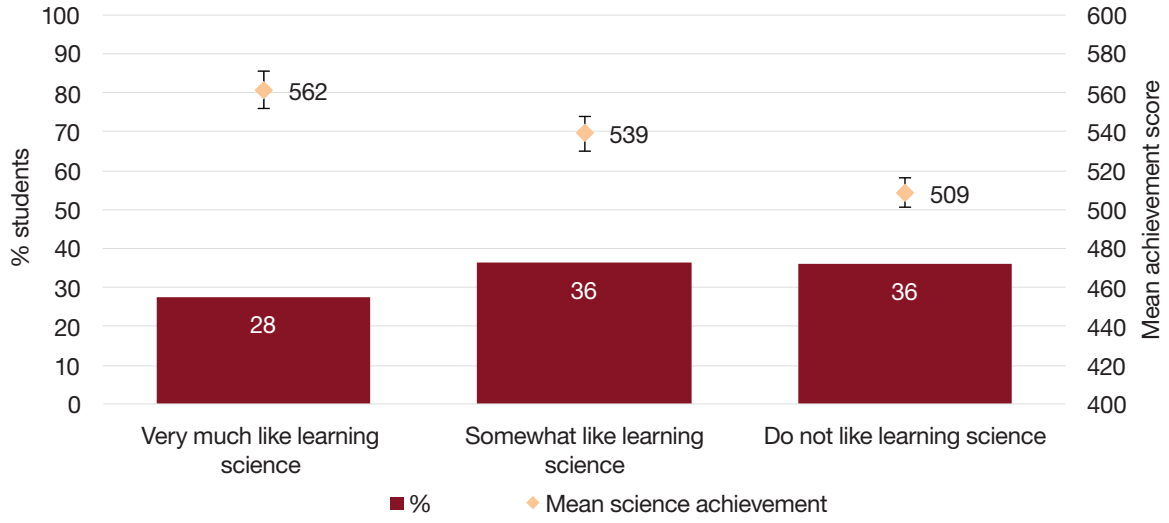


Figure 7.2 presents the percentages of students in each category, broken down by student gender, school gender, and school DEIS status. A slightly higher percentage of boys (29%) than girls (26%) reported *very much liking learning science*, while more girls (40%) than boys (32%) reported that they *do not like learning science*. Among different school types, there was a greater proportion of students who *very much liked learning science* in girls' schools (31%) compared to boys' and mixed-gender schools (both 27%). However, the proportion of students who indicated that they *do not like learning science* was greater in mixed-gender schools (38%), followed by girls' schools (33%), with boys' schools having the lowest proportion (29%). The proportions of students who *very much liked learning science* were similar in DEIS and non-DEIS schools (29% and 27%, respectively). However, a higher percentage in DEIS schools (40%) than in non-DEIS schools (34%) *did not like learning science*.

Figure 7.2: Second Year students' liking of learning science by student gender, school gender, and school DEIS status (2023)

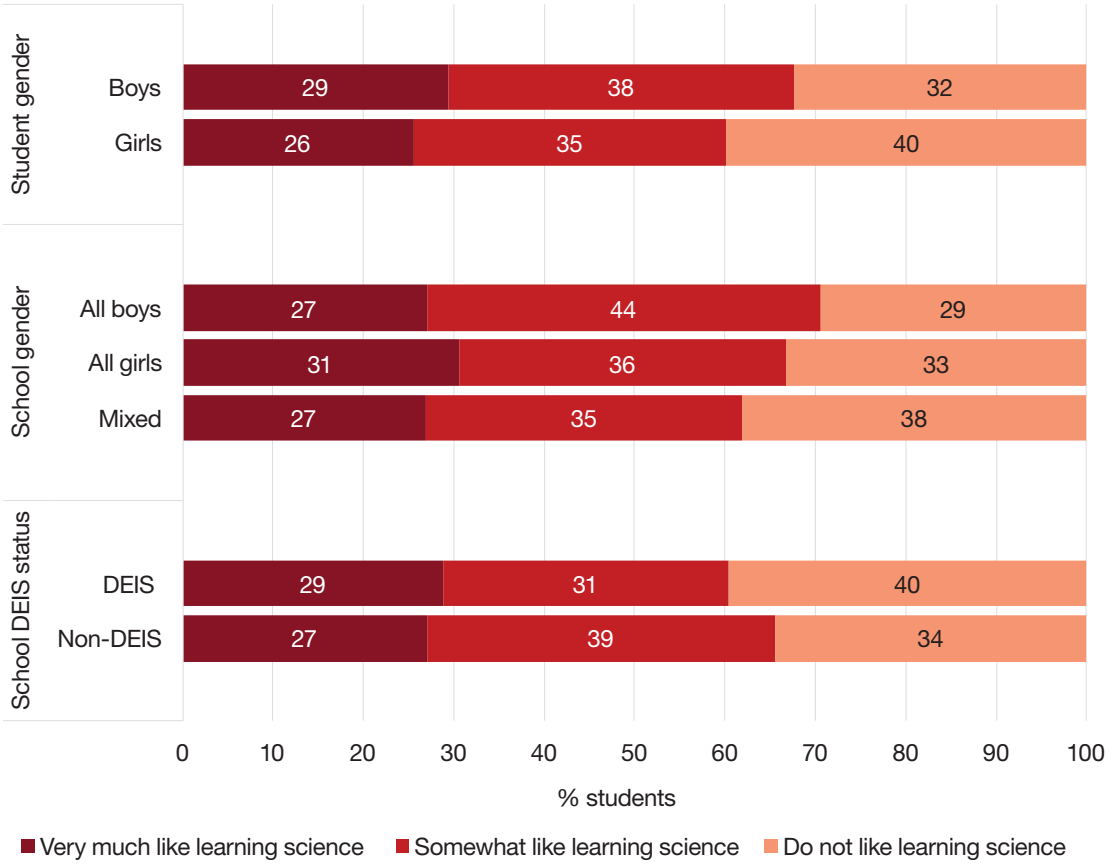
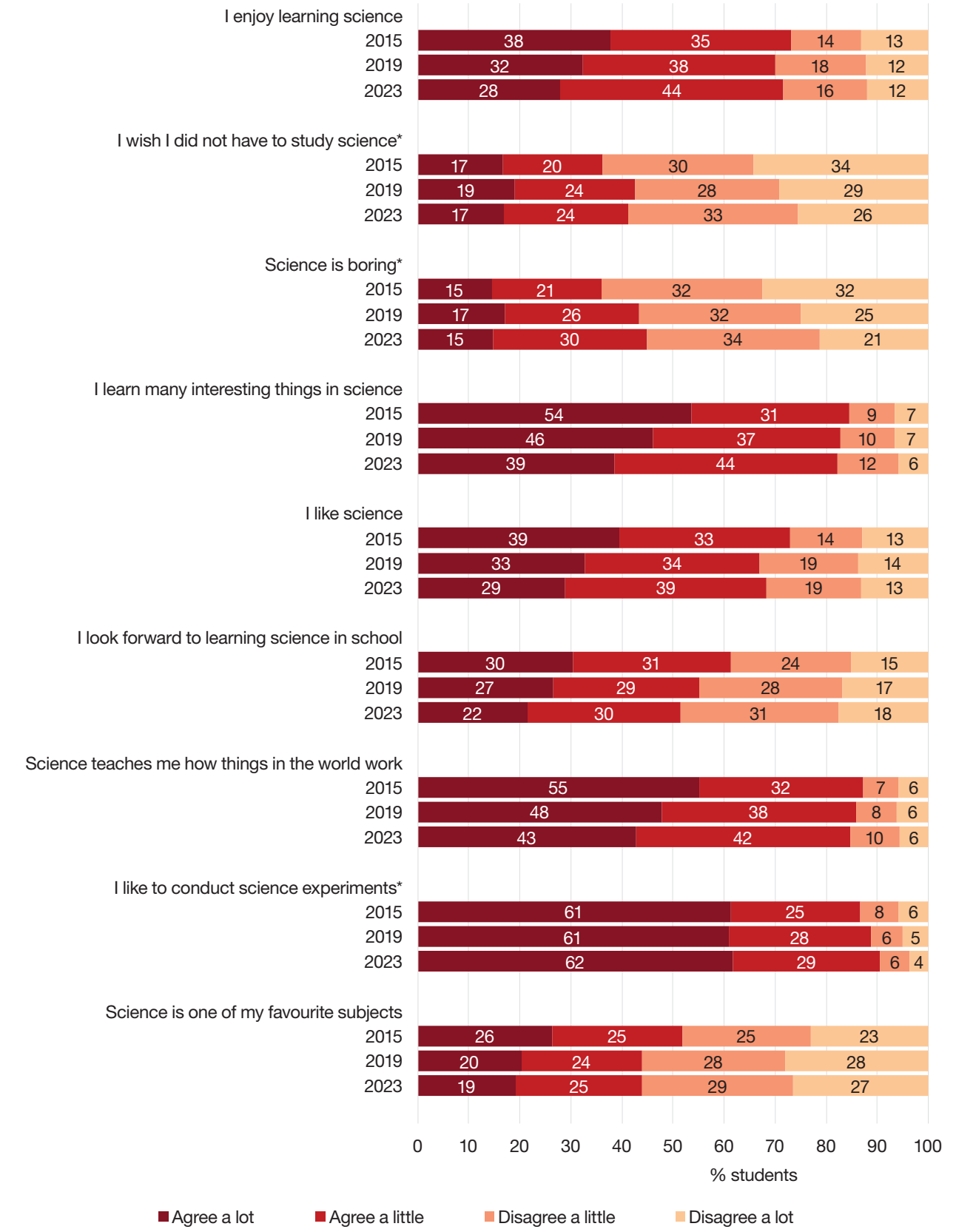


Figure 7.3 presents the percentages of Second Year students by their level of agreement with various statements about their liking of learning science in TIMSS 2015, 2019, and 2023. Although the patterns are slightly mixed, overall, a noticeable and gradual decline in students' liking of learning science can be observed between 2015 and 2023. The largest decrease is observed for the statement 'I learn many interesting things in science', where the percentage of students *agreeing a lot* fell from 54% in 2015, 46% in 2019, to 39% in 2023. Similarly, more students reported wishing they did not have to study science or finding science boring in 2023 compared to previous years. An exception to this general pattern is observed for the statement 'I like to conduct science experiments', which saw relatively little change across the three cycles.

Figure 7.3: Second Year students' endorsement of various statements about liking of learning science (2015, 2019, 2023)



Note. *Item not included in the scale.

Confidence in science

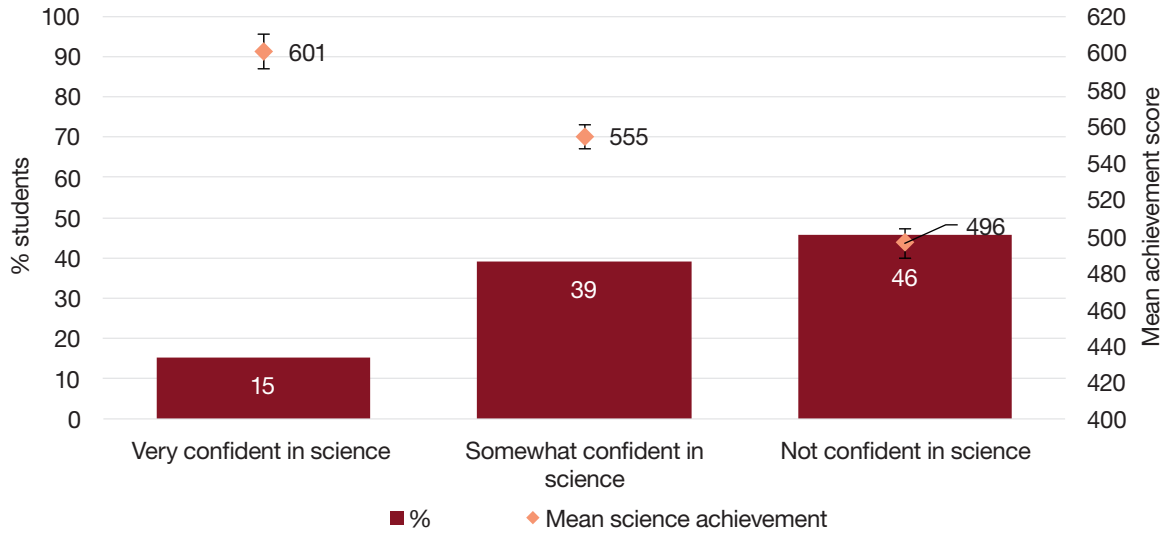
The extent to which Second Year students felt confident in science was captured through eight items in the TIMSS 2023 student questionnaire:

- *I usually do well in science*;
- *Science is harder for me than for many of my classmates*;
- *Science is not one of my strengths*;
- *Science is easy for me*;
- *I am good at working out difficult science problems*;
- *I am good at explaining science to others*;
- *Science is harder for me than any other subject*;
- *Science makes me confused*.

Students were asked to rate their agreement or disagreement with each of these statements. Responses to these eight items were used to create the TIMSS *Students Confident in Science* scale,[27] on the basis of which students were grouped into three categories: *very confident*, *somewhat confident*, or *not confident in science.*

Figure 7.4 presents the percentages and mean science achievement of Second Year students in each category. Approximately 15% indicated that they felt *very confident in science*, 39% felt *somewhat confident*, and 46% *not confident.* These proportions are similar to the international average, 17%, 38%, and 45%, respectively (von Davier, Kennedy, et al., 2024). Second Year students who felt *very confident in science* achieved a significantly higher mean science score (601) than their peers who felt *somewhat confident* (555) and *not confident in science* (496). The associated effect sizes were medium to large (g = .64 and g = 1.41, respectively). There is a moderate to strong positive correlation (r = .45) between the extent to which Second Year students are confident in science and science achievement (Appendix Table A2.1).

Figure 7.4: Second Year students feeling confident in science, percentages and mean science achievement (2023)



27 The overall scale, *Students Confident in Science*, was developed at an international level by Boston College. Full details of the construction of the scale, including the items contributing to it, can be found in von Davier, Fishbein, and Kennedy (2024).

Figure 7.5 presents the percentages of students in each category, broken down by student gender, school gender, and school DEIS status. Boys generally reported higher confidence than girls, with 18% of boys feeling *very confident in science* compared to 12% of girls, and 41% of boys feeling *not confident in science* compared to 51% of girls. While the percentages of students feeling *very confident in science* were very similar across the three school gender types, a smaller proportion of students in boys' schools were *not confident in science* (38%) compared to girls' (45%) and mixed-gender schools (48%). Similarly, although the percentages feeling *very confident in science* were similar in DEIS (14%) and non-DEIS (16%) schools, a higher proportion of students in DEIS schools were *not confident in science* (52%) than in non-DEIS schools (43%).

Figure 7.5: Second Year students feeling confident in science by student gender, school gender, and school DEIS status (2023)

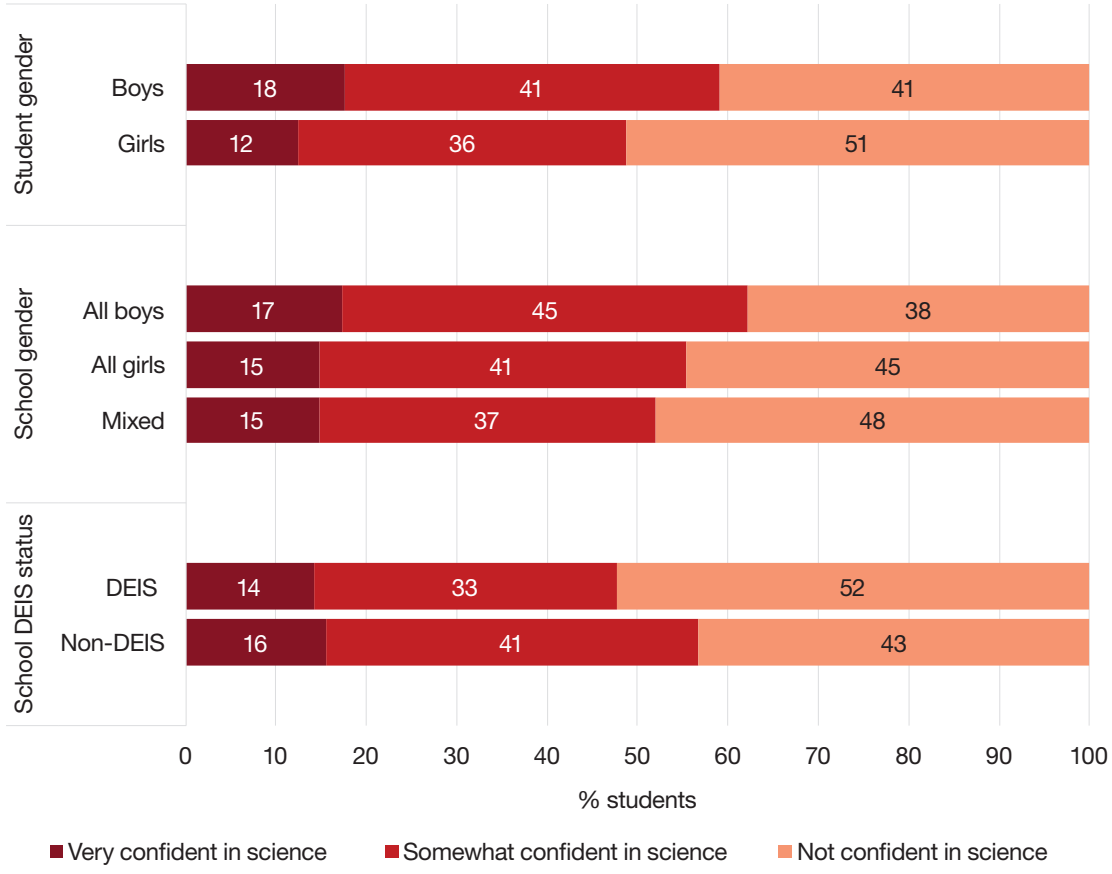
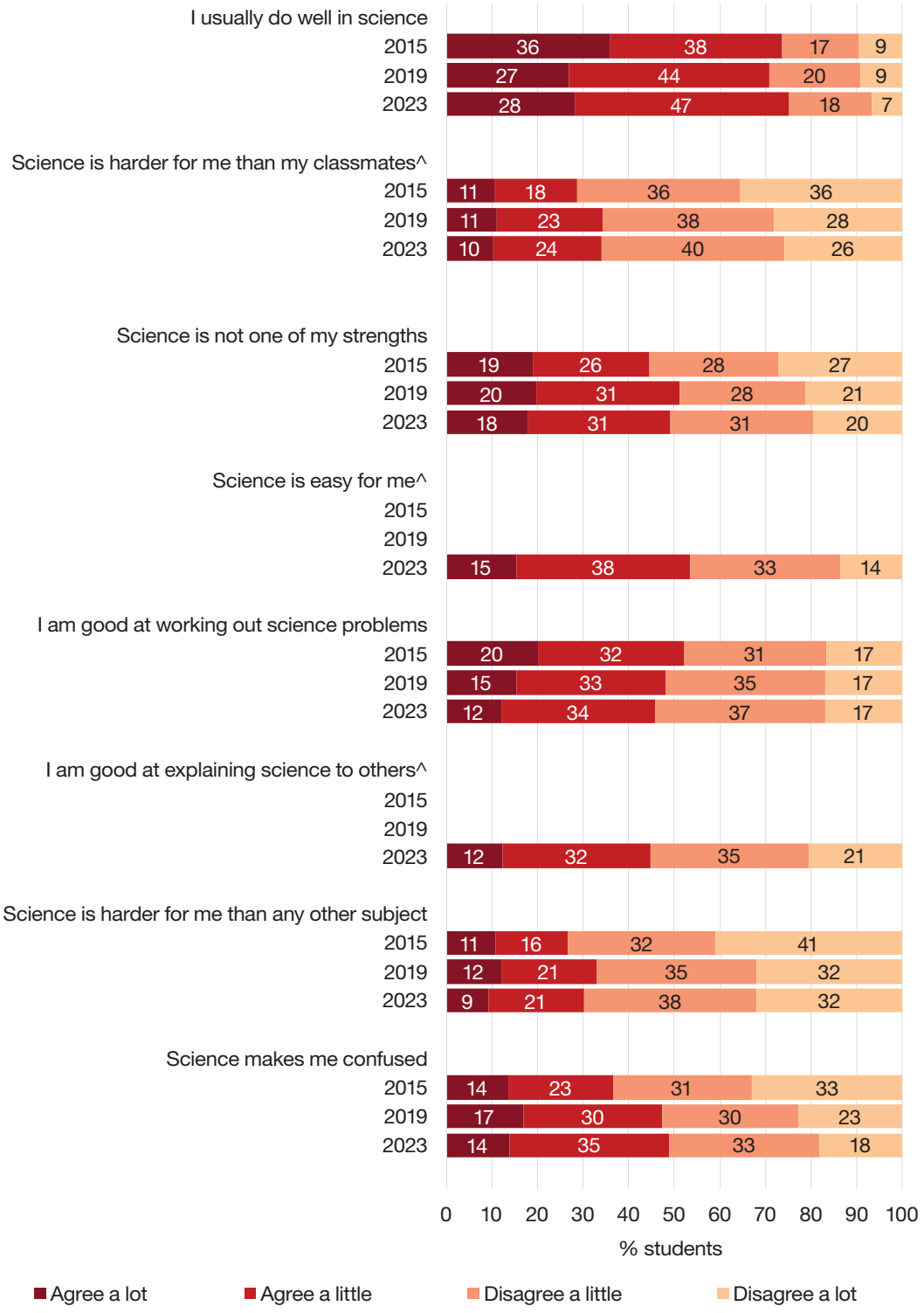


Figure 7.6 presents the percentages of Second Year students by their level of agreement with various statements about the extent to which they felt confident in science in TIMSS 2015, 2019, and 2023. Overall, no clear patterns emerged in how the extent to which students felt confident in science changed between 2015 and 2023. For example, the statement 'I usually do well in science' increased from 71% agreeing (*a lot* or *a little*) in 2019 to 75% in 2023 (similar to 74% in 2015). The statement 'I am good at working out difficult science problems' decreased from 52% agreeing (*a lot* or *a little*) in 2015 to 46% in 2023. Meanwhile, the percentage of students agreeing with the statements 'science is not one of my strengths' and 'science is harder for me than for many of my classmates' increased by four and five percentage points between 2015 and 2023. The largest change in attitude between 2015 and 2023 was in relation to the statement 'science makes me confused', where there was an increase of 12 percentage points in the proportion of students agreeing (*a lot* or *a little*).

Figure 7.6: Second Year students' endorsement of various statements about feeling confident in science (2015, 2019, 2023)



Note. ^2023 item not comparable or not presented to students in 2019 or 2015.[28]
Text for some of the items has been shortened; the full text can be found at the beginning of the *Confidence in science* section.

28 The item 'Science is harder for me than for many of my classmates' was changed slightly in 2023 from 'Science is more difficult for me than for many of my classmates' in 2019 and 2015. As the change in wording is more cosmetic than substantive, the data have been included for all cycles.

Value science

The extent to which Second Year students valued science was captured through nine items in the TIMSS 2023 student questionnaire:

- *I think learning science will help me in my daily life*;
- *I need science to learn other school subjects*;
- *I need to do well in science to get into the college of my choice*;
- *I need to do well in science to get the job I want*;
- *I would like a job that involves using science*;
- *It is important to learn about science to get ahead in the world*;
- *Learning science will give me more job opportunities when I am an adult*;
- *My parent(s)/guardian(s) think that it is important that I do well in science*;
- *It is important to do well in science*.

Students were asked to rate their agreement or disagreement with each of these statements. Responses to eight of these items[29] were used to create the TIMSS *Students Value Science* scale,[30] on the basis of which students were grouped into three categories: *strongly value*, *somewhat value*, or *do not value science*.

Figure 7.7 presents the percentages and mean science achievement of students in each category in 2023. Approximately one-quarter of students (23%) reported that they *strongly valued science*, 38% that they *somewhat valued science*, and 40% that they *did not value science.* On average, internationally, a larger proportion of students indicated that they *strongly value science* (36%), a further 36% indicated that they *somewhat valued science*, and 27% *did not value science* (von Davier, Kennedy, et al., 2024). Second Year students who *strongly valued science* achieved a statistically significantly higher mean science score (560) compared to their peers who *somewhat valued* (542) and *did not value science* (514). The associated effect sizes were small to medium (g = .22 and g = .59, respectively). There is a weak to moderate positive correlation (r = .24) between the extent to which Second Year students value science and science achievement (Appendix Table A2.1).

29 The item '*My parent(s)/guardian(s) think that it is important that I do well in science*' item was not included in the scale.

30 The overall scale, *Students Value Science*, was developed at an international level by Boston College. Full details of the construction of the scale, including the items contributing to it, can be found in von Davier, Fishbein, and Kennedy (2024).

Figure 7.7: Second Year students' valuing of science, percentages and mean science achievement (2023)

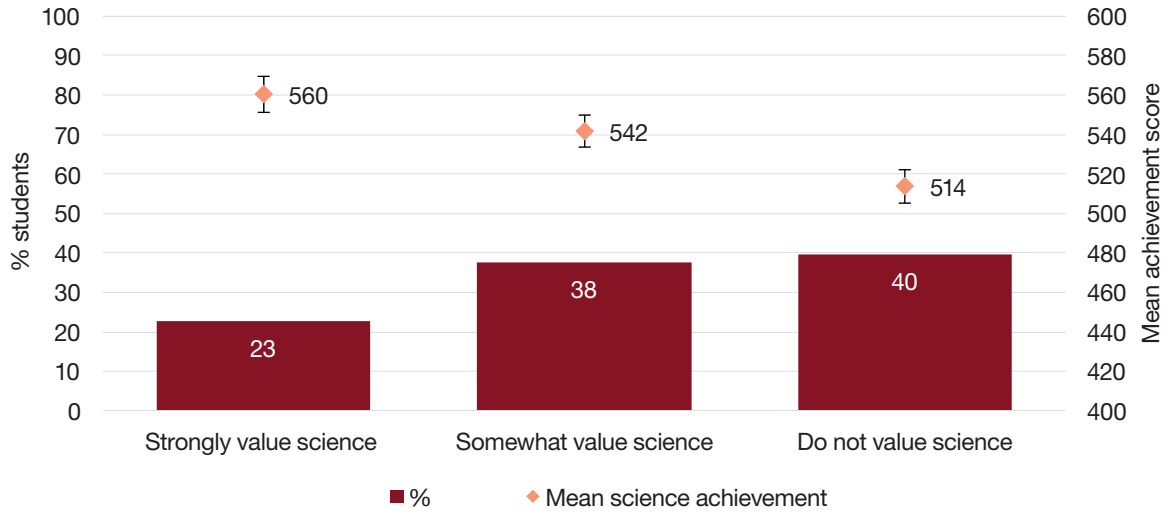


Figure 7.8 presents the percentages of students in each category, broken down by student gender, school gender, and school DEIS status. Although a slightly higher percentage of girls (24%) than boys (21%) *strongly valued science*, identical percentages reported that they *did not value science*. The percentages of students who *strongly value science* were very similar in boys' and mixed-gender schools (22% and 21%, respectively), while a higher proportion was found in girls' schools (30%). Additionally, a higher proportion of students in mixed-gender schools reported that they *do not value science* (42%) compared to boys' (35%) and girls' schools (33%). Lastly, while the percentages of students who *strongly value science* were similar in DEIS (21%) and non-DEIS (23%) schools, a higher proportion in DEIS schools (45%) than in non-DEIS schools (38%) reported *not valuing science*.

Figure 7.8: Second Year students' valuing of science by student gender, school gender, and school DEIS status (2023)

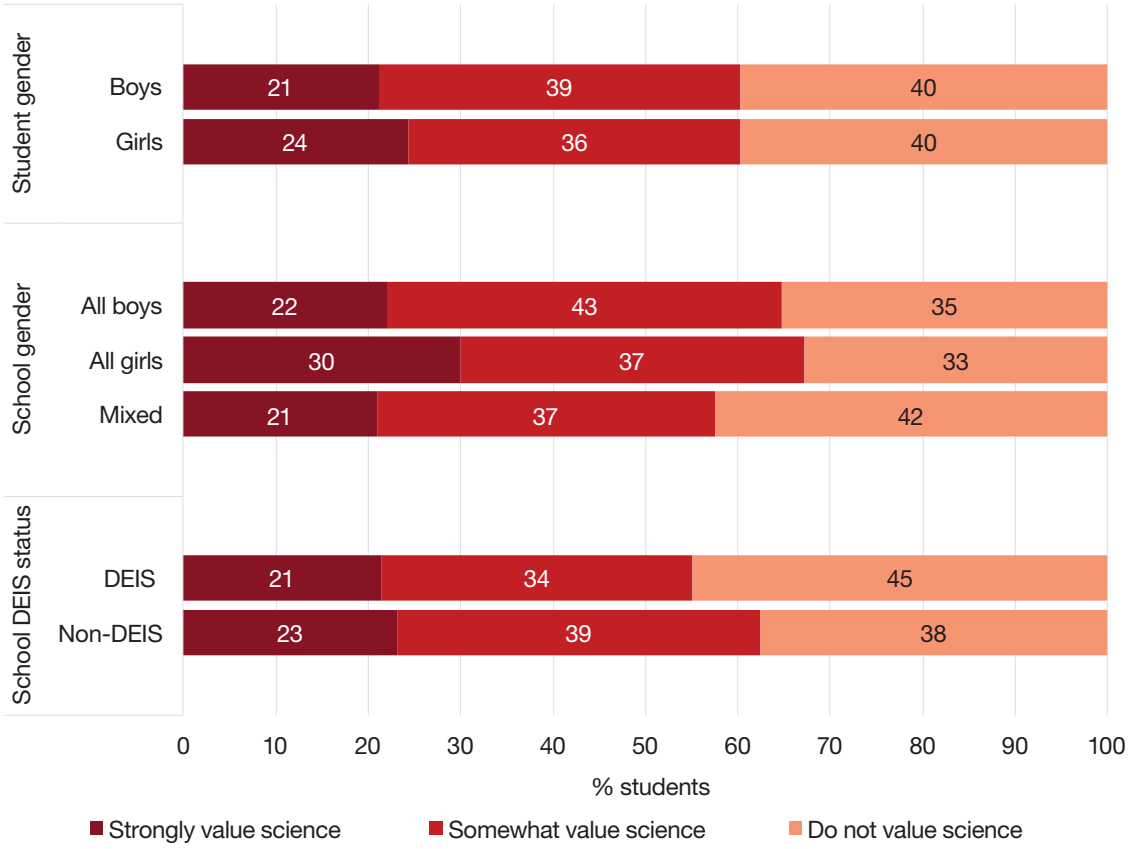
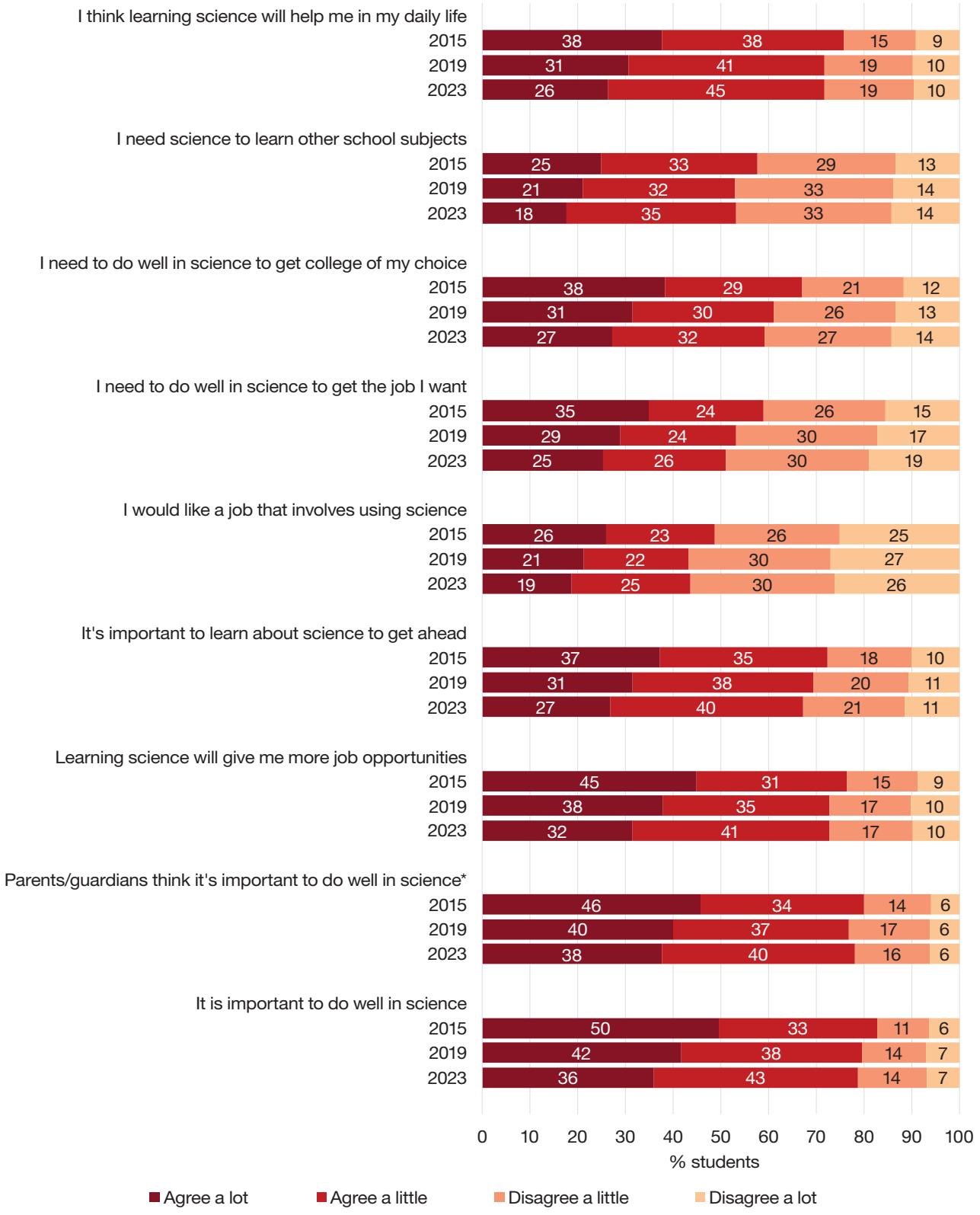


Figure 7.9 presents the percentages of Second Year students by their level of agreement with various statements about the extent to which they valued science in TIMSS 2015, 2019, and 2023. A gradual decline in students' valuing of science is evident between 2015 and 2023. The largest decreases between 2015 and 2023 in the *agree a lot* category were seen for the statements 'learning science will give me more job opportunities when I am an adult' (from 45% to 32%) and 'it is important to do well in science' (from 50% to 36%). Taking a broader view by combining the *agree a lot* and *agree a little* categories, the largest decreases were seen for the statements 'I need to do well in science to get into the college of my choice' (67% to 59%) and 'I need to do well in science to get the job I want' (59% to 51%) over the same period.

Figure 7.9: Second Year students' endorsement of various statements about valuing of science (2015, 2019, 2023)



Note. *Item not included in the scale.
Text for some of the items has been shortened; the full text can be found at the beginning of the *Value science* section.

Chapter 8:
Summary and discussion

In this chapter, we summarise the main findings from the analyses presented in the preceding chapters and highlight key points for discussion.

Key findings

First, a brief summary of the main findings of this report is provided. Readers are encouraged to go back to the relevant sections of the earlier chapters for more detail on any of the following topics.

Frequency of school absence

Between 2019 and 2023, the frequency of student absence from school increased at both Fourth Class and Second Year, according to students' own reports. The proportions of students who said that they were *never or almost never* absent from school declined from 60% to 49% at Fourth Class, and from 46% to 30% at Second Year. At both grade levels, regular absences – once every two weeks or more often – were significantly and negatively associated with achievement in mathematics and science.

Different patterns of absenteeism by gender are apparent between the two levels of education for which TIMSS collects data. At primary level, absences in 2023 tended to be more regular among boys; in boys' and mixed-gender schools; and (to varying degrees) in DEIS schools. At post-primary level, absences were more regular among girls; in girls' and mixed-gender schools; and in DEIS schools.

Sense of school belonging

Just over half of Fourth Class pupils (54%) reported a *high sense of belonging* at school, while 11% of pupils had *little sense of belonging*. Responses were less positive at Second Year, where 21% of students reported a *high sense of belonging* and more than one-quarter (26%) felt *little sense of belonging*. The differences in mathematics and science achievement between students with *high* or *little* sense of belonging were statistically significant, at both grade levels.

At Fourth Class, higher levels of school belonging were reported among girls and in girls' schools. Among DEIS categories, the lowest proportion of students with a *high sense of belonging* was found in DEIS Urban Band 2 schools (46%), with similar proportions (54-55%) found in DEIS Urban Band 1, DEIS Rural, and non-DEIS schools. However, relatively more pupils reported *little sense of belonging* in Urban Band 1 (15%) and Band 2 (14%) schools than in non-DEIS (11%) schools, while fewer did so in DEIS Rural schools (5%). Based on pupils' responses to individual items that were also asked in TIMSS 2019, it appears that pupils' sense of school belonging declined during the 2019-2023 period.

At Second Year, higher levels of school belonging were reported in boys' schools, with the lowest sense of belonging reported in mixed-gender schools. Boys reported a slightly higher sense of school belonging than girls. School belonging was higher in non-DEIS (23% *high* and 23% *little*) than in DEIS schools (17% *high* and 31% *little*). As at Fourth Class, Second Year students' sense of school belonging appears to have declined since 2019.

Experiences of bullying

About two-thirds of students in both Fourth Class (65%) and Second Year (67%) reported that they *never or almost never* experienced bullying. However, almost one-tenth of students (8% and 9%, respectively) said that they experienced bullying behaviours *about weekly*. The differences in mathematics and science achievement between these groups (those who were never bullied and those bullied on approximately a weekly basis) were statistically significant and substantive.

At the student level, similar experiences of bullying were reported by boys and girls in Second Year. In Fourth Class, girls reported experiencing slightly less frequent bullying behaviours than boys. At the school level, more frequent bullying was reported in boys' schools at primary level. At post-primary level, bullying was relatively more frequent in boys' and mixed-gender schools. At Fourth Class, experiences of bullying on a weekly basis were most common in DEIS Urban Band 1 (17%) and DEIS Urban Band 2 (11%) schools, while similar proportions were found in DEIS Rural (7%) and non-DEIS schools (6%). At Second Year, experiences of bullying on a weekly basis were slightly more common in DEIS (11%) than non-DEIS schools (8%). At the level of specific bullying behaviours, student reports at both grade levels indicate that several forms of bullying (e.g., physical aggression in Fourth Class and sharing embarrassing photos online in Second Year) became slightly more common between 2019 and 2023.

Liking of mathematics

Comparable proportions of pupils in Fourth Class were categorised as *very much liking* (28%), *somewhat liking* (35%), and *not liking* (37%) the learning of mathematics, albeit slightly more skewed in the negative direction. Much more pronounced differences are evident at Second Year, where only one-tenth of students (11%) reported *very much liking mathematics* and almost three-fifths (59%) said that they *do not like learning mathematics*. Students who *very much like learning mathematics* achieved a significantly higher mathematics score than those who *do not like learning mathematics* at Fourth Class, and a significantly higher mathematics score than those who *somewhat like* or *do not like learning mathematics* at Second Year.

At Fourth Class, more boys (32%) than girls (24%) reported to *very much like learning mathematics*. The inverse was found at the other end of the scale, where more girls (41%) than boys (33%) said that they *do not like learning mathematics*. Although the proportions of pupils who *do not like learning mathematics* were broadly similar across school gender types (approximately one-third), boys' schools reported a stronger liking of the subject than girls' or mixed-gender schools. Similarly, although comparable proportions of pupils reported to *not like learning mathematics* across the four DEIS categories (36-39%), relatively more pupils *very much liked learning mathematics* in DEIS Urban Band 1 (35%) and DEIS Urban Band 2 (31%) schools than in non-DEIS (27%) or DEIS Rural (25%) schools. Trend analyses of individual items indicate that, in almost every case, Fourth Class pupils' liking of mathematics has undergone a gradual decline across TIMSS cycles, from 2015 to 2019 to 2023 (e.g., a large decrease in the proportion of pupils agreeing that they 'learn many interesting things in maths').

Gender differences among Second Year students were not as marked as those at Fourth Class. Slightly more boys (12%) than girls (9%) reported to *very much like learning mathematics*, while more girls (62%) than boys (56%) reported *not liking* the subject. Differences in the liking of mathematics across school gender types were relatively small, as were differences by school DEIS status. Trend analyses suggest a decline in students' liking of mathematics at Second Year between 2019 and 2023, despite relative stability in attitudes between 2015 and 2019. For instance, the levels of agreement (*a lot* or *a little*) decreased by 10 percentage points for the statement 'I like maths'.

Confidence in mathematics

Similar proportions of Fourth Class pupils reported being *very confident* (27%) and *not confident* (29%) in mathematics. However, at Second Year, relatively fewer students (12%) felt *very confident in mathematics* with more than half (53%) feeling *not confident*. Large minorities (43% of Fourth Class pupils and 35% of Second Year students) fell into the middle *somewhat confident* category. At both grade levels, *very confident* students achieved significantly and substantially higher scores in mathematics than their peers in either of the less confident groups.

At Fourth Class, boys (32%) were more likely than girls (22%) to report feeling *very confident in mathematics*, while girls (34%) were more likely than boys (25%) to feel *not confident*. However, relatively small differences in confidence were found on average across school gender types. Few differences were found across DEIS categories in terms of the percentages of pupils reporting high levels of confidence (24-28%). On the other hand, notably higher proportions of pupils in DEIS Urban Band 2 (39%) and Band 1 schools (35%) expressed feeling *not confident in mathematics*, compared to pupils in DEIS Rural (29%) or non-DEIS (27%) schools. Trend analyses suggest that pupils' confidence in mathematics has gradually declined since 2015. For example, the proportion of pupils agreeing (*a lot* or *a little*) that 'maths makes them confused', rose by 13 percentage points between 2015 and 2023.

Similarly, at Second Year, more boys (15%) than girls (10%) felt *very confident in mathematics,* and more girls (58%) than boys (48%) reported feeling *not confident in mathematics*. Students in girls' and mixed-gender schools reported similar levels of confidence, on average, but a slightly higher proportion of students in boys' schools reported feeling *very confident* and a lower proportion feeling *not confident*. A greater proportion of students in DEIS (57%) than non-DEIS (51%) schools reported feeling *not confident in mathematics*. Unlike at Fourth Class, Second Year students' confidence in mathematics has remained relatively stable between 2015 and 2023.

Valuing of mathematics

Data on the value that students place on learning mathematics are only available at post-primary level as the relevant items were presented to Second Year students, but not pupils in Fourth Class.

One-quarter (25%) of Second Year students reported that they *strongly value mathematics* – i.e., think that mathematics can play a useful role in their lives – and a further 45% *somewhat value* the subject. Responses from almost one-third of students (30%) indicated that they *do not value mathematics*. Students expressing a view of *strongly valuing mathematics* achieved significantly higher mean scores in mathematics than those in the other two categories.

At the student level, boys and girls expressed very similar attitudes in this regard. However, at the school level, students in girls' schools were more likely to report that they *strongly value mathematics* (29%) than their peers in boys' or mixed-gender schools (both 24%). A somewhat higher proportion of students in non-DEIS (26%) than in DEIS (22%) schools reported *strongly valuing mathematics*. The opposite pattern was found at the other end of the scale, with 28% of students in non-DEIS schools and 36% in DEIS schools *not valuing mathematics*. For almost all of the items that feed into the overall measure of valuing mathematics, a clear and gradual decline in students' attitudes can be seen from 2015 to 2019 to 2023. One item provides an exception to this general pattern: similar proportions of students in each of the three recent cycles of TIMSS (37-41%) expressed at least some level of agreement that they would 'like a job that involves using mathematics'.

Liking of science

Close to half (45%) of Fourth Class pupils reported *very much liking science*, with about one-third (34%) *somewhat liking*, and about one-fifth (21%) *not liking the learning of science*. The distribution at Second Year was more balanced, with somewhat fewer students (28%) *very much liking learning science* than *somewhat liking* (36%) or *not liking science* (36%). Students who *very much like learning science* achieved a significantly higher science score than those who *do not like learning science* at Fourth Class, and a significantly higher score than students who either *somewhat like* or *do not like learning science* at Second Year.

At Fourth Class, more boys (49%) than girls (41%) reported that they *very much like learning science*, with relatively similar proportions (20% and 22%, respectively) *not liking learning science.* A greater proportion of pupils in boys' schools (56%) *very much liked science* than in girls' (45%) or mixed-gender (44%) schools. However, similar proportions across the three school gender types (20-21%) *did not like learning science*. Some substantial differences in the liking of learning science can be seen across DEIS categories. The strongest liking was expressed in DEIS Urban Band 1 schools (59% of pupils *very much liking science*) and DEIS Urban Band 2 schools (51%), with smaller proportions in non-DEIS (43%) and DEIS Rural (39%) schools. At the other end of the scale, the proportion *not liking science* ranged from 16% in DEIS Urban Band 1 schools to 24% in DEIS Rural schools. Trend analyses of individual items indicated a declining liking of science among Fourth Class pupils between 2015 and 2023, with particularly noticeable declines evident from 2019 to 2023.

Broadly comparable proportions of boys (29%) and girls (26%) *very much liked learning science* at Second Year, although more girls (40%) than boys (32%) reported *not liking science*. Among school gender types, the largest proportion reporting to *not like learning science* was found in mixed-gender schools (38%), while the largest proportion *very much liking learning science* was in girls' schools (31%). Somewhat fewer students in non-DEIS (34%) than in DEIS schools (40%) reported *not liking science*, with broadly similar proportions *very much liking learning science* in DEIS and non-DEIS settings. Trend analyses indicate that Second Year students' liking of science has gradually declined since 2015.

Confidence in science

A slightly higher proportion of Fourth Class pupils reported being *very confident* (31%) than *not confident* (26%) in science. Confidence was lower among Second Year students, with 15% feeling *very confident* compared to almost half (46%) feeling *not confident*. About two-fifths of students (43% at Fourth Class and 39% at Second Year) were *somewhat confident in science.* At both grade levels, albeit to a greater extent at Second Year, students who were *very confident* achieved a significantly higher score in science than students who were *somewhat confident* or *not confident*. The effect sizes were substantially larger at Second Year (g = .64 and g = 1.41, respectively) than at Fourth Class (g = .30 and g = .78, respectively).

At Fourth Class, boys and girls expressed very similar levels of confidence in learning science. However, a greater proportion of pupils in boys' schools (31%) reported feeling *not confident in science* than pupils in mixed-gender (25%) or girls' (24%) schools. DEIS Urban Band 1 schools had relatively higher proportions of pupils who felt *very confident* or *not confident in science* than non-DEIS schools; conversely, the proportion of *somewhat confident* pupils was higher in non-DEIS settings. Item-level trend analyses indicate that Fourth Class pupils' confidence in learning science is lower in 2023 than in previous cycles of TIMSS with the most noticeable change in the proportions of pupils agreeing (*a lot* or *a little*) that science 'makes them confused' (a 12-percentage-point difference between 2015 and 2023).

At Second Year, more boys (18%) than girls (12%) reported feeling *very confident* and more girls (51%) than boys (41%) felt *not confident in science*. A greater proportion of students in mixed-gender (48%) and girls' (45%) schools than in boys' schools (38%) reported that they are *not confident in science*. A greater proportion of

students in DEIS (52%) than non-DEIS (43%) schools reported feeling *not confident in learning science*, although broadly similar proportions reported feeling *very confident*. Second Year students' confidence appears to have declined to some degree in 2023 relative to previous cycles of TIMSS, although to a lesser extent than the declines seen for *liking of science*.

Valuing of science

Data on the value that students place on learning science are only available at Second Year. About one-quarter (23%) of Second Year students reported *strongly valuing science* (i.e., believing that science can play a useful role in their lives). About two-fifths of students (38%) *somewhat value science* and a similar proportion *do not value science* (40%). Students who *strongly value science* achieved a significantly higher science score than students with less positive attitudes, albeit yielding smaller effect sizes in comparison to those for confidence in science.

A slightly higher percentage of girls (24%) than boys (21%) *strongly valued science*. Accordingly, more students in girls' schools *strongly value science* (30%) than in boys' (22%) or mixed-gender (21%) schools. Similar proportions of students in DEIS (21%) and non-DEIS (23%) schools *strongly value science*, although *not valuing science* was more common in DEIS (45%) than non-DEIS (38%) settings. Trend analyses show a gradual decline in students' valuing of science across the TIMSS cycles from 2015 to 2019 to 2023. In particular, there was a 14-percentage-point decrease in the proportion of students *agreeing a lot* that 'it is important to do well in science'.

Discussion

The findings described above raise several implications of note for students, educators, and policymakers. The following sections discuss some of the key findings of this report, including several issues of concern that may merit additional focused research to better understand the dynamics involved to facilitate considered responses from policymakers and practitioners.

More frequent school absences in 2023

A negative link between frequent absence from schools and academic achievement is well-established in previous research. This pattern is highlighted again in the TIMSS 2023 data in the form of significantly lower mathematics and science achievement among Fourth Class and Second Year students who were regularly absent from school – namely, among students who were absent at least *once every two weeks*.

The reasons for student absences are not recorded in the TIMSS data so, for example, it is not clear how frequently these absences arise due to circumstances in the home, illness, or other reasons. However, a notable finding is that students at both grade levels – albeit to a greater extent at post-primary level – reported more frequent absences from school in 2023 than their equivalent cohorts in previous cycles of TIMSS.

At Fourth Class, about half of the pupils participating in TIMSS 2023 reported being *never or almost never* absent from school, compared to 70% of pupils in 2015 (Perkins et al., 2020). An important methodological caveat to note in these comparisons is that pupils in TIMSS 2023 were offered an additional response option (*once every two months*), which was not available in 2015, and it is possible that this option was selected by some pupils who might otherwise have selected *never or almost never* rather than *once a month*. Combining the *never or almost never* and *once every two months* categories in 2023 yields a similar figure (70%) to *never or almost never* by itself in 2015. However, data from TIMSS 2019 – which are more directly comparable with

the more recent 2023 data and are reported in Chapter 2 – clearly show a decrease (from 60% to 49%) in the proportion of pupils responding *never or almost never* between these two most recent cycles of the study, along with increases in reported weekly and monthly rates of absence since 2019.

More striking changes are apparent at Second Year, where the proportion of students *never or almost never* absent in 2023 (30%) has halved since 2015 (63%; Perkins et al., 2020). Even if it is assumed that all students who reported being absent *once every two months* in 2023 can be included in the comparison, the combined 53% of students in 2023 reporting infrequent absence remains lower than the corresponding figure in 2015. A more direct examination of trend data since 2019 shows that the 30% of students who were *never or almost never* absent in 2023 is only two-thirds the corresponding proportion (46%) who selected that option in TIMSS 2019. At the other end of the scale, a substantially higher percentage of students in 2023 (21%) compared to 2015 (10%) or 2019 (13%) reported being absent either *once a week* or *once every two weeks*. Overall, then, it is evident that Second Year students in TIMSS 2023 reported a higher level of absence from school than was seen in previous cohorts. Internationally, the percentage of Eighth Grade students in TIMSS who reported *never or almost never* being absent from school dropped by nine percentage points between 2019 (55%) and 2023 (46%),[31] while research from other countries also indicates a substantial increase in chronic absenteeism since the pandemic (e.g., USA; Malkus, 2025).

The implications of these increasing rates of absence can be considered in light of the well-established links between student absenteeism, engagement at school, academic achievement, and wellbeing more broadly construed (Schnell et al., 2025; Smyth et al., 2006; Wang et al., 2023). National data reported by schools indicate that substantially greater proportions of students missed more than 20 days of school in 2021/22 (the first school year without nationally mandated school closures since the onset of the COVID-19 pandemic) than in 2019/20 (the school year that concluded with the first pandemic-related closures). At primary level, the percentage of students missing more than 20 days in a school year increased from 5% to 40% over this period, with increases from almost 10% to 27% at post-primary level (TESS, 2023). Non-attendance rates were reported to be highest (at primary level) among DEIS Urban Band 1 schools and (at post-primary level) among DEIS compared to non-DEIS schools (TESS, 2023), consistent with the TIMSS data reported here. However, more up-to-date national-level attendance data have not been published at the time of writing.[32]

In the absence of current comprehensive reports at a national level, the TIMSS 2023 data provide a more recent nationally representative indication of students' frequency of school attendance in Fourth Class and Second Year, albeit with the (significant) caveat that these data are based on student self-reports rather than contemporaneous school statistics. Notwithstanding this limitation, the TIMSS 2023 data indicate clearly that rates of student absence from school have increased since 2019.

Declining attitudes from 2015 to 2023

Across almost all of the attitudinal variables examined in this report, we can see evidence of less enthusiastic and more negative attitudes among the 2023 cohort of students than in previous cohorts. Due to changes across TIMSS cycles in how some of these overarching scales have been constructed at an international level, the focus of these trend comparisons is at the level of individual items and how students responded to them in 2015, 2019, and 2023.

Recent research has indicated that 13-year-olds' interest in mathematics and science increased somewhat over the decade from 2011/12 to 2021/22 (Smyth, 2024). However, notwithstanding some variation across

31 Authors' calculations using the TIMSS 2023 and TIMSS 2019 international databases, which can be accessed at https://timss2023.org.

32 As of 9th May 2025, the most recent attendance report published at https://www.tusla.ie/services/educational-welfare-services/publications/research-and-statistics/ presents the 2019-2022 data cited in text.

specific items and scales in the degree of change over time, the wider set of indicators available in the TIMSS data suggests that the broader picture is one of declines (at both Fourth Class and Second Year) in students' sense of school belonging and their liking of mathematics and science; their confidence in mathematics and science (mainly at Fourth Class); and the extent to which they value mathematics and science (at Second Year). As noted throughout the report and in Appendix Table A2.1, students' attitudes towards mathematics and science tend to be positively correlated with their achievement in these subjects, with the strongest relationship with achievement found for students' levels of confidence. In some cases, these declines have been gradual and incrementally occurring since 2015. In others, poorer attitudes have emerged mainly between 2019 and 2023. Some illustrative examples worth noting include the following:

- The proportion of students agreeing (*a lot* or *a little*) that they 'like maths' has decreased at Fourth Class by 12 percentage points between 2015 and 2023 and, at Second Year, by 10 percentage points, from about one-in-six students to one-in-five over the same time period.
- At Fourth Class, pupils' declining liking of science can be seen in the diminished percentages *agreeing a lot* that they 'enjoy learning science' (from 62% in 2015 to 47% in 2023); 'learn many interesting things in science' (74% to 58%); 'like science' (63% to 46%); 'look forward to learning science in school' (58% to 44%); and 'science teaches them how things in the world work' (76% to 54%).
- Fourth Class pupils' declining confidence in both subject areas can be seen in the substantially lower percentages of pupils in 2023 who *disagree a lot* that 'mathematics/science are harder for them than for their classmates', that 'they are just not good at mathematics/science', that 'mathematics/science are harder for them than any other subject', and that 'mathematics/science make them confused'.
- At Second Year, reductions in students' valuing of mathematics can be seen in the lower percentages *agreeing a lot* that it is important to do well in mathematics (from 68% in 2015 to 47% in 2023); that learning mathematics will assist in finding job opportunities (64% to 43%); that doing well in mathematics will help them get into a desired college (61% to 42%) or job (52% to 34%); that learning mathematics is important to get ahead in the world (41% to 26%); and that learning mathematics can help them in their daily lives (45% to 24%).

As can be seen, several of these indicators have changed from having a majority to a minority of (strongly) positive student responses over the last decade. Although these declining patterns have not been accompanied by changes in the average performance of students in Ireland on the TIMSS mathematics and science assessments over this period (McHugh et al., 2024), these attitudinal trends may eventually result in fewer students pursuing STEM-related subjects or courses and may impact students achieving at the highest levels of achievement, both of which have repeatedly been noted as requiring further development in Ireland (Clerkin & Delaney, 2025; Department of Education, 2024b; Department of Education and Skills, 2017b; Pitsia, 2022). Although the data reported here show greater proportions of students liking science than mathematics, the large recent declines in Fourth Class pupils' attitudes towards science nonetheless pose a concern. For instance, in international comparative terms, Fourth Class pupils' performance on the science component of the TIMSS assessment has consistently tended to be weaker than for mathematics, even when attitudes were more positive (Clerkin et al., 2016; Eivers & Clerkin, 2012; McHugh et al., 2024; Perkins & Clerkin, 2020).

These downward trends in attitudes are sobering given that the importance of fostering greater enjoyment of subjects such as science and mathematics was highlighted almost a decade ago by the STEM Education Review Group (2016) and the *STEM Education Policy Statement 2017-2026* (Department of Education and Skills, 2017a). References to fostering positive student dispositions towards mathematical and scientific learning are also contained within relevant recent curricular developments at both primary level (Department of Education, 2023a, 2023b; National Council for Curriculum and Assessment, 2024) and Junior Cycle (Department of Education and Skills, 2015a, 2015b, 2017b). For example, the *Primary Mathematics Curriculum* places an emphasis on "playful and engaging learning experiences" (Department of Education, 2023b, p. 3) and notes five

key pedagogical practices for the classroom: fostering productive dispositions; encouraging playfulness with mathematics; emphasising mathematical modelling; using cognitively challenging tasks; and promoting maths talk. Similarly, revised science and mathematics specifications at Junior Cycle are partly intended to improve students' dispositions towards learning those subjects – for example, through the introduction of Classroom-Based Assessments (CBAs), which are viewed as encouraging students to develop important skills, enabling active learning approaches, and supporting students to enhance their capacity to learn (McGarr et al., 2024). However, students report that despite these positive aspects, the scheduling of CBAs – with many deadlines coming at the same time – impinges on their enjoyment of the task and is associated with significant stress (McGarr et al., 2023), while some reservations have also been expressed by science teachers (Irish Science Teachers' Association, 2019). It is worth noting that the deadlines for Second Year students to complete CBAs tend to occur near the end of the school year, within a month or so following the administration of the TIMSS 2023 questionnaires, suggesting that the questionnaires may have been completed at a time when students were engaging with CBAs and the added pressure of approaching deadlines for completion.

Overall, the TIMSS trend analyses suggest that additional efforts will be needed over the coming years to adequately support students' enjoyment, confidence in, and valuing of STEM subjects. Notably, a deterioration in primary-level pupils' confidence and liking of reading between 2016 and 2021 has also been reported in Ireland (Pitsia et al., 2024), suggesting that worsening attitudes are not confined to the domains of mathematics or science. A similar conclusion is also suggested by the downward trends reported here in students' sense of school belonging.

In the context of the attitudinal changes seen here from 2015 to 2023 – and, for some variables, in particular, from 2019 to 2023 – the question arises as to how much of that change can be attributed to lingering effects of the COVID-19 pandemic. The first point to note is that several of the indicators reported here suggest that attitudes have been deteriorating over a longer timespan prior to the onset of the pandemic. Nonetheless, the extent of change appears to have increased in some respects between 2019 and 2023. Globally, several studies have been conducted on the extent of learning loss associated with school closures and other disruptions to education during the pandemic (e.g., Jakubowski et al., 2025). However, less attention has been paid to date to any corresponding changes in student experiences and attitudes, with some limited exceptions that mostly originate from the period of the pandemic rather than offering a longer-term perspective (e.g., Alanko et al., 2024; Chzhen et al., 2022; Schmitt-Cerna et al., 2024). TIMSS data show that, for example, there has been an increase internationally in the proportion of Eighth Grade students reporting that 'mathematics makes them confused' (from 47% in 2019 to 55% in 2023), even though responses were relatively stable between 2015 and 2019 on this item.[33] TIMSS 2023 data show that the percentage of Eighth Grade students who reported *very much liking mathematics* was substantially higher internationally (21%) than the percentage of Second Year students in Ireland (11%); similarly, more students reported *very much liking learning science* internationally (40%) than in Ireland (28%) (von Davier, Kennedy, et al., 2024). The data reported here suggest that further research specifically focused on this topic – including the extent to which any declines that have occurred since the pandemic are likely to persist – is merited, both in the Irish national context and more widely.

Gender differences in school experiences and attitudes

Somewhat different patterns of gender differences in students' experiences of school life are evident. At Fourth Class, school belonging was strongest among girls, whereas, at Second Year, feelings of belonging were stronger among boys. While similar experiences of bullying were reported by boys and girls in Second Year, in Fourth Class, girls reported experiencing slightly less frequent bullying behaviours than boys. These patterns

33 Authors' calculations using the TIMSS 2023 and TIMSS 2019 international databases, which can be accessed at https://timss2023.org.

are also reflected in gender differences in rates of school absence, which are found here to be higher for boys at primary level and higher for girls at post-primary level. At both grade levels, there were few gender differences in students' reports of school absence in TIMSS 2019, which means that the differences highlighted here have emerged only between 2019 and 2023.

In terms of broader attitudes towards school, Smyth (2017), using data from the Growing Up in Ireland study, showed that 13-year-old girls at that point were more likely than boys to like school 'very much'. Similarly, earlier analyses had highlighted a greater level of educational disengagement among boys than girls as they moved through Junior Cycle (Smyth et al., 2006). Although the indicators are not directly comparable, these previous findings stand in contrast to the TIMSS 2023 data, which show a stronger sense of school belonging among Second Year boys (at approximately 14 years old) than girls.

Greater consistency, and larger gender differences, can be seen in terms of students' attitudes towards mathematics and science in the TIMSS 2023 data. In relation to mathematics, at both Fourth Class and Second Year, girls enjoy learning mathematics less than boys and they are less confident in mathematics than boys. Interestingly, despite the differences in attitudes relating to enjoyment and confidence, boys and girls value mathematics at Second Year to a similar extent. In relation to science, at both grade levels, boys like learning the subject more than girls. At Fourth Class, levels of confidence are similar between boys and girls; however, at Second Year, boys are more confident in science than girls. For valuing science, similar proportions of boys and girls *do not value science.*

Gender differences in attitudes towards learning are found in many countries (Campos et al., 2025; Ghasemi & Burley, 2019) but are worth noting in the Irish context, given the renewed focus on fostering positive attitudes towards mathematics and reducing gender differences in this regard as expressed in the national LNDL strategy (Department of Education, 2024b) and efforts at curricular reform over the last decade. The TIMSS data reported here are broadly consistent with other studies that have also demonstrated more positive views held by boys than girls in Ireland in relation to the learning of mathematics and science (Devine et al., 2024b; Smyth, 2024). Given the achievement gaps by gender now present for the first time in TIMSS 2023 at Second Year (Clerkin et al., 2025; McHugh et al., 2024), renewed efforts should be made to target the improvement of attitudes to mathematics and science, particularly among girls, especially given its known association with achievement.

Differences in school experiences and attitudes by DEIS status

The data reported here suggest both positive and negative findings in terms of differences in student experiences by school DEIS status.

At both grade levels, more frequent school absences were reported by students in DEIS schools. Feelings of school belonging were weaker among students in DEIS schools at Second Year, and among pupils in DEIS Urban Band 2 schools (but not Band 1 schools) at Fourth Class, while, a notably smaller proportion of pupils in DEIS Rural schools (5%) compared to all other school categories (11-15%) reported having *little sense of belonging* at school. At primary level, bullying was reported to be experienced more often by pupils in DEIS Urban (Band 1 and Band 2) schools than in DEIS Rural or non-DEIS schools. However, at post-primary level, differences in bullying behaviour between DEIS and non-DEIS schools were relatively small.

At Fourth Class, an encouraging finding of note is that pupils in DEIS Urban (Band 1 and Band 2) schools reported a strong liking of learning mathematics and science relative to pupils in DEIS Rural or non-DEIS schools. This is comparable to findings from the Children's School Lives (CSL) study, which noted that Fifth Class pupils in non-DEIS schools are somewhat more likely than those in DEIS schools to indicate that they are bored learning mathematics as well as social, environmental, and scientific education (Devine et al., 2024a). These patterns mark a change since TIMSS 2011, when pupils in DEIS Urban Band 2 schools expressed more negative feelings about school than pupils in all other DEIS categories (Clerkin & Creaven, 2013). The finding of

a strong liking of both STEM subjects in DEIS Urban primary schools is also positive in light of previous analysis showing that Fourth Class pupils' liking of science was particularly strongly associated with higher science achievement in more highly disadvantaged school contexts, relative to contexts with minor or moderate levels of disadvantage (Nonte et al., 2022). However, pupils' confidence in both subjects in 2023 was more balanced across DEIS categories, albeit with a higher proportion of pupils in DEIS Urban schools feeling *not confident* in mathematics or science.

At Second Year, broadly comparable proportions of students in DEIS and non-DEIS schools expressed strong liking, high confidence, and strong valuing of mathematics and science, but more students in DEIS schools tended to express low levels of liking, confidence, or perceived value. For comparison, Nelis et al. (2021) found that students in post-primary DEIS schools reported a significantly lower mean score than students in non-DEIS schools on an indicator of the perceived value of schooling. That indicator was general – that is, applied to school as a whole – rather than the domain-specific indicators in TIMSS. Based on the TIMSS 2023 data, for mathematics and science at least, it appears that efforts to support student engagement, promotion of positive attitudes towards learning, and promotion of the value of STEM subjects should be especially cognisant of a need to support the relatively larger cohort of students with more negative perceptions in DEIS schools. Further information about the resources and educational practices of DEIS and non-DEIS schools will be reported in a forthcoming TIMSS 2023 report of school and classroom learning environments (Pitsia et al., forthcoming).

Differences between primary and post-primary levels

Correlations between mathematics/science achievement and students' attitudes towards these subjects, and their sense of school belonging more generally, indicate that students' attitudes are more strongly related to their achievement at Second Year than at Fourth Class (Appendix Table A2.1). At the same time, students in Second Year in TIMSS 2023 tended – across almost all indicators examined – to report a more negative view of school than pupils in Fourth Class. For example, compared to Fourth Class pupils, Second Year students reported:

- Weaker feelings of school belonging (54% vs 21% reporting a *high sense of belonging*);
- Weaker perceptions of teacher support (8% vs 30% disagreeing that their teachers care about them);
- Lower liking of mathematics (28% vs 11% *very much like learning mathematics*);
- Lower confidence in mathematics (27% vs 12% *very confident* in mathematics and 29% vs 53% *not confident*);
- Lower liking of science (45% vs 28% *very much like learning science*);
- Lower confidence in science (31% vs 15% *very confident in science* and 26% vs 46% *not confident*);

High proportions of students at both grade levels, but particularly at Second Year, expressed feelings of interpersonal discomfort at school. For example, about one-tenth of Fourth Class pupils disagreed that their peers like them as they are, and about one-fifth of Second Year students disagreed that their peers either like or respect them.

Notably, Smyth's (2017) analysis suggests that students' attitudes towards school at primary level were associated with their subsequent attitudes after transitioning to post-primary level, but with substantial fluidity among large proportions of young people whose attitudes towards school either worsened or improved over time. In terms of domain-specific attitudes, students' views of mathematics from age 9 to age 13 were found to be more closely related to their early proficiency in the subject than was found for English. In that sense, Smyth (2017) noted that "fostering foundational skills in maths at primary level was crucial to a later positive engagement with the subject" (p. 51). International research has also highlighted the challenges that can arise

during students' transition from primary to post-primary education, including the importance of students' relationships with teachers and peers, the availability of emotional support, and their perceptions of the school environment and school safety (Symonds & Galton, 2014).

Unfortunately, although the TIMSS data provide a representative picture of the attitudes of Fourth Class and Second Year students in Ireland, data from individual students cannot be matched across cycles/grades and so examination of the extent of changes in individual students' experiences of school and attitudes over time are not possible with these data. However, a decline in students' enjoyment of going to school as they progress through from the junior to the more senior classes in primary school has been highlighted in a series of CSL reports (Devine et al., 2023; Martinez Sainz et al., 2023; Sloan et al., 2024). Taking these into consideration – and mindful of declines in student attitudes across recent cycles of TIMSS, as discussed above – it is clear that the interactions between student achievement in a subject and their views of the subject can vary substantially as students move from primary school to post-primary school and beyond. In that regard, efforts to improve students' experiences of school (both generally and in specific domains of learning) should take a holistic view of the student experience, with particular consideration given to delicate transitional points in their educational lives such as the transition from primary to post-primary schooling. Considerations to these transitions can be seen in current curricular frameworks which recognise and support the need to effectively support students around these transitional points (Department of Education, 2023a).

TIMSS 2023 national reporting and further research

This report is the third in a series of national reports describing the main findings for Ireland from TIMSS 2023. Previous reports have focused on the mathematics and science achievement of students in Ireland (McHugh et al., 2024) and on students' environmental knowledge and attitudes (Clerkin et al., 2025). Forthcoming reports will describe in detail the characteristics, resources, and practices of schools and classrooms as well as home environments of Fourth Class and Second Year students. These reports will be made available on www.erc.ie in the coming months.

Simultaneously, work is underway for the next cycle of TIMSS, the main data collection of which is scheduled in 2027. The findings of the current set of reports can be compared against the data that arise from the 2027 cycle to monitor how student achievement and experiences evolve over the coming years.

The findings presented in this report provide valuable new information about several aspects of students' experiences of school and their attitudes towards learning mathematics and science. However, particularly in light of some concerning trends described above, the findings also raise further questions that merit additional research. Future work focused on declines in student attitudes could include a more in-depth multivariate examination of topics such as the interrelationships between (changes over time in) school attendance, experience of bullying behaviours, sense of belonging, and attitudes to mathematics and science. In addition, data from other sources such as teacher and principal reports of the school and classroom environments – including, for example, the school disciplinary atmosphere and classroom organisation and teaching practices – can be examined for their relationships with students' experiences of school and learning. A forthcoming TIMSS 2023 report (Pitsia et al., forthcoming) will go towards providing more detail on the school and classroom environments of Fourth Class and Second Year students.

In addition, ongoing mixed-method studies such as CSL and the University of Limerick's evaluation of the impact of the Junior Cycle Framework (see McGarr et al., 2023, 2024) may be able to shed additional light on students' views on the value of mathematics and science with respect to, for example, students' interactions with teachers and how classroom pedagogies and discussions may impact the formation of attitudes.

References

Adamma, O. N., Ekwutosim, O. P., & Unamba, E. C. (2018). Influence of extrinsic and intrinsic motivation on pupils academic performance in mathematics. *Supremum Journal of Mathematics Education*, *2*(2), 52–59. https://doi.org/10.5281/zenodo.1405857

Alanko, K., Kuhlberg, L., & Lagerström. M. (2024). Factors associated with school engagement changes during the COVID-19 pandemic among Finnish middle school students. *European Journal of Psychology Open*, *83*(3), 109–118. https://doi.org/10.1024/2673-8627/a000062

Appleton, J. J., Christenson, S. L., & Furlong, M. J. (2008). Student engagement with school: Critical conceptual and methodological issues of the construct. *Psychology in the Schools*, *45*, 369–386. https://doi.org/10.1002/pits.20303

Bandura, A. (2001). Social cognitive theory: An agentic perspective. *Annual Review of Psychology, 52*, 1–26. https://doi.org/10.1146/annurev.psych.52.1.1

Bandura, A. (2006). Toward a psychology of human agency. *Perspectives on Psychological Science, 1*(2), 164–180. https://doi.org/10.1111/j.1745-6916.2006.00011.x

Campos, M., Eryilmaz, N., & Strietholt, R. (2025). Beyond achievement gaps: Inequalities in affective components of math learning. *Large-scale Assessments in Education*, *13*(12). https://doi.org/10.1186/s40536-025-00249-8

Carroll, S., McCauley, V., & Grenon, M. (2023). Science self-efficacy beliefs of upper primary students in Ireland. *International Journal of Science Education*, *46*(6), 503–523. https://doi.org/10.1080/09500693.2023.2245947

Chzhen, Y., Symonds, J., Devine, D., Mikolai, J., Harkness, S., Sloan, S., & Martinez Sainz, G. (2022). Learning in a pandemic: Primary school children's emotional engagement with remote schooling during the spring 2020 Covid-19 lockdown in Ireland. *Child Indicators Research*, *15*, 1517–1538. https://doi.org/10.1007/s12187-022-09922-8

Çiftçi, Ş. K., & Yıldız, P. (2019). The effect of self-confidence on mathematics achievement: The meta-analysis of Trends in International Mathematics and Science Study (TIMSS). *International Journal of Instruction, 12*(2), 683–694. https://doi.org/10.29333/iji.2019.12243a

Clerkin, A., & Creaven, A.-M. (2013). Pupil engagement. In E. Eivers & A. Clerkin (Eds.), *National schools, international contexts: Beyond the PIRLS and TIMSS test results* (pp. 33–54). Educational Research Centre. http://www.erc.ie/documents/pt2011_context_report.pdf

Clerkin, A., & Delaney, E. (2025). How large-scale assessments have informed education policy in Ireland. *IEA Compass: Briefs in Education,* No 26. IEA. https://www.iea.nl/sites/default/files/2025-01/CB26-LSA-Data-Informing-Policy-Ireland.pdf

Clerkin, A., Piccio, G., Denner, S., Pitsia, V., & McHugh, G. (2025). *Environmental knowledge and attitudes in Ireland's schools: Findings from TIMSS 2023*. Educational Research Centre. https://doi.org/10.70092/5142220.0525

Clerkin, A., Perkins, R., & Cunningham, R. (2016). *TIMSS 2015 in Ireland: Mathematics and science in primary and post-primary schools.* Educational Research Centre. https://www.erc.ie/wp-content/uploads/2016/11/TIMSS-initial-report-FINAL.pdf

Coe, R., & Kime, S. (2013). *The DIY evaluation guide.* Education Endowment Foundation. https://www.testingtreatments.org/wp-content/uploads/2017/11/EEF_DIY_Evaluation_Guide_2013.pdf

Cohen, J. (1988). *Statistical power analysis for the behavioral sciences* (2nd ed.). Lawrence Erlbaum Associates.

Crick, N. R., & Grotpeter, J. K. (1995). Relational aggression, gender, and social-psychological adjustment. *Child Development, 66*(3), 710–722. https://doi.org/10.2307/1131945

Deci, E.L., & Ryan, R.M. (1985). *Intrinsic motivation and self-determination in human behavior*. Springer. https://doi.org/10.1007/978-1-4899-2271-7

Department of Education and Skills. (2013). *Action plan on bullying: Report of the Anti-Bullying Working Group to the Minister for Education and Skills*. https://assets.gov.ie/24758/0966ef74d92c4af3b50d64d286ce67d0.pdf

Department of Education and Skills. (2015a). *Framework for Junior Cycle 2015.* https://ncca.ie/media/3249/framework-for-junior-cycle-2015-en.pdf

Department of Education and Skills. (2015b). *Junior Cycle science: Curriculum specification.* https://www.curriculumonline.ie/getmedia/f668d804-6283-4d4a-84ab-c71e5b37d198/Specification-for-Junior-Cycle-Science.pdf

Department of Education and Skills. (2017a). *STEM education: Policy statement 2017–2026.* https://assets.gov.ie/43627/06a5face02ae4ecd921334833a4687ac.pdf

Department of Education and Skills. (2017b). *Junior Cycle mathematics.* https://www.curriculumonline.ie/getmedia/6a7f1ff5-9b9e-4d71-8e1f-6d4f932191db/JC_Mathematics_Specification.pdf

Department of Education. (2019). *Wellbeing policy statement and framework for practice: 2018-2023.* https://www.gov.ie/en/department-of-education/campaigns/wellbeing-in-education

Department of Education. (2022). *Cineáltas: Action plan on bullying*. https://assets.gov.ie/static/documents/cinealtas-action-plan-on-bullying.pdf

Department of Education. (2023a). *Primary curriculum framework: For primary and special schools*. https://www.curriculumonline.ie/getmedia/84747851-0581-431b-b4d7-dc6ee850883e/2023-Primary-Framework-ENG-screen.pdf

Department of Education (2023b). *Primary mathematics curriculum: For primary and special schools*. https://www.curriculumonline.ie/getmedia/484d888b-21d4-424d-9a5c-3d849b0159a1/PrimaryMathematicsCurriculum_EN.pdf

Department of Education. (2024a). *Bí Cineálta: Procedures to prevent and address bullying behaviour for primary and post-primary schools*. https://assets.gov.ie/296487/d0ea26bc-5b6c-45f3-b0fd-2f3e2d3c1f07.pdf

Department of Education. (2024b). *Ireland's literacy, numeracy and digital literacy strategy 2024-2033: Every learner from birth to young adulthood.* https://assets.gov.ie/293255/a509a8d7-a4ac-43f9-acb0-29cdc26a1327.pdf

Department of Education, & National Educational Psychological Service. (2024). *Managing reluctant attendance and school avoidance behaviour: A good practice guide for primary schools.* https://assets.gov.ie/83467/5c49a18e-5f61-4125-86ca-a0c76f068bfc.pdf#page=null

Devine, D., Ioannidou, O., Sloan, S., Martinez-Sainz, G., Symonds, J., Bohnert, M., Greaves, M., Moore, B., Smith, K., Crean, M., Davies, A., Jones, M., Barrow, N., Crummy, A., Gleasure, S., Samonova, E., Smith, A., Stynes, H., & Donegan, A. (2024a). *Children's School Lives: Equalities in children's school lives – The impact of social background* (Report No. 8a). University College Dublin. https://cslstudy.wpenginepowered.com/wp-content/uploads/2024/10/CSL-Report-Number-8a-Equalities.pdf

Devine, D., Ioannidou, O., Sloan, S., Martinez-Sainz, G., Symonds, J., Bohnert, M., Greaves, M., Moore, B., Smith, K., Crean, M., Davies, A., Jones, M., Barrow, N., Crummy, A., Gleasure, S., Samonova, E., Smith, A., Stynes, H., & Donegan, A. (2024b). *Equalities in Children's school lives: The impact of gender* (Report No. 8b). University College Dublin. https://cslstudy.wpenginepowered.com/wp-content/uploads/2024/12/CSL-8b-Gender.pdf

Devine, D., Martinez-Sainz, G., Symonds, J., Sloan, S., Moore, B., Crean, M., Barrow, N., Greaves, M., Donegan, A., Samonova, E., Davies, A., Farrell, E., O'Giobúin, R., & Farrell, J. (2023). *Primary pedagogies: Children and teachers' experiences of pedagogical practices in primary schools in Ireland 2019-2022* (Report No. 5). University College Dublin. https://cslstudy.wpenginepowered.com/wp-content/uploads/2023/06/CSL_Report5_ForPublication.pdf

Eccles, J. S. (2009). Who am I and what am I going to do with my life? Personal and collective identities as motivators of action. *Educational Psychologist*, *44*(2), 78–89. http://dx.doi.org/10.1080/00461520902832368

Eccles, J. S., & Roeser, R. W. (2011). Schools as developmental contexts during adolescence. *Journal of Research on Adolescence*, *21*(1), 225–241. https://doi.org/10.1111/j.1532-7795.2010.00725.x

Eivers, E., & Clerkin, A. (2012). *PIRLS & TIMSS 2011: Reading, mathematics and science outcomes for Ireland.* Educational Research Centre. http://www.erc.ie/documents/pt_2011_main_report.pdf

Evans, D. K., & Yuan, F. (2022). How big are effect sizes in international education studies? *Educational Evaluation and Policy Analysis, 44*(3), 532–540. https://doi.org/10.3102/01623737221079646

Finn, J. D. (1989). Withdrawing from school. *Review of Educational Research, 59*(2), 117–142. https://doi.org/10.2307/1170412

Foody, M., Samara, M., & O'Higgins Norman, J. (2017). Bullying and cyberbullying studies in the school-aged population on the island of Ireland: A meta-analysis. *British Journal of Educational Psychology, 87*(4), 535–557. https://doi.org/10.1111/bjep.12163

Fredricks, J. A., Blumenfeld, P. C., & Paris, A. H. (2004). School engagement: Potential of the concept, state of the evidence. *Review of Educational Research, 74*(1), 59–109. https://doi.org/10.3102/00346543074001059

Furlong, M. J., Sharkey, J. D., Felix, E. D., Tanigawa, D., & Green, J. G. (2010). Bullying assessment: A call for increased precision of self-reporting procedures. In S. R. Jimerson, S. M. Swearer, & D. L. Espelage (Eds.), *Handbook of bullying in schools: An international perspective* (pp. 329–345). Routledge/Taylor & Francis Group.

Gardella, J. H., Fisher,W. B., & Teurbe-Tolon A. R. (2017). A systematic review and meta-analysis of cyber-victimization and educational outcomes for adolescents. *Review of Educational Research, 87*(2), 283–308. https://doi.org/10.3102/0034654316689136

Ghasemi, E., & Burley, H. (2019). Gender, affect, and math: A cross-national meta-analysis of Trends in International Mathematics and Science Study 2015 outcomes. *Large-scale Assessments in Education*, *7*(10). https://doi.org/10.1186/s40536-019-0078-1

Gottfried, A. E. (1985). Academic intrinsic motivation in elementary and junior high school students. *Journal of Educational Psychology*, *77*(6), 631–645. https://doi.org/10.1037/0022-0663.77.6.631

Government of Ireland. (2023). *STEM education: Implementation plan to 2026.* https://assets.gov.ie/static/documents/stem-education-implementation-plan-to-2026.pdf

Hancock, K. J., Gottfried, M. A., & Zubrick, S. R. (2018). Does the reason matter? How student reported reasons for school absence contribute to differences in achievement outcomes among 14–15 year olds. *British Educational Research Journal*, *44*(1), 141–174. https://doi.org/10.1002/berj.3322

Irish Science Teachers' Association. (2019). *Listening to the voice of science teachers: The response from science teachers in the light of their experience of teaching the new Junior Cycle Science curriculum. Report of Findings from ISTA Junior Cycle Science Committee presented at the ISTA Annual Conference.* https://ista.ie/wp-content/uploads/2023/08/Report-ISTA-Junior-Cycle-Science-Website.pdf

Jakubowski, M., Gajderowicz, T., & Patrinos, H. A. (2025). COVID-19, school closures, and student learning outcomes. New global evidence from PISA. *npj Science of Learning*, *10*(5). https://doi.org/10.1038/s41539-025-00297-3

Kavanagh, L., Shiel, G., & Gilleece, L. (2015). *The 2014 National Assessments of English Reading and Mathematics. Volume 2: Context report.* Educational Research Centre. https://www.erc.ie/wp-content/uploads/2016/09/NA-Context-Report-Oct_2016.pdf

Korpershoek, H., Canrinus, E. T., Fokkens-Bruinsma, M., & de Boer, H. (2020). The relationships between school belonging and students' motivational, social-emotional, behavioural, and academic outcomes in secondary education: A meta-analytic review. *Research Papers in Education, 35*(6), 641–680. https://doi.org/10.1080/02671522.2019.1615116

Kraft, M. A. (2020). Interpreting effect sizes of education interventions. *Educational Researcher*, *49*(4), 241–253. https://doi.org/10.3102/0013189X20912798

Malkus, N. (2025). *Lingering absence in public schools: Tracking post-pandemic chronic absenteeism into 2024.* American Enterprise Institute. https://www.aei.org/wp-content/uploads/2025/06/Lingering-Absence-in-Public-Schools-Tracking-Post-Pandemic-Chronic-Absenteeism-into-2024.pdf?x85095

Martinez Sainz, G., Devine, D., Sloan, S., Symonds, J., Ioannidou, O., Moore, B., Crean, M., Barrow, N., Grieves, M., Gleasure, S., Donegan, A., Samonova, E., Davies, A., Stynes, H., Farrell; E., O'Giobúin, R., Smith, A., Farrell, J., & Gilligan, E. (2023). *Curriculum and assessment in children's school lives: Experiences from primary school in Ireland 2019-2023* (Report No. 6). University College Dublin. https://cslstudy.wpenginepowered.com/wp-content/uploads/2023/12/CSL-Report-Number-6-v6.pdf

McGarr, O., McCormack, O., O'Reilly, J., Hennessy, J., O'Meara, N., Calderón, A., Leahy, K., MacPhail, A., Lenihan, R., Neary, A., Lynch, R., Power, J., Ó Gallchóir, C., McMahon, J., & Goos, M. (2024). *Exploring the introduction of the framework for Junior Cycle: A longitudinal study. Interim report No. 4: School case studies (Round 2).* University of Limerick. https://doi.org/10.34961/researchrepository-ul.27443502.v1

McGarr, O., McCormack, O., O'Reilly, J., Lynch, R., Power, J., Hennessy, J., O'Meara, N., Neary, A., Leahy, K., Calderon, A., MacPhail, A., Ó Gallchóir, C., McMahon, J., Lenihan, R., Ní Chathasaigh, C., & Goos, M. (2023). *Exploring the introduction of the framework for Junior Cycle: A longitudinal study. Interim report No. 2.* University of Limerick. https://doi.org/10.34961/researchrepository-ul.22656892.v1

McHugh, G., Denner, S., Clerkin, A., Piccio, G., & Pitsia, V. (2024). *TIMSS 2023: Insights into mathematics and science achievement in Ireland.* Educational Research Centre. https://doi.org/10.70092/2009137.1224

Nakamoto, J., & Schwartz, D. (2010). Is peer victimization associated with academic achievement? A meta analytic review. *Social Development, 19*(2), 221–242. https://doi.org/10.1111/j.1467-9507.2009.00539.x

National Council for Curriculum and Assessment. (2024). *Draft science, technology and engineering education specification for primary and special schools: For consultation.* https://ncca.ie/media/4sxhyppx/draft_primary_steeducation_specification_2024.pdf

Nelis, S. M., Gilleece, L., Fitzgerald, C., & Cosgrove, J. (2021). *Beyond achievement: Home, school and wellbeing findings from PISA 2018 for students in DEIS and non-DEIS schools.* Educational Research Centre. https://www.erc.ie/wp-content/uploads/2021/06/FINAL_Web_version_ERC-PISA-DEIS-Report-II_May-2021.pdf

Nonte, S., Clerkin, A., & Perkins, R. (2022). An examination of science achievement and school compositional effects in Ireland using TIMSS data. *European Journal of Educational Research*, *11*(4), 2523–2536. https://doi.org/10.12973/eu-jer.11.4.2523

OECD, J. (2003). *Student engagement at school: A sense of belonging and participation. Results from PISA 2000.* PISA, OECD Publishing. https://doi.org/10.1787/9789264018938-en

O'Neill, B., & Dinh, T. (2015). Mobile technologies and the incidence of cyberbullying in seven European countries: Findings from Net Children Go Mobile. *Societies*, *5*(2), 384–398. https://doi.org/10.3390/soc5020384

Perkins, R., & Clerkin, A. (2020). *TIMSS 2019: Ireland's results in mathematics and science.* Educational Research Centre. https://www.erc.ie/wp-content/uploads/2021/01/03-ERC-TIMSS-2019-Report_A4_Online.pdf

Perkins, R., Clerkin, A., & Chubb, E. (2020). *Students' perspectives on learning mathematics and science: Results from TIMSS 2015 in Ireland*. Educational Research Centre. https://www.erc.ie/wp-content/uploads/2020/11/B23354-Students-perspectives-on-learning-maths-and-science-online.pdf

Pitsia, V. (2022). Examining high achievement in mathematics and science among post-primary students in Ireland: A multilevel binary logistic regression analysis of PISA data. *Large-scale Assessments in Education, 10*(14). https://doi.org/10.1186/s40536-022-00131-x

Pitsia, V., McAteer, S., McHugh, G., & Delaney, E. (2024). *PIRLS 2021: Exploring the contexts for reading of primary school pupils in Ireland*. Educational Research Centre. https://doi.org/10.70092/1691824.1024

Pitsia, V., McHugh, G., Denner, S., & Clerkin, A. (forthcoming). *Continuity and change in Ireland's schools and classrooms: TIMSS 2011-2023*. Educational Research Centre.

Rutkowski D., & Rutkowski, L. (2018). *No one likes a bully: How systematic is international bullying and what relationship does it have with mathematics achievement in 4th grade? IEA Compass: Briefs in Education*, No. 1. IEA. https://www.iea.nl/sites/default/files/2019-04/Compass_briefs_in_education_1_april_2018.pdf

Ryan, R. M., & Deci, E. L. (2000a). Intrinsic and extrinsic motivations: Classic definitions and new directions. *Contemporary Educational Psychology*, *25*(1), 54–67. https://doi.org/10.1006/ceps.1999.1020

Ryan, R. M., & Deci, E. L. (2000b). Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. *American Psychologist*, *55*(1), 68–78. https://doi.org/10.1037/0003-066X.55.1.68

Schmitt-Cerna, I., Ramírez-Olascuaga, M., Arhuis-Inca, W., Ipanaqué-Zapata, M., Arhuis-Inca, S. R., & Bazalar-Palacios, J. (2024). Relationship between attitudes toward mathematics and perceptions of virtual teaching in the COVID-19 context. *Frontiers in Education*, *9*, 1414114. https://doi.org/10.3389/feduc.2024.1414114

Schnell, J., Saxer, K., Mori, J., & Hascher, T. (2025). Feeling well and doing well. The mediating role of school engagement in the relationship between student well-being and academic achievement. *European Journal of Psychology of Education*, *40*(48). https://doi.org/10.1007/s10212-025-00947-5

Shiel, G., Cosgrove, J., Sofroniou, N., & Kelly, A. (2001). *Ready for Life? The literacy achievements of Irish 15-year olds with comparative international data: Summary report.* Educational Research Centre. http://www.erc.ie/documents/p00summaryreport.pdf

Sloan, S., Martinez Sainz, G., Devine, D., Symonds, J., Ioannidou, O., Moore, B., Davies, A., Bohnert, M., Stynes, H., Senior, J., Osborne, K., Crean, M., Barrow, N., Grieves, M., Gleasure, S., Donegan, A., Samonova, E., Farrell, E., O'Giobuin, R., Smith, A., & Farrell, J. (2024). *Children's School Lives: Children's wellbeing in Irish primary schools (2019 to 2023)* (Report No. 7). University College Dublin. https://cslstudy.wpenginepowered.com/wp-content/uploads/2024/05/CSL-Report-Number-7_Wellbeing.pdf

Smyth, E. (2017). *Off to a good start? Primary school experiences and the transition to second-level education*. Economic & Social Research Institute. https://www.esri.ie/system/files/publications/BKMNEXT343%20%281%29.pdf

Smyth, E. (2024). *The changing social worlds of 13-year-olds* (ESRI Research Series No. 178). Economic & Social Research Institute. https://www.esri.ie/system/files/publications/RS178.pdf

Smyth, E., Dunne, A., McCoy, S., & Darmody, M. (2006). *Pathways through the Junior Cycle: The experiences of Second Year students.* Liffey Press/ESRI.

STEM Education Review Group. (2016). *STEM education in the Irish school system: A report on Science, Technology, Engineering and Mathematics (STEM) education. Analysis and recommendations.* https://assets.gov.ie/static/documents/stem-education-in-the-irish-school-system.pdf

Symonds, J., & Galton, M. (2014). Moving to the next school at age 10–14 years: An international review of psychological development at school transition. *Review of Education*, *2*(1), 1–27. https://doi.org/10.1002/rev3.3021

Tusla Education Support Service. (2023). *School attendance data primary and post-primary schools and student absence reports primary and post-primary schools: 2019-2022.* https://www.tusla.ie/uploads/content/AAR_SAR_2019_22.pdf

Urdan, T., & Schoenfelder, E. (2006). Classroom effects on student motivation: Goal structures, social relationships, and competence beliefs. *Journal of School Psychology, 44*(5), 331–349. https://doi.org/10.1016/j.jsp.2006.04.003

von Davier, M., Kennedy, A., Reynolds, K., Fishbein, B., Khorramdel, L., Aldrich, C., Bookbinder, A., Bezirhan, U., & Yin, L. (2024). *TIMSS 2023 international results in mathematics and science.* Boston College, TIMSS & PIRLS International Study Center. https://doi.org/10.6017/lse.tpisc.timss.rs6460

von Davier, M., Fishbein, B., & Kennedy, A. (Eds.). (2024). *TIMSS 2023 technical report (methods and procedures)*. Boston College, TIMSS & PIRLS International Study Center. https://timss2023.org/methods

Wagemaker, H., & Mirazchiyski, P. (2023). *Cyberbullying and student learning: An analysis of student achievement in Eighth Grade using TIMSS 2019 data. IEA Compass: Briefs in Education*, No. 19. IEA. https://www.iea.nl/sites/default/files/2023-01/IEA-Compass-Brief-19.pdf

Wang, X. S., Perry, L. B., Malpique, A., & Ide, T. (2023). Factors predicting mathematics achievement in PISA: A systematic review. *Large-scale Assessments in Education*, *11*(24). https://doi.org/10.1186/s40536-023-00174-8

What Works Clearinghouse. (2014). *Procedures and standards handbook: Version 3.0*. https://ies.ed.gov/ncee/wwc/docs/referenceresources/wwc_procedures_v3_0_standards_handbook.pdf

Appendix Tables

Table A2.1: Correlations among scale scores with mathematics and science achievement, Fourth Class and Second Year (2023)

	Fourth Class		Second Year	
	Mathematics	Science	Mathematics	Science
Sense of school belonging	0.08	0.05	0.21	0.15
More frequent experience of bullying	-0.17	-0.19	-0.05	-0.05
Like learning mathematics	0.13	-	0.34	-
Confidence in mathematics	0.46	-	0.48	-
Value of mathematics	-	-	0.22	-
Like learning science	-	0.08	-	0.28
Confidence in science	-	0.26	-	0.45
Value of science	-	-	-	0.24

Note. All correlation coefficients shown are statistically significant at the p<.05 level.

Table A2.2: Fourth Class pupils' sense of school belonging, percentages and mean science achievement (2023)

Extent of sense of school belonging…	%	Mean Science
High sense of school belonging *(R)*	54	535
Some sense of school belonging	35	533
Little sense of school belonging	11	**515**

Note. **Bold** indicates statistically significant differences from the reference group *(R)* (*p*<.05).

Table A2.3: Fourth Class pupils' experience of bullying, percentages and mean science achievement (2023)

Experience bullying...	%	Mean Science
Never or Almost Never *(R)*	65	543
About Monthly	27	**524**
About Weekly	8	**472**

Note. **Bold** indicates statistically significant differences from the reference group *(R)* (*p*<.05).

Table A3.1: Second Year students' absences from school, percentages and mean science achievement (2023)

Student reported absence...	%	Mean Science
Never or almost never *(R)*	30	546
Once every two months	23	535
Once a month	26	**528**
Once every two weeks	15	**503**
Once a week	6	**456**

Note. **Bold** indicates statistically significant differences from the reference group *(R)* (p<.05).

Table A3.2: Second Year students' sense of school belonging, percentages and mean science achievement (2023)

Extent of sense of school belonging...	%	Mean Science
High sense of school belonging *(R)*	21	541
Some sense of school belonging	53	**531**
Little sense of school belonging	26	**508**

Note. **Bold** indicates statistically significant differences from the reference group *(R)* (p<.05).

www.erc.ie

ISBN: 978-1-911678-36-6 (PDF)