

2015

Trends in International Mathematics and Science Study

TIMSS



National Report

TIMSS 2015

Malta Report

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Forward

The Trends in International Mathematics and Science Study (TIMSS) carries out a four-yearly assessment of Mathematics and Science competences in many countries around the world. The results for Malta, when compared to those achieved by Year 9 students in 2007, show a significant improvement in Science and a small improvement in Mathematics. The average score for Science in 2015 was 481 (compared to 457 in 2007) and 494 (versus the average score of 488 in 2007) for Mathematics. The mean international standard score is 500. Malta placed in the 22nd position in Science and in the 20th position in Mathematics amongst 39 countries. Notwithstanding these improvements when compared to 2007, Malta still needs to work harder in both areas, within a strategy to improve attainment.

Malta participated in the TIMSS 2015 with students in the Year 9 (Form 3) cohort. A total of 3,817 students were tested in Mathematics and Science. The same students together with 832 teachers of mathematics and science and 47 Heads of School filled in a background questionnaire which provided interesting information about the teaching and learning processes in Maltese classrooms.

Governments and Education Ministries around the world use the TIMSS results to assess the effectiveness of their educational systems in a global context. They identify gaps in learning resources and opportunities, highlight areas of weakness and stimulate curricular reform. Education policy makers also use TIMSS to measure the impact of new educational initiatives. Malta has been giving priority to Mathematics and Science education and has provided additional human and physical resources in order to improve attainment. It has promoted reform in the curriculum of both Mathematics and Science, promoted Inquiry Based Learning as a pedagogical tool in teacher training sessions, provided learning tools through a number of EU co-funded projects, increased the teacher-to-student ratio in Science laboratories and set up activities for talented students in both the primary and secondary cycles. These initiatives, together with more awareness in schools about TIMSS and other international surveys, have resulted in a higher attainment mark for Maltese students when compared to 2007 when Malta participated with the same student cohort. Malta has managed to reduce the percentage of students performing at the Low International Benchmark and below, in both Mathematics and Science (Mathematics 40% → 38%; Science 52% → 43%). Yet much more needs to be done to further reduce these percentages and to manage to engage students in these educational pathways. Malta has also managed to increase the percentage of students performing at the Advanced International Benchmark in Science from 5% to 7% of the cohort, but remained constant in Mathematics (5%).

These results were obtained through the dedication of many teachers, heads of department, education officers and school management teams who have coordinated their work so that students better engage in the educational process and raise their attainment bar. Further reflection upon results attained is required in order to ensure that the introduction of learning outcomes, the reform in assessment together with the implementation of the science education strategy will ensure better results in the next cycle of the TIMSS 2019, which will be administered as a computer-based assessment instead of a paper-based one.

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Acknowledgements

This TIMSS 2015 National Report is based on data collected during school year 2014/2015 from all of Malta's secondary schools following the participation of Year 9 students in the TIMSS study. Besides the assessment itself students also completed a questionnaire reporting on their classroom and school experiences, study habits and home background, among others. Similar questionnaires were also completed by each Head of School and teachers of Mathematics and Science subjects.

The TIMSS National Centre (within the Educational Assessment Unit, MEDE) is therefore particularly grateful to all the participating schools for the cooperation that was forthcoming when administering this study. Special thanks go to all the Heads of School, the School Coordinators who were responsible for the actual administration of the study in their respective schools, the teachers who completed the questionnaires, and the participating students.

Appreciation is also extended to staff within the then Research and Development Department (MEDE) who were responsible for the administration of TIMSS 2015 prior to the move of personnel, and responsibility for the administration of international assessments in Malta, to the Department of Curriculum Management.

Other persons who contributed to the successful administration of TIMSS 2015 in Malta include the Transport Section within MEDE, the personnel who coded the test items and staff who then inputted the data.

Finally, our special appreciation goes to Professor Liberato Camilleri of the University of Malta, who analysed both the international and national data in order to author the present National Report. His utmost commitment to this task, enthusiasm when commenting on particular aspects of the emerging results and his expertise in the field are duly acknowledged.

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Executive Summary

The Trends in International Mathematics and Science Study (TIMSS) is a comparative international study of mathematics and science achievement. The goal of TIMSS is to provide comparative information about educational attainment across participating countries to enhance teaching and learning in these two subjects. TIMSS 2015 is the sixth assessment in the TIMSS series observing twenty years of trends in educational achievement, together with comprehensive data on students' contexts for learning mathematics and science at the fourth and eighth grade. TIMSS 2015 survey took place in 57 countries and 7 benchmarking entities around the world. Malta, together with 38 other countries and 7 benchmarking entities participated in the Grade 8 (Year 9) student assessment. Grade 4 (Year 5) students were assessed in 49 countries and 7 benchmarking entities which did not include Malta. Besides monitoring trends in achievement at grades 4 and 8, TIMSS provides information about relative progress across years. This is the first time that such a comparison can be carried out for same Maltese students who participated in TIMSS 2007 and 2015 surveys. TIMSS also provides comparative perspectives on trends in achievement in the context of different educational systems, school organisational approaches, and instructional practices and collects a rich collection of background information from heads of school, students and teachers.

1. Background to TIMSS 2015

- The survey takes place every four years. The first was carried out in 1995 and TIMSS 2015 was the sixth survey.
- Malta took part in this survey on three occasions, where 8th grade students were tested in both Mathematics and Science in the 2007 and 2015 surveys and 4th grade students were tested in these subjects in the 2011 survey.
- The 3817 Maltese students that participated in the TIMSS study included 1882 females and 1935 males. The sample comprised almost the whole population of 13-14-year olds in Form 3 and guaranteed a maximum margin of error of approximately 1% at the 95% confidence level.
- These students, whose average age was 13.84 years, included students from 48 secondary schools. 1982 students participated from 19 state schools, 1431 students participated from 21 church schools and 404 students from independent schools.
- The sample of 832 teachers that participated in the TIMSS study included 224 Mathematics, 119 Biology, 86 Chemistry, 261 Physics, 129 Geography and 13 Integrated Science teachers. 56.0% of these teachers teach in State, 34.6% in Church and 9.4% in Independent schools.
- Questionnaires were provided to students, mathematics and science teachers and heads of school. The questionnaires submitted to heads of school and class teachers elicited information about the approaches adopted by the school and teachers to the teaching of Mathematics and Science. The student questionnaires elicited information about demographic and economic backgrounds, educational resources at home.

- Test items were organised into fourteen test booklets with items repeated across booklets. Each student was provided with a test booklet and had to complete the provided tasks under test conditions.
- TIMSS identifies two dimensions - content dimension and cognitive dimension. For science at grade 8 there are four content domains, which include Biology, Chemistry, Physics and Earth Science. For mathematics, there are four content domains, which include Numbers, Algebra, Geometry and Data handling and chance. In addition there are three cognitive domains in each curriculum area, which include Knowing, Applying and Reasoning.
- Students' knowledge and understanding of mathematics and science in the TIMSS assessment are assessed using two question formats – multiple choice and constructed-response. Multiple-choice questions provide four response options, of which only one is correct. Constructed-response questions students are required to construct a written response.
- A total score is generated to measure attainment of students in Mathematics and Science. The TIMSS achievement scale score is a rescaled version of the total score, which has a mean of 500 and a standard deviation of 100. This makes it possible to compare Mathematics and Science scale scores at different cycles.
- TIMSS 2015 identifies four benchmarks of Mathematics and Science achievement. The low, intermediate, high and advanced benchmarks are set at 400, 475, 550 and 625 respectively.

2. Student Attainment in Science

- Malta's mean Science score (481) was significantly lower than the international average (500) and was ranked 22nd of 39 participating countries.
- Science attainment of Maltese students was comparable to students from United Arab Emirates but was significantly higher than sixteen countries including Malaysia, Bahrain, Qatar, Iran, Thailand, Oman, Chile, Georgia, Jordan, Kuwait, Lebanon, Saudi Arabia, Morocco, Botswana, Egypt and South Africa.
- The bottom 25% of Maltese students scored less than 415 and the top 25% scored more than 557 on the Science Achievement scale.
- The proportion of Maltese students scoring more than 550 scale points in Science (28%) was marginally lower than the international average (29%). Moreover, the proportion of Maltese students scoring less than 475 scale points in Science (43%) was significantly higher than the international average (36%).
- In 28 countries participating in TIMSS 2015, girls performed better than boys in Science; in 11 countries boys performed better than girls. The mean Science score for Maltese girls (485) exceeded that of boys (477) by around 8 scale points and the difference was significant.
- On average, Independent school students scored significantly higher in Science than Church school students who in turn scored significantly higher than State school students. Mean science scores of girls exceed those of boys by 18.6 scale points in State schools, 2.0 scale points in Church schools, while the mean science scores of boys exceed those of girls by 6.1 scale points in Independent schools.

- Maltese students scored highest in Physics (490), followed by Chemistry (481), Earth Science (481) and Biology (473). Moreover, they scored higher in tasks that required applying (489), following by tasks that required reasoning (479) and tasks that required knowing (468).
- Maltese female students scored significantly higher than males in Biology and Chemistry; while male students scored marginally higher than females in Physics and Earth Science. In all three cognitive domains girls scored higher than boys, however the difference was significant in the Applying and Reasoning domains.
- In the TIMSS 2015 cycle, Maltese students scored significantly higher than the 2007 cycle in all content and cognitive domains. This significant improvement was achieved by both female and male students.

3. Student Attainment in Mathematics

- Malta's mean Mathematics score (494) was 6 scale points lower than the international average (500) and was ranked 20th of 39 participating countries.
- Mathematics attainment of Maltese students was comparable to students from Italy and New Zealand but was significantly higher than 18 countries including Malaysia, Turkey, Bahrain, United Arab Emirates, Georgia, Lebanon, Qatar, Iran, Thailand, Chile, Oman, Kuwait, Egypt, Botswana, Jordan, Morocco, South Africa and Saudi Arabia.
- The bottom 25% of Maltese students scored less than 436 and the top 25% scored more than 558 in the Mathematics Achievement scale.
- The proportion of Maltese students scoring more than 550 scale points in Mathematics (34%) was higher than the international average (31%). Moreover, the proportion of Maltese students scoring less than 475 scale points in Mathematics (38%) was equal to the international average (38%).
- In 16 countries participating in TIMSS 2015, boys performed better than girls in Mathematics; in 22 countries girls performed better than boys. There was no gender discrepancy in Mathematics attainment in Chinese Taipei. The mean Mathematics score for Maltese boys (495) exceeded that of girls (492) by around 3 scale points and the difference was not significant.
- On average, Independent school students scored significantly higher in Mathematics than Church school students who in turn scored significantly higher than State school students. Mean Mathematics scores of girls exceed those of boys by 5.2 scale points in State schools; however, the mean Mathematics scores of boys exceed those of girls by 11.7 scale points in Church schools and 18.3 scale points in Independent schools.
- Maltese students scored highest in Number (501) followed by Algebra (492), Data and Chance (487) and Geometric (484). Boys scored higher than girls in Number, while girls scored higher than boys in Algebra, Geometry and Data and Chance.
- Maltese students scored higher in tasks that required knowing (499), following by tasks that required applying (493) and tasks that required reasoning (484). Both boys and girls scored highest in tasks that required knowing and lowest in tasks that required reasoning.

- In almost all four content domains (Number, Geometric shapes and Measure, Data display) and all three cognitive domains (Knowing, Applying and Reasoning) female students attending state schools scored higher than males; while male students attending church and independent schools scored higher than females.
- In the TIMSS 2015 cycle, Maltese students scored significantly higher in Algebra, marginally higher in Number and Data and Chance and significantly lower in Geometry than the 2007 cycle. In the 2015 cycle, Maltese students scored significantly higher in Knowing and Reasoning and marginally higher in Applying than the 2007 cycle.

4. Home Language and Home Learning Resources

- The scale score that measures home resources for learning ranges takes into consideration the parents' highest level of education, the availability of books and an internet connection at home and whether the student has an own room. This score ranges from 11.6 (Republic of Korea) to 8.2 (Morocco). Malta's mean scale score (10.5) is above the international mean (10.25). Science and Mathematics attainment are both positively and significantly related to home resources for learning.
- The mean home resources score of students attending independent schools (11.5) is significantly higher than students attending church schools (10.9), which in turn is significantly higher than students attending state schools (10.0). The corresponding mean Mathematics scores of students attending independent, church and state schools are 547.4, 521.4 and 465.6 and the corresponding mean Science scores are 553.5, 518.3 and 443.7.
- 25.3% of Maltese students speak English almost always, 54.8% sometimes and 19.9% never speak English at home. These proportions vary significantly between school types, where 65.7% of students from independent schools, 22.0% from church schools and 19.5% from state schools almost always speak English at home. On the other hand, the corresponding percentages of students who never speak English at home are 8.9%, 18.2% and 23.5%. There is strong evidence that students who speak the language of the tests (English) regularly tend to attain higher scores in Mathematics and Science.

5. School Conditions and School Resources

- The proportion of Maltese students coming from economically affluent homes (32%) is marginally higher than the international average (31%). On the other hand, the proportion of Maltese students coming from economically disadvantaged homes (5%) is significantly lower than the international average (36%). Both Mathematics and Science attainment are positively and significantly related to the student's economic background.
- 4% of Maltese schools have more than 90% English-speaking students; 6% of the schools have 51% to 90% and 90% of the schools have 50% or less English-speaking students. Schools that have more than 50% English-speaking students scored significantly higher in both Mathematics and Science than schools that have less than 50% English speaking students. A plausible reason is that for both Mathematics and Science the language of instruction is English.

- The proportion of Maltese schools in which Mathematics instruction is not affected by resource shortages (55%) is significantly higher than the international proportion (27%). There are no Maltese schools where Mathematics instruction is considerably affected by resource shortages, which is significantly lower than the international proportion (7%).
- The scale score that measures the adequacy of resources that enhance Mathematics instruction ranges from 12.0 (Singapore) to 8.4 (Turkey and Malaysia). Malta's resources scale score (11.4) is significantly higher than the international average (10.1).
- The proportion of Maltese schools in which Science instruction is not affected by resource shortages (66%) is significantly higher than the international proportion (27%). There are no Maltese schools where Science instruction is considerably affected by resource shortages, which is significantly lower than the international proportion (7%).
- The scale score that measures the adequacy of resources that enhance Science instruction ranges from 12.2 (Singapore) to 8.4 (Turkey and Malaysia). Malta's resources scale score (11.6) is significantly higher than the international average (10.2).
- 39% of Maltese Science teachers and 39% of Mathematics teachers indicated no problems related to school conditions and school resources. 46% of Maltese Science teachers and 48% of Mathematics teachers indicated minor problems; while 15% of Maltese Science teachers and 13% of Mathematics teachers indicated moderate to severe problems. The corresponding international proportions are 34%, 43% and 23% according to Science teachers and 34%, 44% and 22% according to Mathematics teachers.
- The scale score that measures good school conditions and good school resources according to Science teachers ranges from 11.6 (Qatar) to 7.4 (Botswana). Malta's scale score (10.4) is significantly higher than the international average (10.0). The scale score that measures good school conditions and good school resources according to Mathematics teachers ranges from 11.7 (Qatar) to 7.6 (Botswana). Malta's scale score (10.5) is significantly higher than the international average (10.0). Attainment of students in Mathematics and Science is significantly positive related to good school conditions and school resources.

6. Job Satisfaction, Challenges and School Sense of Belonging

- The proportion of Maltese heads of school who assign very high emphasis to academic success (8%) is marginally above the international average (7%) and is comparable to United States, New Zealand, Kazakhstan and Chinese Taipei. The proportion of Maltese Science and Mathematics teachers who assign very high emphasis to academic success (6% and 5% respectively) are similar to United States, New Zealand, Kuwait, Thailand and Israel and are comparable to the international average (5% and 5% respectively)
- The proportions of Maltese Science and Mathematics teachers who are very satisfied with their job (44% and 45% respectively) are significantly lower than the corresponding international averages (49% and 50%). The proportions of Maltese Science and Mathematics teachers who are less than satisfied with their job (13% and 11% respectively) are significantly higher than the corresponding international averages (9% and 7%).

- The scale score that measures job satisfaction according to Science teachers ranges from 11.0 (Egypt, Lebanon and Chile) to 8.7 (Japan). Malta's scale score (9.6) is significantly lower than the international average (10.0). The scale score that measures job satisfaction according to Mathematics teachers ranges from 11.2 (Egypt and Qatar) to 9.0 (Japan). Malta's scale score (9.9) is marginally lower than the international average (10.0). Attainment of students in Mathematics and Science is significantly positive related to the teachers' job satisfaction.
- The proportions of Maltese Science and Mathematics teachers who are faced with few challenges at school (37% and 28% respectively) are significantly lower than the corresponding international averages (45% and 45%). The proportions of Maltese Science and Mathematics teachers who are faced with many challenges at school (11% and 13% respectively) are significantly higher than the corresponding international averages (6% and 5%).
- The scale score that measures how much Science teachers cope with challenges faced at school ranges from 11.7 (Georgia) to 8.5 (Korea and Botswana). Malta's scale score (9.4) is significantly lower than the international average (10.0). The scale score that measures how much Mathematics teachers cope with challenges faced at school ranges from 11.6 (Georgia) to 9.0 (Korea). Malta's scale score (9.1) is significantly lower than the international average (10.0). Attainment of students in Mathematics and Science is weakly positive related to coping with challenges faced at school.
- The proportion of Maltese students with high sense of school belonging (33%) is significantly lower than the international average (44%), while the proportion of Maltese students with little sense of school belonging (16%) is significantly higher than the international average (9%).
- The scale score that measures students' sense of school belonging ranges from 11.3 (Morocco) to 8.5 (Slovenia). Malta's scale score (9.5) is significantly lower than the international average (10.0). Attainment of students in Mathematics and Science is significantly positively related to students' sense of school belonging.
- Female students attending independent and church schools have significantly higher sense of school belonging than male students attending state schools.

7. Discipline, Safety and Bullying at School

- The proportion of Maltese heads of school reporting negligible disciplinary problems (50%) is significantly higher than the international average (43%). Moreover, the proportion of heads of school reporting moderate disciplinary problems (5%) is significantly lower than the international average (11%).
- The scale score that measures students' good behaviour at school ranges from 11.7 (Singapore) to 8.1 (Morocco). Malta's mean scale score (10.6) is significantly higher than the international average indicating that students' behaviour at school is better than most other countries. Attainment in Mathematics and Science are significantly positively related to the students' good behaviour at school.

- According to heads of school, state schools have the most disciplinary problems with students' bad behaviour and church schools have the least.
- The proportions of Maltese Science and Mathematics teachers indicating that they attend very safe and orderly schools are respectively 38% and 48%, while the corresponding international average are 45% and 46%. The proportions of Maltese Science and Mathematics teachers indicating that they attend schools that are less than safe and orderly are respectively 10% and 6%, while the corresponding international average are 8% and 8%.
- The scale score that measures safety and order at school according to Science teachers ranges from 11.5 (Kazakhstan) to 8.3 (Botswana). Malta's scale score (10.1) is marginally lower than the international average (10.3). The scale score that measures safety and order at school according to Mathematics teachers ranges from 11.6 (Ireland) to 9.0 (Botswana). Malta's scale score (10.4) is marginally higher than the international average (10.3). Attainment of students in Mathematics and Science is significantly positive related to safety and order at school.
- The proportion of Maltese students who hardly ever experienced bullying (64%) is marginally higher than the international average (63%). On the other hand, the proportion of Maltese students who are bullied on a weekly basis (7%) is marginally lower than the international average (8%).
- The scale score that measures lack of bullying at school ranges from 11.3 (Chinese Taipei and Kazakhstan) to 8.4 (Botswana). Malta's mean scale score (10.0) is equal to the international average (10.0). Attainment in Mathematics and Science are negatively related to the extent of bullying experienced by the child at school.
- School bullying is significantly more prevalent between male than female students; however bullying between female students in independent schools is significantly higher than females attending other schools.

8. Level of Education and Years of Experience of Teachers and Heads of School

- The proportions of Maltese Mathematics and Science teachers with a Master's degree or a PhD (13% and 22% respectively) are significantly lower than the corresponding international averages (25% and 28%). However, the proportions of Maltese Mathematics and Science teachers with a Bachelor's degree (80% and 76% respectively) are significantly higher than the corresponding international averages (66% and 64%). The proportions of Maltese Mathematics and Science teachers who completed post-secondary education but did not attain a degree (7% and 2% respectively) are considerably lower than the international averages (9% and 9%).
- The proportion of Maltese teachers who majored in both Mathematics and Mathematics Education (66%) and in both Science and Science Education (38%) are significantly higher than the corresponding international averages (36% and 32%). The proportions of Maltese teachers who teach Mathematics and/or Science but majored in another subject (4% and 4%) are significantly lower than international average proportions (13% and 7%).
- The relationship between students' attainment in Mathematics/Science and teachers' training is very weak.

- The proportions of Maltese mathematics and science teachers with less than 10 years teaching experience (47% and 53% respectively) are significantly higher than the international averages (37% and 38%). The proportions of Maltese mathematics and science teachers with at least 20 years teaching experience (15.0% and 16% respectively) are significantly lower than the international averages (34% and 32%).
- The relationship between the students' attainment in Mathematics/Science and teachers' years of teaching experience is very weak.
- During the last two years, the proportion of Maltese mathematics teachers participating in developing Mathematics pedagogy/instruction (60%), Mathematics curriculum (54%), integrating information technology into mathematics (57%) and addressing individual students' needs (44%) were higher than the international averages (59%, 50%, 50% and 42% respectively). On the other hand, the proportion of mathematics teachers participating in developing Mathematics content (45%), Mathematics assessment (41%) and improving students' critical thinking or problem-solving skills (33%) were lower than international averages (56%, 44% and 45% respectively).
- During the last two years, the proportion of Maltese science teachers participating in developing Science pedagogy/instruction (60%), Science curriculum (60%), integrating information technology into science (56%) and addressing individual students' needs (49%) were higher than the international averages (57%, 49%, 50%, and 42% respectively). The proportion of Maltese science teachers participating in Science assessment (37%) was lower than the international average (44%). Teachers' participation in Science content (55%) and improving students' critical thinking or inquiry skills (45%) were equal to international averages.
- The proportion of Maltese heads of school with less than five years of experience (55%) is significantly higher than the international average (32%), while the proportion with twenty years of experience (4%) is significantly lower than the international average (12%). The average number of years of experience of Maltese heads of school, which is around 7 years, is two years less than the international average.
- All Maltese heads of school have a bachelor's degree and 58% have a postgraduate degree, which exceeds the international average proportion (50%).

9. Teaching Mathematics and Science Topics

- The total annual instructional duration in Maltese schools, as reported by heads of school, is 964 hours. This is 57 hours less than the international average (1021 hours). The annual instructional duration of Mathematics in Maltese schools, as reported by Maltese teachers is 127 hours. This is 11 hours less than the international average (138 hours).
- By mid-April, Maltese Mathematics teachers cover 89% of the TIMSS topics in Numbers in Form 3, 77% of the Algebra TIMSS topics, 63% of the Geometry TIMSS topics and 63% of the Data and Chance TIMSS topics. Maltese Science teachers cover 48% of the TIMSS topics in Biology in Form 3, 82% of the Chemistry TIMSS topics, 53% of the Physics TIMSS topics and 63% of the Earth Science TIMSS topics.

- The proportion of Maltese students (8%) whose teachers emphasized science investigation in at least half the lessons is significantly lower than the international average (27%). However, there is no evidence that students' attainment in Science is related to the teachers' emphasis on science investigation.
- Maltese heads of school reported that all schools have science laboratories and this proportion is significantly higher than the international average (85%). Moreover, 92% of heads of school reported that science teachers have assistance available when students conduct experiments, which is significantly higher than the international average (58%).
- The proportions of Maltese Mathematics and Science teachers who allow their students to use computers or tablets during lessons (4% and 7% respectively) are significantly lower than the international averages (32% and 42%).
- The proportion of Maltese students using the Internet to access assignments posted online by teachers (65%) and collaborate with classmates on assignments or projects (80%) are significantly higher than the corresponding international means (53% and 69%). On the other hand, the proportion of Maltese students using the Internet to access the textbook or other course materials (45%) is significantly lower than the international average (56%). The Maltese student proportions using the Internet to communicate with the teacher (35%), find information, articles, or tutorials to aid in understanding mathematics (58%) and find information, articles, or tutorials to aid in understanding science (60%) are comparable to the international averages (36%, 57% and 61% respectively).
- The proportion of Maltese students who are never or almost never absent from school (66%) is significantly larger than the international average (61%), while the proportions of Maltese students who are absent once every two weeks (6%) or at least once a week (5%) are lower than the corresponding international means (8% and 8% respectively). There is a very strong relationship between absenteeism and attainment in Mathematics and Science, where students who are rarely absent from school perform significantly better in Mathematics and Science than their counterparts who are frequently absent.
- The scale score that measures the ease of teaching Mathematics in Maltese schools due to the lack of students' needs ranges from 12.5 (Japan) to 8.5 (Iran and Morocco). Malta's scale score (10.4) is significantly higher than the international average (10.0). The scale score that measures the ease of teaching Science in Maltese schools due to the lack of students' needs ranges from 12.5 (Japan) to 8.8 (Morocco). Malta's scale score (10.6) is significantly higher than the international average (10.0). There is a strong relationship between teaching limitations caused by students' needs and attainment in Mathematics and Science, where the larger the limitations the lower the attainment.
- Maltese teachers tend to give more homework in Mathematics but less homework in Biology, Chemistry, Physics and Geography; however, attainment in Mathematics and Science is not related to the duration to complete homework.
- Church school teachers give significantly more homework in Mathematics, Biology, Chemistry, Physics but less in Geography compared to state and independent school teachers.

10. Attitudes to Mathematics and Science

- The proportions of Maltese students who experienced very engaging teaching in Biology (59%), Chemistry (55%) and Physics (51%) were higher than the international averages (50%, 46% and 44% respectively); while the proportions of Maltese students who experienced very engaging teaching in Mathematics (41%) and Geography (36%) were lower than the international averages (43% and 45% respectively).
- The scale scores that measure engaging teaching in Chemistry (10.4), Biology (10.3) and Physics (10.2) in Maltese schools exceed the international averages (10.0); however, the scale scores that measure engaging teaching in Mathematics (9.8) and Geography (9.4) are lower than the international averages (10.0). There is a strong positive relationship between students' attainment Mathematics and Science and the extent of engaging teaching.
- The engaging teaching scale scores provided by students attending independent schools are significantly higher in Biology, Physics and Geography; however there is no school type bias for engaging teaching in Mathematics and Chemistry.
- The engaging teaching scale scores are significantly higher in Mathematics, Geography and Physics for male students and significantly higher in Biology for female students; however there is no gender bias for engaging teaching in Chemistry.
- The proportions of Maltese students who like very much learning Biology (55%), Chemistry (51%) and Physics (35%) were significantly higher than the international averages (36%, 31% and 27% respectively); while the proportions of Maltese students who like learning Mathematics (17%) and Geography (20%) were significantly lower than the international averages (22% and 28% respectively).
- The scale scores that measure enjoyment of learning Chemistry (11.2), Biology (10.9) and Physics (10.3) in Maltese schools exceed the international averages (10.0); however, the scale scores that measure enjoyment of learning Mathematics (9.5) and Geography (9.1) are lower than the international averages (10.0). There is a strong positive relationship between students' attainment in Mathematics and Science and their enjoyment of learning the subjects.
- The enjoyment of learning scale scores provided by students attending independent schools are significantly higher in Biology, Physics, Mathematics and Geography; however there is no school type bias for enjoyment of learning in Chemistry.
- The enjoyment of learning scale scores are significantly higher in Mathematics, Geography and Physics for male students and significantly higher in Biology for female students; however there is no gender bias for enjoyment of learning Chemistry.
- The proportion of Maltese students who were very confident in Biology (34%), Chemistry (35%) and Physics (23%) were significantly higher than the corresponding international averages (26%, 21% and 18%); while the proportions of students who were very confident in Mathematics (13%) and Geography (21%) were lower than the corresponding international averages (14% and 24%).
- The scale scores that measure the students' confidence in Chemistry (10.8), Biology (10.2) and Physics (10.2) in Maltese schools exceed the international averages (10.0); however, the scale

scores that measure students' confidence in Mathematics (9.7) and Geography (9.5) are lower than the international averages (10.0). There is a significant positive relationship between students' attainment in Mathematics and Science and students' confidence in the subjects.

- The confidence scale scores provided by students attending independent schools are significantly higher in Biology, Physics, Mathematics and Geography; however there is no school type bias for confidence in Chemistry.
- The confidence scale scores are significantly higher in Mathematics, Geography and Physics for male students; however there is no gender bias for confidence in Biology and Chemistry.
- The proportion of Maltese students who strongly value Mathematics (44%) is higher than the international average (42%); while the proportion of Maltese students who strongly value Science (37%) is lower than the international average (40%).
- The mean scale scores that measure the value Maltese students give to Mathematics (10.0) and Science (9.9) are comparable to the international averages (10.0).
- Students attending church and independent value Science subjects more than state school students; however there is no school type bias for the value given to Mathematics.
- Male students value Mathematics more than female students; however, there is no significant gender discrepancy for the value given to Science subjects.

1

Background to TIMSS 2015

1.1 Introduction

The Trends in International Mathematics and Science Study (TIMSS) is a comparative international study of mathematics and science achievement. The goal of TIMSS is to provide comparative information about educational attainment across participating countries to enhance teaching and learning in these two subjects. TIMSS measures trends in mathematics and science achievement at grade 4 (Year 5) and grade 8 (Year 9 [Form 3]), and monitors curricular implementation. Figure 1 shows the countries participating in the TIMSS 1995, 1999, 2003, 2007, 2011 and 2015 cycles, where Malta participated in the 2007 and 2015 cycles for the 8th grade and in 2011 for the 4th grade. In the 2015 cycle, Malta participated with 38 other countries and 7 benchmarking entities, including Florida, Quebec, Ontario, Dubai, Norway, Buenos Aires and Abu Dhabi. For each participating country, Figure 1.2 displays the number of sampled students, the number of withdrawn, excluded and absent students and the number of assessed students. The Maltese cohort comprised 4063 students, where 82 were excluded or withdrawn because they did not satisfy the selection criteria and 164 were absent on the day when they were assessed. This means that a total of 3,817 students participated in the assessment.

To identify the procedures and practices that are effective in improving students' learning in mathematics and science, TIMSS 2015 administers background questionnaires to students, their teachers, and their heads of school. The student questionnaire, which was completed by 3,817 Maltese students aged 13-14 years, enquires aspects of students' home and school lives, including basic demographic information, their home environment, school climate for learning, and self-perception and attitudes toward mathematics and science. The teacher questionnaire, which was completed by 224 mathematics and 608 science teachers, enquires teacher characteristics as well as classroom contexts for teaching and learning mathematics and science, and the topics taught in these subjects. The questionnaire also asks about teachers' backgrounds, their job satisfaction, their views on opportunities for collaboration with other teachers and their education and training as well as professional development. Moreover, it collects information on characteristics of the classes, instructional time, materials, and activities for teaching mathematics and science and promoting students' interest in the subjects, use of computers, assessment practices, and homework. The school questionnaire, which was completed by 47 heads of school, enquires about school characteristics, instructional time, technology and resources, parental involvement, school climate for learning, teaching staff, the role of head of school and students' school readiness.

Figure 1.1: Countries participating in the TIMSS cycles

Country	Grade 4					Grade 8					
	2015	2011	2007	2003	1995	2015	2011	2007	2003	1999	1995
Armenia	○	●	○	●		○	●	○	●		
Australia	●	●	●	●	●	●	●	●	●	○	●
Bahrain	●	●				●	●	●	●		
Belgium (Flemish)	●	●		●					●	●	●
Botswana (6, 9)		●				●	●	○	○		
Bulgaria	●							●	●	●	
Canada	●				○	●				○	○
Chile	●	●				●	●		●	●	
Chinese Taipei	●	●	●	●		●	●	●	●	●	
Croatia	●	●									
Cyprus	●			●	●			●	●	●	●
Czech Republic	●	●	●		●			●		●	●
Denmark	●	●	●								●
Egypt						●		●	●		
England	●	●	●	●	●	●	●	●	●	●	●
Finland	●	●					●			○	
France	●										●
Georgia	●	●	●			●	●	●			
Germany	●	●	●								●
Hong Kong SAR	●	●	●	●	●	●	●	●	●	●	●
Hungary	●	●	●	●	●	●	●	●	●	●	●
Indonesia	●				○		●	●	○	○	○
Iran, Islamic Rep. of	●	●	●	●	●	●	●	●	●	●	●
Ireland	●	●				●					●
Israel					○	●	●	○	○	○	○
Italy	●	●	●	●	○	●	●	●	●	●	○
Japan	●	●	●	●	●	●	●	●	●	●	●
Jordan	●					●	●	●	●	●	
Kazakhstan	●	●	○			●	●				
Korea, Rep. of	●	●			●	●	●	●	●	●	●
Kuwait	●	●	○		○	●		○			○
Lebanon						●	●	●	●		
Lithuania	●	●	●	●		●	●	●	●	●	●
Malaysia						●	●	●	●	●	
Malta		●				●		●			
Morocco	●	●	○	○		●	●	○	○	○	
Netherlands	●	●	●	●	●				●	●	●
New Zealand	●	●	●	●	●	●	●		●	●	●
Northern Ireland	●	●									
Norway (5,9)	●					●					
Oman	●	●				●	●	●			
Poland	●	○									
Portugal	●	●			●						●
Qatar	●	●	○			●	●	○			
Russian Federation	●	●	●	●		●	●	●	●	●	●
Saudi Arabia	●	●				●	●	○	○		
Serbia	●	●						●	●		
Singapore	●	●	●	●	●	●	●	●	●	●	●
Slovak Republic	●	●	●						●	●	●
Slovenia	●	●	●	●	●	●	●	●	●	○	●
South Africa (5, 9)	●					●	●		○	○	○
Spain	●	●									●
Sweden	●	●	●			●	●	●	●		●
Thailand		●			○	●	●	●		●	○
Turkey	●	●				●	●	○		○	
United Arab Emirates	●	●				●	●				
United States	●	●	●	●	●	●	●	●	●	●	●

● Indicates participation in that testing cycle.
 ○ Indicates participation but data not comparable for measuring trends to 2015, primarily due to countries improving translations or increasing population coverage.

Figure 1.2: Number of students participating from each country in TIMSS 2015

Country	Within-School Student Participation (Weighted Percentage)	Number of Sampled Students in Participating Schools	Number of Students Withdrawn from Class/School	Number of Students Excluded	Number of Eligible Students	Number of Students Absent	Number of Students Assessed
Australia	91%	11,968	312	88	11,568	1,230	10,338
Bahrain	97%	5,334	66	201	5,067	149	4,918
Botswana (9)	98%	6,192	66	12	6,114	150	5,964
Canada	93%	9,618	70	139	9,409	652	8,757
Chile	93%	5,285	67	21	5,197	348	4,849
Chinese Taipei	98%	5,915	53	50	5,812	101	5,711
Egypt	91%	8,897	273	0	8,624	802	7,822
England	95%	5,252	185	0	5,067	253	4,814
Georgia	98%	4,215	28	46	4,141	106	4,035
Hong Kong SAR	96%	4,363	24	13	4,326	171	4,155
Hungary	97%	5,190	20	112	5,058	165	4,893
Iran, Islamic Rep. of	98%	6,482	80	177	6,225	95	6,130
Ireland	92%	5,214	44	47	5,123	419	4,704
Israel	93%	6,079	41	102	5,936	424	5,512
Italy	95%	5,021	16	282	4,723	242	4,481
Japan	95%	5,037	8	12	5,017	272	4,745
Jordan	96%	8,617	441	0	8,176	311	7,865
Kazakhstan	98%	5,040	61	0	4,979	92	4,887
Korea, Rep. of	98%	5,526	35	55	5,436	127	5,309
Kuwait	90%	5,081	113	0	4,968	465	4,503
Lebanon	96%	4,044	24	0	4,020	147	3,873
Lithuania	93%	4,864	27	148	4,689	342	4,347
Malaysia	98%	10,092	171	41	9,880	154	9,726
Malta	96%	4,063	15	67	3,981	164	3,817
Morocco	95%	13,979	229	0	13,750	715	13,035
New Zealand	90%	9,119	93	47	8,979	837	8,142
Norway (9)	91%	5,354	37	128	5,189	492	4,697
Oman	99%	9,218	161	21	9,036	153	8,883
Qatar	98%	5,691	115	73	5,503	100	5,403
Russian Federation	97%	5,025	52	59	4,914	134	4,780
Saudi Arabia	97%	3,962	72	5	3,885	126	3,759
Singapore	97%	6,341	15	0	6,326	210	6,116
Slovenia	94%	4,654	17	76	4,561	304	4,257
South Africa (9)	96%	13,708	574	0	13,134	620	12,514
Sweden	94%	4,561	43	121	4,397	307	4,090
Thailand	99%	6,761	179	0	6,582	100	6,482
Turkey	98%	6,537	232	71	6,234	155	6,079
United Arab Emirates	97%	18,740	78	106	18,556	544	18,012
United States	94%	11,489	198	439	10,852	631	10,221

The TIMSS 2015 mathematics and science assessments are based on wide-ranging frameworks developed collectively with the participating countries. For each curriculum area the frameworks are organized around two dimensions: a content dimension specifying the content to be assessed and a cognitive dimension specifying the thinking processes to be assessed. The TIMSS assessments contain approximately 200 assessment items for each curriculum area, where the majority of TIMSS items assess students' applying and reasoning skills.

TIMSS also administers a curriculum questionnaire to research coordinators of each country to collect information about educational policies and the national contexts that shape the content and implementation of the mathematics and science curricula across countries. The questionnaire is designed to collect information about the organization of the mathematics and science curriculum in each country, and about the content of these subjects intended to be covered up to the eighth grade. It also includes questions on attrition and retention policies, the local or national examination system, as well as goals and standards for mathematics and science instruction.

1.2 Selection criteria, test design and administration

Since Malta participated solely in the 8th grade survey, this report will focus on these 13 to 14-year old students who attend secondary educational institutions. In Malta, the main study was administered in April 2015 and included all the students in this cohort who attended state and non-state schools. A large proportion (94.7%) of these students was born in 2001 and the sample average age (13.84 years) was comparable to other participating countries. The student sample included 1,935 (50.7%) males and 1,882 (49.3%) females and guaranteed a maximum margin of error of approximately 1% assuming a 95% degree of confidence. 1,982 (51.9%) students participated from 19 state schools, 1,431 (37.5%) students participated from 21 church schools and 404 (10.6%) students participated from 8 independent schools. These sample proportions are similar to the population proportions of students attending these school types ensuring a representative sample. Table 1.1 shows the frequency and proportion of male and female Maltese students categorized by school type.

Table 1.1: Maltese students categorized by gender and school type

		School Type		
		State	Church	Independent
Gender	Male	985 (25.8%)	740 (19.4%)	210 (5.5%)
	Female	997 (26.1%)	691 (18.1%)	194 (5.1%)

The sample of 832 teachers comprised 224 (26.9%) Mathematics, 119 Biology (14.3%), 86 (10.3%) Chemistry, 261 (31.4%) Physics, 129 (15.5%) Geography and 13 (1.6%) Integrated Science teachers. 466 (56.0%) of these teachers teach in State, 288 (34.6%) in Church and 78 (9.4%) in Independent schools.

Table 1.2: Maltese teachers categorized by subject taught and school type

		School Type		
		State	Church	Independent
Subject taught	Mathematics	128 (15.4%)	74 (8.9%)	22 (2.6%)
	Biology	33 (4.0%)	68 (8.2%)	18 (2.2%)
	Chemistry	27 (3.2%)	47 (5.6%)	12 (1.4%)
	Physics	158 (19.0%)	83 (10.0%)	20 (2.4%)
	Geography	114 (13.7%)	11 (1.3%)	4 (0.5%)
	Integrated Science	6 (0.7%)	5 (0.6%)	2 (0.3%)

Since the number of assessment items for all curriculum areas is considerable it is impossible that a student answers these items in the amount of testing time available. To resolve this overload problem, TIMSS uses a matrix-sampling approach that involves packaging the entire assessment pool of mathematics and science items into a set of 14 student achievement booklets, with each student completing just one booklet. Each item appears in two booklets, providing a mechanism for linking together the student responses from the various booklets. The booklets are designed to be administered in two sessions, separated by a short break and the duration of each session is 45 minutes. The 14 booklets are distributed among the students in each sampled class according to a predetermined order, so that approximately equal proportions of students respond to each booklet.

TIMSS assessments use two item formats: multiple-choice and constructed-response. The multiple-choice items comprise four response options, of which only one item is correct. Responses to these questions are assessed as incorrect (0 points) and correct (1 point). Although multiple-choice items can be used to assess any of the behaviours in the cognitive domains, these items are more appropriate to measure a wide range of content in a relatively short testing time. On the other hand, constructed-response items are more appropriate when assessing students' ability in making complex interpretations or evaluations. Responses to these questions are assessed as incorrect (0 points), partially correct (1 point) or completely correct (2 points).

TIMSS uses item response theory scaling methods to assemble a comprehensive picture of the achievement of the entire student population of a country from the combined responses of individual students to the booklets that they are assigned. This approach reduces to manageable proportions what otherwise would be an impossible student burden, albeit at the cost of greater complexity in booklet assembly, data collection, and data analysis.

1.3 The TIMSS Science assessment items

Analogous to earlier surveys, TIMSS 2015 identifies two dimensions - content dimension and cognitive dimension. The content domains define the specific subject matter covered by the assessment, and the cognitive domains define the sets of behaviours expected of students as they engage with the content. There are four content domains in Science at the 8th grade, which include Biology (35%), Chemistry (20%), Physics (25%) and Earth Science (20%). In addition, there are three cognitive domains in each curriculum area, which include Knowing (35%), Applying (35%) and Reasoning (30%). The percentages displayed in the brackets indicate the proportion of items in each achievement booklet related to the content and cognitive domains. For each of the content domains the Science framework identifies several topic areas to be included in the assessment. The four content domains can be categorised as follows:

- **Biology**
 - Characteristics and life processes of organisms
 - Cells and their functions
 - Life cycles, reproduction and heredity
 - Diversity, adaptation, and natural selection
 - Ecosystems
 - Human health

- **Chemistry**
 - Composition of matter
 - Properties of matter
 - Chemical change
- **Physics**
 - Physical states and changes in matter
 - Energy transformation and transfer
 - Light and sound
 - Electricity and magnetism
 - Forces and motion
- **Earth science**
 - Earth's structure, physical features
 - Earth's processes, cycles and history
 - Earth's resources, their use and conservation
 - Earth in the solar system and the universe

To respond correctly to TIMSS test items, students need to be familiar with the Science content of the items. Just as important, however, the items were designed to elicit the use of particular cognitive skills. The assessment framework presents detailed descriptions of the skills and abilities that make up the cognitive domains, which are assessed in conjunction with the content. The three cognitive domains can be described as follows:

- **Knowing**
 - Identify or state facts, relationships, and concepts; identify the characteristics or properties of specific organisms, materials, and processes; identify the appropriate uses for scientific equipment and procedures; and recognize and use scientific vocabulary, abbreviations, units, symbols and scales.
 - Describe or identify descriptions of properties, structures, and functions of organisms and materials, and relationships among organisms, materials, processes and phenomena.
 - Provide/identify examples of organisms, materials, and processes that possess certain stated characteristics; and clarify statements of facts/concepts with appropriate examples.
- **Applying**
 - Identify or describe similarities and differences between groups of organisms, materials, or processes; and distinguish, classify, or sort individual objects, materials, organisms, and processes based on given characteristic and properties.
 - Relate knowledge of an underlying science concept to an observed or inferred property, behaviour, or use of objects, organisms, or materials.
 - Use a diagram or other model to demonstrate knowledge of science concepts, to illustrate a process cycle relationship, or system, or to find solutions to science problems.

- Use knowledge of science concepts to interpret relevant textual, tabular, pictorial, and graphical information.
- Provide or identify an explanation for an observation or a natural phenomenon using a science concept or principle.
- **Reasoning**
 - Identify the elements of a scientific problem and use information, concepts, relationships, and data patterns to answer questions and solve problems.
 - Answer questions that require consideration of a number of different factors or related concepts.
 - Make general conclusions that go beyond the experimental or given conditions; apply conclusions to new situations.
 - Use evidence and science understanding to support the reasonableness of explanations, solutions to problems, and conclusions from investigations.
 - Convey questions that can be answered by investigation and predict results of an investigation given information about the design; formulate testable assumptions based on conceptual understanding and knowledge from experience, observation, and/or analysis of scientific information; and use evidence and conceptual understanding to make predictions about the effects of changes in biological or physical conditions.
 - Plan investigations or procedures appropriate for answering scientific questions or testing hypotheses; and describe or recognize the characteristics of well-designed investigations in terms of variables to be measured and controlled and cause-and-effect relationships.
 - Evaluate alternative explanations; weigh advantages and disadvantages to make decisions about alternative processes and materials; and evaluate results of investigations with respect to sufficiency of data to support conclusions.
 - Make valid inferences on the basis of observations, evidence, and/or understanding of science concepts; and draw appropriate conclusions that address questions or hypotheses, and demonstrate understanding of cause and effect.

1.4 International Benchmarks of Attainment in Science

To enable comparison between participating countries regarding students' knowledge and understanding of scientific processes and relationships, seven scores were generated for each student. Four scores are provided for content domains – Biology, Chemistry, Physics, Earth science. Three other scores are provided for cognitive domains – Knowing, Applying and Reasoning. Moreover, an overall Science attainment score was generated to measure students' knowledge and understanding of Science. The TIMSS Science achievement scale has mean 500 and standard deviation 100 and was designed to remain constant between assessments at different cycles.

In order to aid interpretation of the survey results, these Science achievement scores are categorized by four international benchmarks. The Advanced International Benchmark is set at a scale score of 625, the High International Benchmark is 550, the Intermediate International Benchmark is 475 and the Low International Benchmark is 400. Figure 1.3 provides a detailed description of each benchmark.

Figure 1.3: International Benchmarks of Achievement in Science

625	Advanced International Benchmark	<i>Students communicate understanding of complex concepts related to biology, chemistry, physics and Earth science in practical, abstract, and experimental contexts. Students apply knowledge of cells and their functions as well as characteristics and life processes of organisms. They demonstrate understanding of diversity, adaptation, and natural selection among organisms, and of ecosystems and the interaction of organisms with their environment. Students apply knowledge of life cycles, and heredity in plants and animals. Students demonstrate knowledge of the composition and physical properties of matter and apply knowledge of chemical and physical change in practical and experimental contexts. Students communicate understanding of physical states and changes in matter in practical and experimental contexts, apply knowledge of energy transfer, and demonstrate knowledge of electricity and magnetism. Students communicate understanding of forces and pressure and demonstrate knowledge of light and sound in practical and abstract situations. Students communicate understanding of Earth's structure, physical features, and resources as well as of Earth in the solar system. Students show understanding of basic aspects of scientific investigation. They identify which variables to control in an experimental situation, compare information from several sources, combine information to predict and draw conclusions, and interpret information in diagrams, maps, graphs, and tables to solve problems. They provide written explanations to communicate scientific knowledge.</i>
550	High International Benchmark	<i>Students apply and communicate understanding of concepts from biology, chemistry, physics, and Earth science in everyday and abstract situations. Students apply knowledge of cells and their functions and of the characteristics and life processes of organisms. They communicate understanding of ecosystems and the interaction of organisms with their environment and apply some knowledge of human health related to nutrition and infectious disease. Students show some knowledge and understanding of the composition and properties of matter and chemical change. They apply basic knowledge of energy transformation and transfer and of light and sound in practical situations, and demonstrate understanding of simple electrical circuits and properties of magnets. Students apply their knowledge of forces and motion to everyday and abstract situations. They apply knowledge of Earth's physical features, processes, cycles, and history, and show some understanding of Earth's resources, their use, and conservation as well as some knowledge of the interaction between the Earth and the Moon. Students demonstrate some scientific inquiry skills, including selecting and justifying an appropriate experimental method. They combine and interpret information from various types of diagrams, graphs, and tables; select relevant information to analyze and draw conclusions; and provide short explanations conveying scientific knowledge.</i>
475	Intermediate International Benchmark	<i>Students demonstrate and apply their knowledge of biology, chemistry, physics, and Earth science in various contexts. Students demonstrate some knowledge of characteristics and life processes of animals and human health. They apply knowledge of ecosystems, the interaction of living things, and the adaptation of animals to their environments. Students apply some knowledge of the properties of matter. They also show knowledge of some aspects of force, motion, and energy. Students apply knowledge of Earth's processes, resources, and physical features. They interpret information from tables, graphs, and pictorial diagrams to draw conclusions, apply knowledge to practical situations, and communicate their understanding through brief descriptive responses.</i>
400	Low International Benchmark	<i>Students show some basic knowledge of biology, chemistry, physics, and Earth science. Students apply basic knowledge of ecosystems and adaptation of animals to their environment, show knowledge of basic facts related to thermal and electrical conductivity and electromagnetism, and show knowledge of some basic Earth science facts. Students interpret simple pictorial diagrams and apply basic knowledge to practical situations.</i>

Figure 1.4: Item related to Earth Science at a Low International Benchmark (Applying)

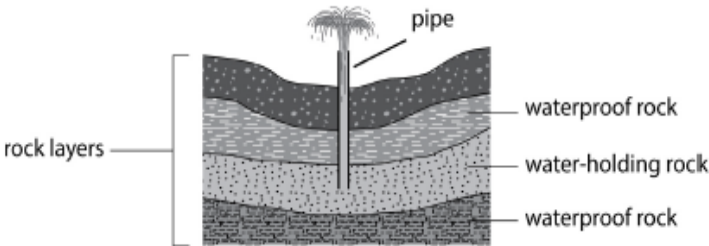
Hungary	95 (1.0)	⬆	An artesian basin holds water underground in a layer of rock. Part of an artesian basin is shown in the diagram.
Kazakhstan	92 (1.1)	⬆	
Russian Federation	91 (1.4)	⬆	
England	91 (1.3)	⬆	
Chinese Taipei	91 (1.1)	⬆	
Lithuania	91 (1.5)	⬆	
Singapore	91 (1.0)	⬆	When people put pipes down into the rock layer, water rises up the pipe and runs onto the ground.
Slovenia	90 (1.4)	⬆	
Ireland	90 (1.3)	⬆	What moves the water up the pipe?
United States	90 (0.9)	⬆	
Canada	89 (1.0)	⬆	(A) electricity (B) magnetism ● pressure (D) gravity
Italy	88 (1.6)	⬆	
Australia	88 (1.0)	⬆	
Thailand	86 (1.3)	⬆	
Sweden	85 (1.7)	⬆	
Georgia	85 (1.8)	⬆	
Japan	85 (1.5)	⬆	
Korea, Rep. of	84 (1.3)	⬆	
Norway (9)	83 (1.7)	⬆	
Malta	83 (1.9)	⬆	
New Zealand	82 (1.6)	⬆	
Turkey	82 (1.5)	⬆	
Chile	81 (1.8)	⬆	
Israel	80 (1.5)	⬆	
United Arab Emirates	80 (1.1)	⬆	
International Avg.	80 (0.3)		
Oman	79 (1.4)	⬆	
Hong Kong SAR	78 (2.3)	⬆	
Jordan	78 (1.4)	⬆	
Iran, Islamic Rep. of	76 (1.6)	⬇	
Bahrain	75 (2.0)	⬇	
Qatar	73 (1.9)	⬇	
Malaysia	69 (2.0)	⬇	
Kuwait	69 (2.3)	⬇	
Saudi Arabia	65 (2.2)	⬇	
Morocco	63 (1.3)	⬇	
Egypt	60 (2.2)	⬇	
Botswana (9)	56 (2.0)	⬇	
Lebanon	54 (2.8)	⬇	
South Africa (9)	48 (2.2)	⬇	

Figure 1.4 shows an example of a multiple-choice item related to Earth Science, which has an ‘applying’ cognitive domain. This item is anchored at the Low International Benchmark. At this level, students are able to use a diagram to identify what moves water from an artesian basin to the surface. One score point is awarded for a correct answer. The mean Malta score for this item was marginally higher than the international average.

Figure 1.5: Item related to Physics at an Intermediate International Benchmark (Knowing)

Singapore	90 (1.1)	●
Italy	90 (1.3)	●
Lithuania	89 (1.4)	●
Hungary	89 (1.3)	●
Malaysia	85 (1.5)	●
Russian Federation	85 (2.1)	●
Hong Kong SAR	83 (1.7)	●
Australia	83 (1.7)	●
Korea, Rep. of	83 (1.8)	●
United States	82 (1.2)	●
Kazakhstan	82 (2.1)	●
Iran, Islamic Rep. of	80 (1.5)	●
Slovenia	79 (1.9)	●
Chile	78 (1.7)	●
Ireland	77 (2.1)	●
New Zealand	76 (2.1)	●
Georgia	73 (2.4)	●
England	72 (2.1)	●
Canada	72 (1.7)	●
Turkey	70 (1.8)	●
International Avg.	68 (0.3)	
Chinese Taipei	68 (1.6)	
Malta	67 (2.1)	
Thailand	66 (2.0)	
Israel	62 (1.8)	▼
Lebanon	62 (2.7)	▼
Norway (9)	61 (2.4)	▼
Bahrain	60 (2.6)	▼
United Arab Emirates	60 (1.3)	▼
Jordan	57 (2.1)	▼
Morocco	56 (1.7)	▼
Qatar	53 (1.9)	▼
Kuwait	52 (2.1)	▼
Egypt	51 (1.9)	▼
Botswana (9)	50 (1.9)	▼
Japan	49 (2.1)	▼
South Africa (9)	47 (1.5)	▼
Saudi Arabia	42 (2.4)	▼
Sweden	41 (2.5)	▼
Oman	35 (1.8)	▼

A horizontal spring is compressed.



What sort of energy does the compressed spring have?

(A) thermal

(B) electrical

● potential

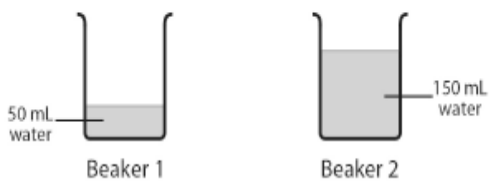
(D) chemical

Figure 1.5 shows an example of a multiple-choice item related to Physics, which has a ‘knowing’ cognitive domain. This item is anchored at the Intermediate International Benchmark. At this level, students are able to recognise the form of energy in a compressed spring. One score point is awarded for a correct answer. The mean Malta score for this item was marginally lower than the international average.

Figure 1.6: Item related to Chemistry at a High International Benchmark (Applying)

Japan	79 (1.3)	⬤
Slovenia	76 (2.0)	⬤
Chinese Taipei	73 (1.7)	⬤
Sweden	71 (2.1)	⬤
Hungary	69 (2.3)	⬤
Lithuania	68 (2.4)	⬤
Singapore	66 (1.6)	⬤
Russian Federation	65 (2.4)	⬤
Hong Kong SAR	65 (2.5)	⬤
Ireland	63 (2.0)	⬤
England	61 (1.9)	⬤
Norway (9)	61 (2.3)	⬤
Kazakhstan	58 (2.9)	⬤
Malaysia	56 (1.9)	⬤
Italy	55 (2.0)	⬤
Canada	52 (1.7)	⬤
Korea, Rep. of	48 (2.5)	⬤
International Avg.	48 (0.3)	
South Africa (9)	46 (1.4)	
Turkey	45 (2.2)	
Malta	45 (2.3)	
New Zealand	44 (2.3)	
Chile	43 (2.2)	⬤
Australia	41 (2.0)	⬤
Botswana (9)	39 (1.8)	⬤
United States	38 (1.4)	⬤
United Arab Emirates	38 (1.4)	⬤
Lebanon	37 (2.2)	⬤
Oman	37 (1.2)	⬤
Israel	36 (2.1)	⬤
Jordan	36 (1.9)	⬤
Bahrain	36 (2.6)	⬤
Qatar	34 (1.9)	⬤
Thailand	33 (2.0)	⬤
Iran, Islamic Rep. of	32 (2.3)	⬤
Saudi Arabia	31 (2.4)	⬤
Georgia	30 (2.1)	⬤
Kuwait	26 (2.2)	⬤
Egypt	26 (1.7)	⬤
Morocco	23 (1.4)	⬤

Pogiso put 20 grams of sugar in each of two beakers. Beaker 1 contained 50 mL of water, and Beaker 2 contained 150 mL of water, as shown in the diagrams below.



Which solution is more dilute?
(Check one box.)

☐ The solution in Beaker 1
☒ The solution in Beaker 2

Explain your answer.

There is more water and the same amount of sugar in Beaker 2.

Figure 1.6 shows an example of a constructed-response item related to Chemistry, which has an ‘applying’ cognitive domain. This item is anchored at the High International Benchmark. At this level, students are able to identify and explain which solution is more than dilute than another in a given context. Two score points are awarded for a complete answer. The mean Malta score for this item was marginally lower than the international average.

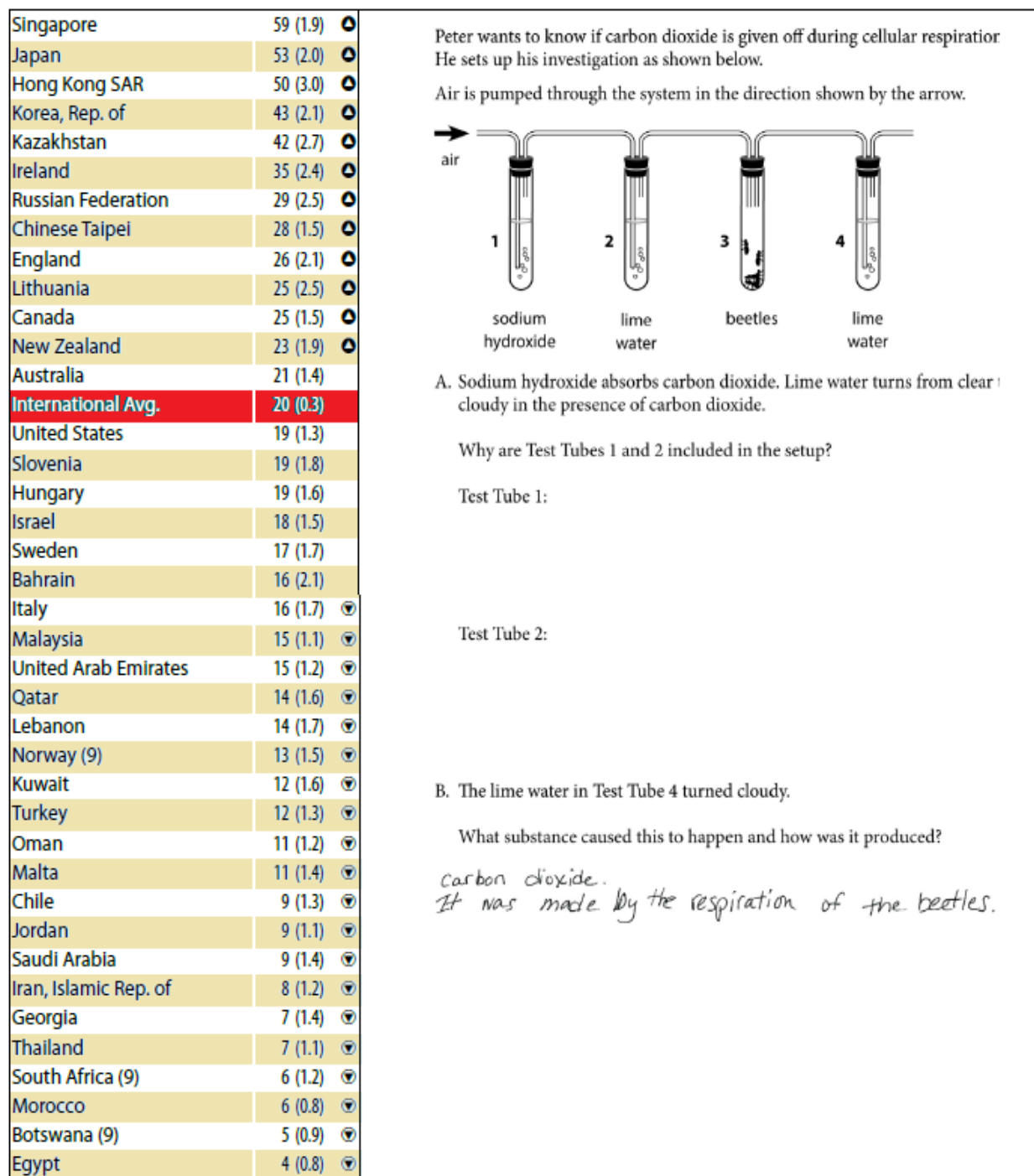
Figure 1.7: Item related to Biology at an Advanced International Benchmark (Reasoning)

Figure 1.7 shows an example of a constructed-response item related to Biology, which has a ‘reasoning’ cognitive domain. This item is anchored at the Advanced International Benchmark. At this level, students are able to identify the gas produced and its source in this investigation about cellular respiration. 2 score points are awarded for a complete answer. The mean Malta score for this item was significantly lower than the international average.

1.5 The TIMSS Mathematics assessment items and Benchmarks

There are four content domains in Mathematics at the 8th grade, which include Number (30%), Algebra (30%), Geometry (20%) and Data and Chance (20%). The percentages displayed in the brackets indicate the proportion of items in each booklet related to the content. The four content domains are categorised as follows:

- **Number**
 - Whole numbers
 - Fractions, decimals and integers
 - Patterns and relationships
- **Algebra**
 - Expressions and operations;
 - Equations and inequalities
 - Relationships and functions.
- **Geometry**
 - Geometric shapes;
 - Geometric measurement
 - Location and movement
- **Data and Chance**
 - Characteristics of data sets
 - Data interpretation
 - Chance

There are three cognitive domains in each curriculum area, which include Knowing (35%), Applying (40%) and Reasoning (25%), which are categorised as follows:

- **Knowing**
 - Recall definitions, terminology, number and geometric properties, units of measurement and notation.
 - Recognize numbers, expressions, quantities, and shapes. Recognize entities that are mathematically equivalent.
 - Classify numbers, expressions, quantities, and shapes by common properties.
 - Carry out algorithmic procedures for the four arithmetic operations or a combination of these with whole numbers, fractions, decimals, and integers. Carry out straightforward algebraic procedures.
 - Retrieve information from graphs, tables, texts, or other sources.
 - Use measuring instruments; and choose appropriate units of measurement.
- **Applying**
 - Determine efficient/appropriate operations, strategies, and tools for solving problems for which there are commonly used methods of solution.

- Show data in tables or graphs; create equations, inequalities, geometric figures/diagrams that model problem situations; and generate equivalent representations for a mathematical entity or relationship.
- Implement strategies and operations to solve problems involving familiar mathematical concepts and procedures.
- **Reasoning**
 - Determine, describe, or use relationships among numbers, expressions, quantities, and shapes.
 - Link different elements of knowledge, related representations, and procedures to solve problems.
 - Evaluate alternative problem solving strategies and solutions.
 - Make valid inferences on the basis of information and evidence.
 - Make statements that represent relationships in more general and more widely applicable terms.
 - Provide mathematical arguments to support a strategy or solution.

To enable comparison between participating countries regarding students' knowledge and understanding of mathematical processes and relationships, seven scores were generated for each student (four scores for content domains and three scores for cognitive domains) The TIMSS Mathematics achievement scale has mean 500 and standard deviation 100. Benchmark scores are described in Figure 1.8.

Figure 1.8: International Benchmarks of Achievement in Mathematics

625	Advanced International Benchmark	●
	<i>Students can apply and reason in a variety of problem situations, solve linear equations, and make generalizations. They can solve a variety of fraction, proportion, and percent problems and justify their conclusions. Students can use their knowledge of geometric figures to solve a wide range of problems about area. They demonstrate understanding of the meaning of averages and can solve problems involving expected values.</i>	
550	High International Benchmark	○
	<i>Students can apply their understanding and knowledge in a variety of relatively complex situations. They can use information to solve problems involving different types of numbers and operations. They can relate fractions, decimals, and percentages to each other. Students at this level show basic procedural knowledge related to algebraic expressions. They can solve a variety of problems with angles including those involving triangles, parallel lines, rectangles, and similar figures. Students can interpret data in a variety of graphs and solve simple problems involving outcomes and probabilities.</i>	
475	Intermediate International Benchmark	●
	<i>Students can apply basic mathematical knowledge in a variety of situations. They can solve problems involving negative numbers, decimals, percentages, and proportions. Students have some knowledge of linear expressions and two- and three-dimensional shapes. They can read and interpret data in graphs and tables. They have some basic knowledge of chance.</i>	
400	Low International Benchmark	○
	<i>Students have some knowledge of whole numbers and basic graphs.</i>	

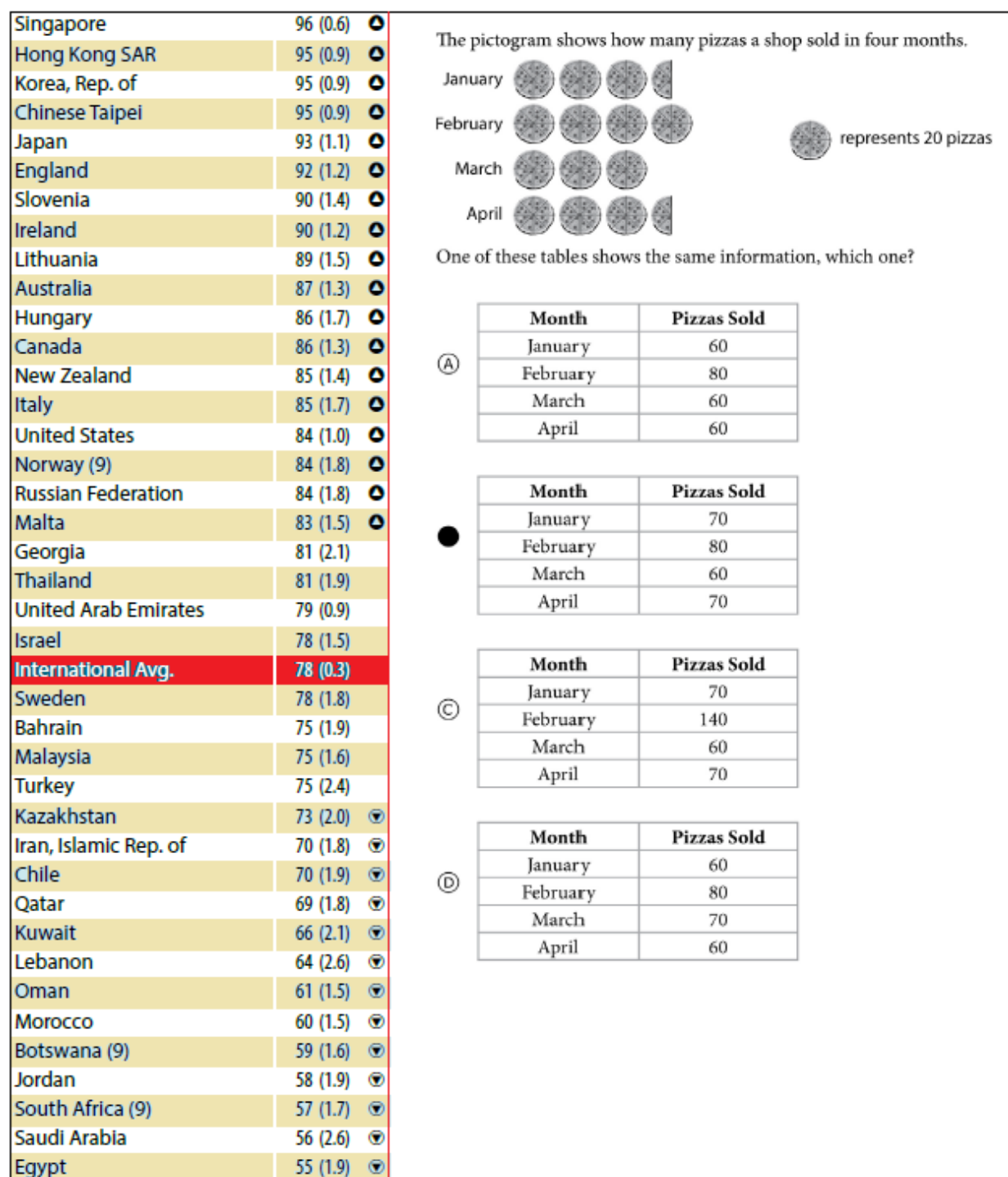
Figure 1.9: Item related to Data and Chance at a Low International Benchmark (Knowing)

Figure 1.9 shows an example of a multiple-choice item related to Data and Chance, which has a ‘knowing’ cognitive domain. This item is anchored at the Low International Benchmark. At this level, students are able to identify the table that matches the information shown in the pictograph. 1 score point is awarded for a correct answer. The mean Malta score for this item was significantly higher than the international average.

Figure 1.10: Item related to Numbers at an Intermediate International Benchmark (Knowing)

Chinese Taipei	85 (1.4)	●
Hong Kong SAR	85 (1.7)	●
Singapore	82 (1.5)	●
Russian Federation	77 (2.2)	●
Slovenia	76 (1.9)	●
Korea, Rep. of	75 (2.0)	●
Japan	73 (1.7)	●
Hungary	72 (2.2)	●
Kazakhstan	70 (2.3)	●
Canada	68 (1.7)	●
Italy	65 (2.2)	●
United States	64 (1.7)	●
Israel	63 (1.8)	●
Ireland	63 (1.9)	●
Lithuania	62 (2.3)	●
Sweden	59 (2.9)	
Lebanon	56 (2.2)	
Georgia	56 (2.7)	
International Avg.	55 (0.3)	
Australia	55 (2.0)	
United Arab Emirates	54 (1.1)	
Norway (9)	54 (2.4)	
Malta	53 (2.0)	
England	50 (2.7)	
Qatar	49 (2.0)	▼
New Zealand	48 (2.0)	▼
Malaysia	44 (1.9)	▼
Iran, Islamic Rep. of	42 (2.2)	▼
Morocco	42 (1.5)	▼
Turkey	41 (2.4)	▼
Bahrain	41 (1.8)	▼
Oman	40 (1.6)	▼
Egypt	40 (2.0)	▼
Thailand	39 (2.6)	▼
Kuwait	39 (2.1)	▼
Chile	38 (2.4)	▼
Jordan	34 (1.9)	▼
Saudi Arabia	30 (2.6)	▼
Botswana (9)	29 (1.7)	▼
South Africa (9)	23 (1.9)	▼

For every whole number n , are these statements **true** or **false**?
Fill in one circle for each statement.

	True	False
$n + 4 = 4 + n$	☒	☐ (B)
$n - 5 = 5 - n$	☐ (A)	☒
$n \times 6 = 6 \times n$	☒	☐ (B)
$n \div 7 = 7 \div n$	☐ (A)	☒

Figure 1.10 shows an example of a constructed-response item related to Numbers, which has a ‘knowing’ cognitive domain. This item is anchored at an Intermediate International Benchmark. At this level, students are able to recognize the commutative properties of numbers. 2 score points are awarded for a complete answer. The mean Malta score for this item was marginally lower than the international average.

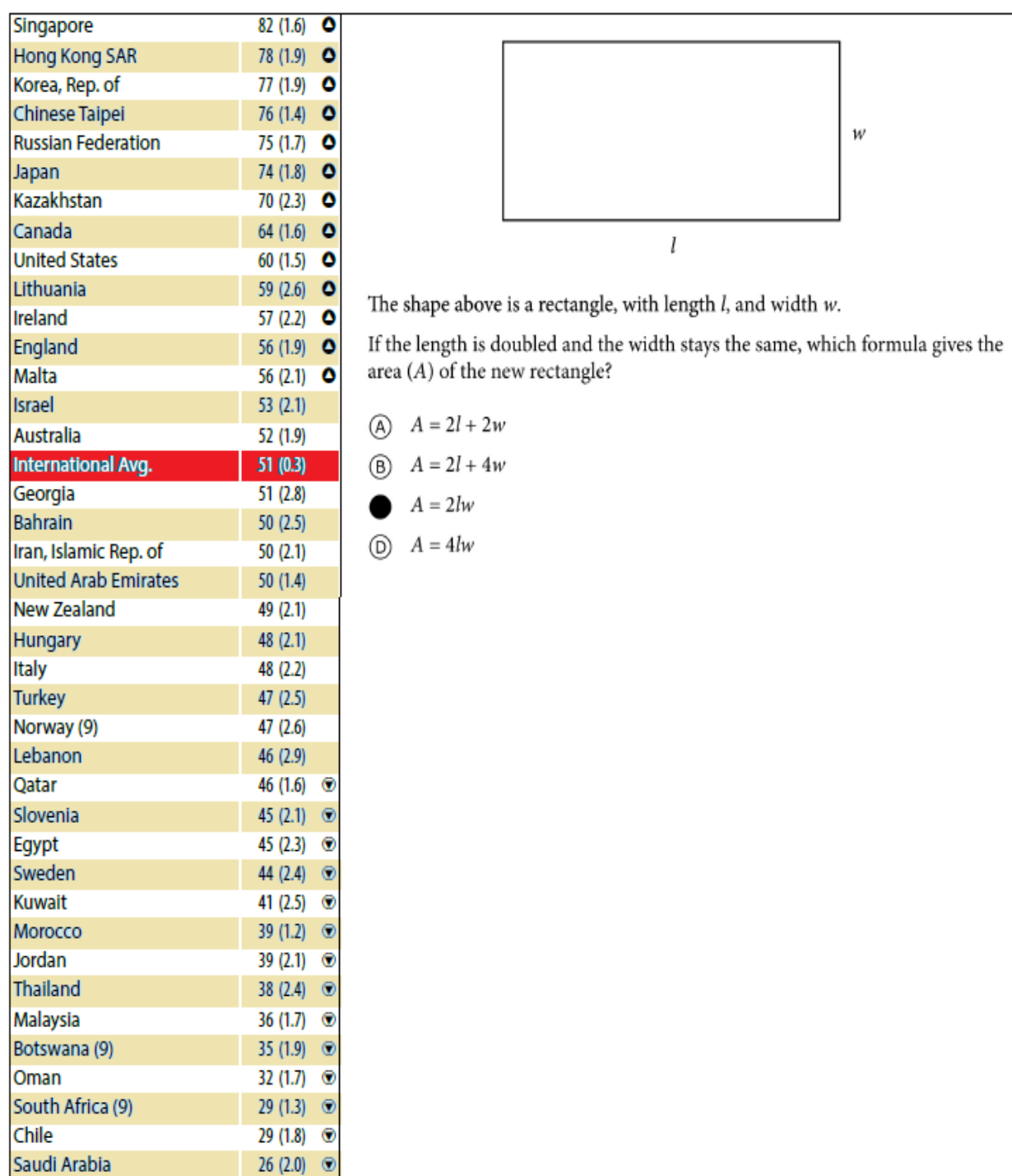
Figure 1.11: Item related to Algebra at a High International Benchmark (Applying)

Figure 1.11 shows an example of a multiple-choice item related to Algebra, which has an ‘applying’ cognitive domain. This item is anchored at the High International Benchmark. At this level, students are able to identify the formula that represents a situation involving the area of a rectangle. 1 score point is awarded for a correct answer. The mean Malta score for this item was significantly higher than the international average.

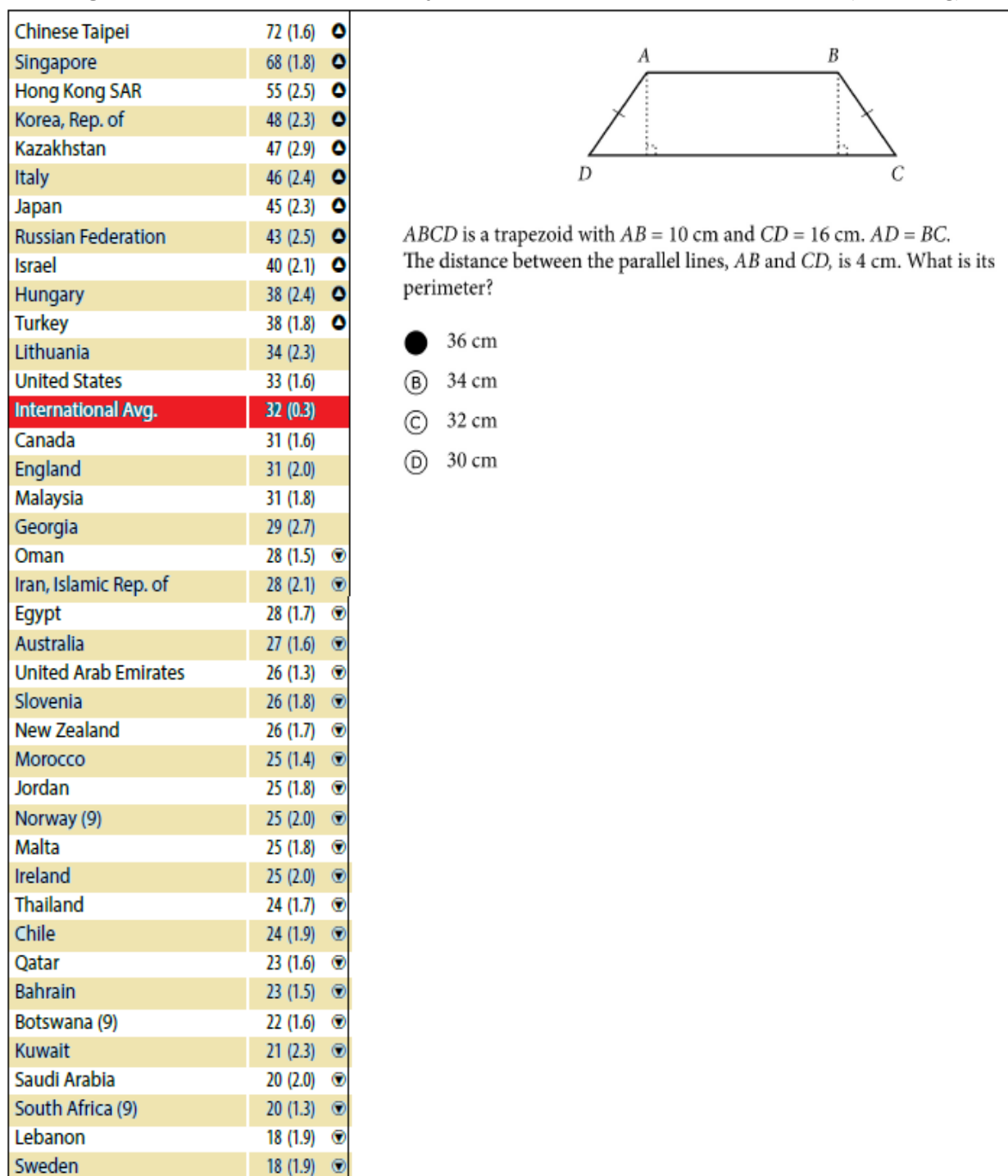
Figure 1.12: Item related to Geometry at an Advanced International Benchmark (Reasoning)

Figure 1.12 shows an example of a multiple-choice item related to Geometry, which has a ‘reasoning’ cognitive domain. This item is anchored at the Advanced International Benchmark. At this level, students are able to use Pythagoras theorem to find the perimeter of the trapezium. 1 score point is awarded for a correct answer. The mean Malta score for this item was significantly lower than the international average.

1.6 Report Structure

Chapter 2 presents the international and national results for Science in TIMSS 2015. Firstly, the overall mean Science attainment scores of 8th grade students are compared between the participating countries and then the mean scores are compared for the content and cognitive domains. The reporting of these results includes both mean scores and percentages achieving the international benchmarks, as both are important. In some graphical displays the 95% confidence intervals of the average Science achievement scores, quartiles and other percentiles are also provided. Performance in Science is also compared between the 2007 and 2015 cycles and between boys and girls for each country separately. This chapter also contrasts overall achievement in Science scores of Maltese students attending different school types.

Chapter 3 follows the same path of chapter 2 by presenting the international and national results for Mathematics in TIMSS 2015. Mathematics attainment scores of 8th grade students are compared between the participating countries and then are compared for the content and cognitive domains. Performance in Mathematics is also compared between the 2007 and 2015 cycles and between boys and girls for each country separately. This chapter also contrasts overall achievement in Mathematics of Maltese students attending different school types.

Chapter 4 analyzes student-level factors, including home background and student activities and attitudes that are potentially related to student achievement. In particular, this chapter presents detailed information about students' home educational resources and students' spoken language at home. A scale score is generated for some of these issues which will be used to identify differences between participating countries.

Chapter 5 describes the school-level contexts in which the students learn mathematics and science both locally and internationally using the information provided mostly supplied by heads of school and partly by teachers. This chapter analyzes the school composition by student economic background, the effect of Science and Mathematics resource shortages on instruction and problems encountered with school conditions and resources. A scale score is generated for some of these issues which will be used to identify differences between participating countries.

Chapter 6 describes the views of heads of school and teachers regarding a number of school-related issues. It highlights their perspective regarding the school emphasis on academic success in Mathematics and Science. Moreover, this chapter addresses other issues related to teachers' job satisfaction, challenges faced by teachers and students' sense of school belonging. A scale score is generated for some of these issues which will be used to identify differences between participating countries.

Chapter 7 describes the views of heads of school and teachers regarding school safety. It examines school discipline problems, order and safety at school and school bullying. A scale score is generated for some of these issues which will be used to identify differences between participating countries.

Chapter 8 describes the teachers' and heads of school formal education and their years of experience. It also investigates teachers' participation in professional development in Mathematics and Science in the last two years.

Chapter 9 is related to classroom instruction and provides information about the teaching duration of Mathematics and Science, percentages of students who are taught the TIMSS Science and Mathematics topics, computer activities during mathematics lessons, resources available for science experiments, teachers' emphasis on science investigation, computer activities during science and mathematics lessons, prevalence of Internet use by students for schoolwork, duration of assigned mathematics and science homework, limitation encountered when teaching students with needs and student absenteeism from school. A scale score is generated for some of these issues which will be used to identify differences between participating countries.

Chapter 10 is related to student engagement and attitudes. In particular, this chapter presents information about students' views on engaging teaching in science and mathematics lessons and assesses how much they like and value these subjects and feel confident. A scale score is generated for most of these issues which will be used to identify differences between participating countries.

2

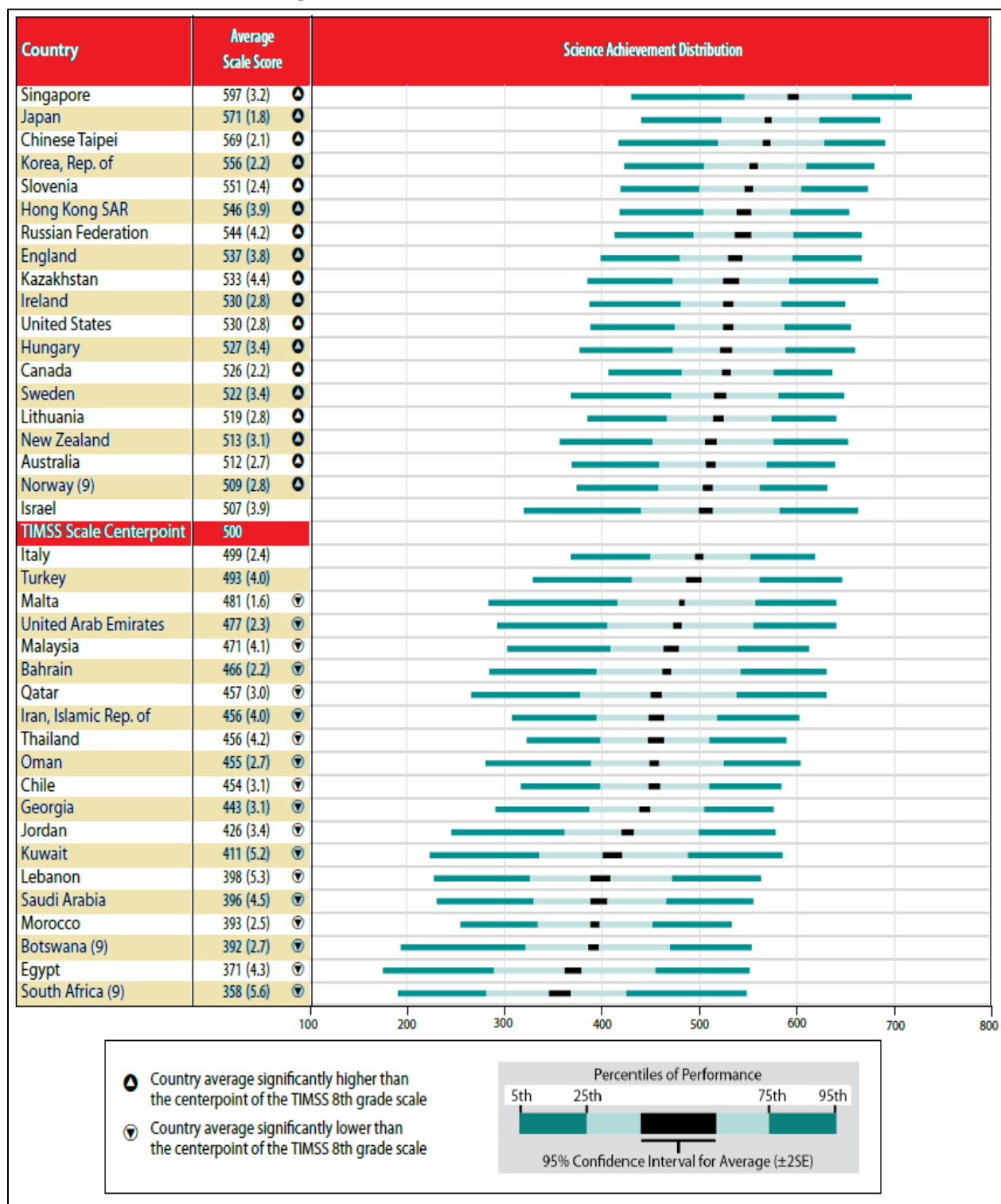
Students' Attainment in Science

2.1 Introduction

This chapter presents the international and national results for Science in TIMSS 2015. Firstly, the overall mean Science attainment scores of 8th grade students are compared between the participating countries and then the mean scores are compared for the content and cognitive domains described in Chapter 1. Performance in Science is displayed by comparing mean scores and comparing percentage of students achieving the international benchmarks. In some graphical displays the 95% confidence intervals of the average Science achievement scores, quartiles and other percentiles are also provided. Attainment in Science is also compared between boys and girls for each country separately. This chapter also contrasts overall achievement in Science between Maltese students attending different school types and between Maltese students participating in the 2007 and 2015 cycles. The seven benchmarking entities (Florida, Quebec, Ontario, Norway, Dubai, Buenos Aires and Abu Dhabi) are excluded from this analysis.

2.2 Overall Achievement in Science in TIMSS 2015

Singapore, Japan, Chinese Taipei, Republic of Korea, Slovenia, Hong Kong and Russian Federation attained the highest mean scores in Science of the participating countries in TIMSS 2015 for 8th grade students. The mean Science score of Singapore was significantly higher than those of all other participating countries. Malta's average Science score (481) was significantly lower than the international TIMSS mean Science score (500) implying that attainment in Science of 8th grade Maltese students is significantly lower than the average Science attainment of the participating countries. Science attainment of Maltese students was comparable to students from United Arab Emirates (477) but was significantly higher to 16 countries including Malaysia (471), Bahrain (466), Qatar (457), Iran (456), Thailand (456), Oman (455), Chile (454), Georgia (443), Jordan (426), Kuwait (411), Lebanon (398), Saudi Arabia (396) Morocco (393), Botswana (392), Egypt (371) and South Africa (358). The 21 countries that scored significantly higher than Malta in Science included Singapore (597), Japan (571), Chinese Taipei (569), Republic of Korea (556), Slovenia (551), Hong Kong (546) Russian Federation (544), England (537), Kazakhstan (533), Ireland (530), United States (530), Hungary (527), Canada (526), Sweden (522), Lithuania (519), New Zealand (513), Australia (512), Norway (509), Israel (507), Italy (499) and Turkey (493).

Figure 2.1: Distribution of Science achievement

The 5th and 95th percentiles of the Maltese Science scores were 284 and 640 respectively, which implies that the bottom 5% of the students scored lower than 284 and the top 5% scored higher than 640. The 10th, 25th, 50th, 75th and 90th percentiles are 331, 415, 492, 557 and 610 respectively.

Figure 2.2: Multiple Comparison of Mean Science Achievement

Country	Average Scale Score	Figure 1.17: Multiple Comparison of Mean Service Home / Client																																								
		Singapore	Japan	Chinese Taipei	Korea, Rep. of	Slovenia	Hong Kong SAR	Russian Federation	England	Kazakhstan	Ireland	United States	Hungary	Canada	Sweden	Lithuania	New Zealand	Australia	Norway (9)	Israel	Italy	Turkey	Malta	United Arab Emirates	Malaysia	Bahrain	Qatar	Iran, Islamic Rep. of	Thailand	Oman	Chile	Georgia	Jordan	Kuwait	Lebanon	Saudi Arabia	Morocco	Botswana (9)	Egypt	South Africa (9)		
Singapore	597 (3.2)																																									
Japan	571 (1.8)	▼																																								
Chinese Taipei	569 (2.1)	▼	▼																																							
Korea, Rep. of	556 (2.2)	▼	▼	▼																																						
Slovenia	551 (2.4)	▼	▼	▼	▼																																					
Hong Kong SAR	546 (3.9)	▼	▼	▼	▼	▼																																				
Russian Federation	544 (4.2)	▼	▼	▼	▼	▼	▼																																			
England	537 (3.8)	▼	▼	▼	▼	▼	▼	▼																																		
Kazakhstan	533 (4.4)	▼	▼	▼	▼	▼	▼	▼	▼																																	
Ireland	530 (2.8)	▼	▼	▼	▼	▼	▼	▼	▼	▼																																
United States	530 (2.8)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼																															
Hungary	527 (3.4)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼																														
Canada	526 (2.2)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼																													
Sweden	522 (3.4)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼																												
Lithuania	519 (2.8)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼																											
New Zealand	513 (3.1)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼																										
Australia	512 (2.7)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼																									
Norway (9)	509 (2.8)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼																								
Israel	507 (3.9)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼																							
Italy	499 (2.4)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼																						
Turkey	493 (4.0)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼																					
Malta	481 (1.6)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼																				
United Arab Emirates	477 (2.3)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼																			
Malaysia	471 (4.1)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼																		
Bahrain	466 (2.2)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼																	
Qatar	457 (3.0)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼																
Iran, Islamic Rep. of	456 (4.0)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼															
Thailand	456 (4.2)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼														
Oman	455 (2.7)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼													
Chile	454 (3.1)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼												
Georgia	443 (3.1)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼											
Jordan	426 (3.4)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼										
Kuwait	411 (5.2)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼									
Lebanon	398 (5.3)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼								
Saudi Arabia	396 (4.5)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼		
Morocco	393 (2.5)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	
Botswana (9)	392 (2.7)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	
Egypt	371 (4.3)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	
South Africa (9)	358 (5.6)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	

Figure 2.1 displays the mean Science scores on the TIMSS achievement scale, which are listed together with the standard errors for each country. The standard error refers to uncertainty in estimates resulting from random fluctuations in samples. The smaller the standard error, the better the sample's score is as an estimate of the population's score. The 95% confidence intervals, which are shown graphically as the darkened areas on the achievement distribution, provide a range of values for the actual mean Science score if the whole population of students had to be included in the study. Mean Science scores of two countries differ significantly when their corresponding confidence interval are disjoint (do not overlap).

Figure 2.2 depicts whether or not the differences in average achievement between pairs of countries are statistically significant. Selecting a country of interest and reading across the table, an arrow pointing up indicates a significantly better performance and an arrow pointing down indicates a significantly poorer performance than the comparison country. The absence of an arrow indicates no significant difference in performance.

Figure 2.3: Percentiles scores of Science Achievement

Country	5th Percentile	10th Percentile	25th Percentile	50th Percentile	75th Percentile	90th Percentile	95th Percentile
Australia	369 (5.5)	403 (4.2)	459 (4.1)	516 (2.9)	569 (2.3)	614 (2.9)	639 (3.6)
Bahrain	285 (5.3)	325 (3.7)	394 (4.3)	471 (2.8)	541 (2.2)	597 (4.0)	630 (4.7)
Botswana (9)	194 (5.8)	240 (4.4)	322 (4.6)	403 (3.2)	471 (2.7)	524 (3.1)	553 (3.4)
Canada	407 (5.3)	434 (4.2)	481 (2.9)	529 (2.5)	575 (2.2)	613 (2.6)	635 (3.4)
Chile	317 (6.3)	348 (4.2)	398 (4.5)	455 (3.9)	511 (3.6)	558 (3.0)	584 (5.1)
Chinese Taipei	417 (4.4)	456 (3.4)	519 (3.2)	579 (2.6)	629 (2.6)	668 (3.4)	690 (3.5)
Egypt	176 (6.3)	218 (5.4)	291 (5.5)	375 (5.3)	455 (5.0)	517 (4.4)	551 (5.5)
England	399 (8.2)	428 (5.9)	480 (5.3)	540 (5.3)	595 (4.6)	640 (4.6)	665 (4.5)
Georgia	291 (7.5)	328 (6.5)	386 (4.5)	448 (3.1)	505 (4.2)	550 (3.9)	576 (4.6)
Hong Kong SAR	418 (9.5)	454 (6.8)	504 (4.3)	552 (3.5)	593 (3.3)	631 (4.7)	653 (5.4)
Hungary	377 (10.0)	416 (7.1)	473 (4.5)	532 (3.9)	588 (3.9)	633 (4.2)	658 (5.3)
Iran, Islamic Rep. of	308 (5.2)	341 (4.6)	395 (4.2)	457 (4.5)	519 (5.2)	570 (6.9)	602 (9.2)
Ireland	387 (10.3)	424 (6.3)	482 (3.7)	537 (2.4)	585 (2.5)	627 (2.9)	650 (4.6)
Israel	320 (9.1)	363 (7.9)	440 (6.2)	516 (4.3)	582 (4.1)	634 (3.6)	662 (4.7)
Italy	368 (5.2)	397 (6.4)	450 (3.6)	503 (2.7)	552 (2.5)	593 (3.5)	618 (4.3)
Japan	440 (5.0)	472 (4.1)	523 (3.1)	575 (2.1)	624 (2.2)	663 (2.5)	686 (2.5)
Jordan	246 (9.2)	292 (6.6)	361 (4.3)	435 (3.9)	499 (3.0)	547 (2.9)	577 (6.0)
Kazakhstan	385 (6.6)	418 (6.5)	473 (5.1)	532 (5.2)	593 (4.8)	647 (7.0)	683 (9.3)
Korea, Rep. of	423 (3.9)	453 (3.1)	505 (2.3)	558 (2.5)	609 (2.6)	653 (3.4)	679 (4.3)
Kuwait	224 (10.0)	264 (8.1)	336 (7.8)	415 (6.0)	488 (5.4)	550 (8.8)	585 (9.5)
Lebanon	228 (9.4)	263 (8.3)	326 (7.1)	401 (6.9)	471 (5.6)	530 (5.2)	562 (7.1)
Lithuania	385 (6.5)	416 (5.0)	467 (4.2)	524 (3.2)	574 (3.1)	616 (4.3)	640 (7.0)
Malaysia	303 (9.5)	341 (9.0)	409 (7.5)	479 (4.7)	539 (3.2)	586 (2.8)	612 (3.3)
Malta	284 (6.9)	331 (5.5)	415 (2.8)	492 (2.4)	557 (2.4)	610 (3.2)	640 (4.4)
Morocco	255 (4.2)	284 (3.5)	334 (3.5)	393 (2.7)	452 (2.7)	504 (3.4)	533 (3.5)
New Zealand	357 (6.8)	392 (5.0)	453 (4.2)	518 (3.5)	576 (3.3)	625 (3.9)	652 (5.0)
Norway (9)	374 (5.6)	407 (4.9)	458 (4.1)	513 (2.7)	562 (3.0)	605 (3.3)	631 (4.0)
Oman	281 (6.3)	322 (5.4)	390 (4.3)	461 (2.9)	526 (3.1)	576 (2.7)	604 (2.9)
Qatar	266 (5.6)	307 (4.6)	379 (5.1)	462 (3.9)	538 (3.8)	598 (4.9)	630 (5.2)
Russian Federation	413 (6.7)	442 (6.2)	494 (6.5)	547 (4.2)	596 (3.9)	640 (5.0)	666 (5.6)
Saudi Arabia	231 (7.8)	269 (6.1)	330 (5.3)	398 (4.7)	466 (4.7)	521 (8.2)	555 (9.9)
Singapore	430 (8.6)	475 (8.7)	547 (5.4)	609 (3.5)	657 (2.5)	696 (2.3)	718 (2.8)
Slovenia	419 (7.2)	451 (3.8)	500 (3.3)	554 (3.0)	605 (2.7)	647 (3.1)	672 (4.0)
South Africa (9)	191 (4.8)	224 (4.6)	283 (4.8)	350 (6.0)	426 (8.9)	504 (10.6)	549 (12.5)
Sweden	368 (11.5)	411 (7.1)	471 (4.7)	528 (3.6)	582 (4.0)	626 (3.9)	649 (5.2)
Thailand	323 (4.2)	352 (5.1)	399 (4.5)	456 (4.3)	511 (5.5)	559 (5.6)	590 (9.0)
Turkey	329 (7.3)	366 (4.7)	431 (4.6)	498 (4.7)	560 (4.5)	614 (5.2)	645 (6.4)
United Arab Emirates	293 (6.0)	333 (4.7)	405 (3.8)	484 (2.5)	554 (3.0)	608 (2.5)	639 (3.9)
United States	388 (5.1)	421 (4.2)	475 (3.5)	535 (3.5)	588 (3.1)	631 (2.9)	656 (3.5)

Figure 2.3 shows the ranges in Science achievement for the middle group of students (25th to 75th percentiles) and for the lowest and highest attainers (5th and 95th percentiles). For high performing countries the difference between the 5th and 95th percentile was around 250 points; while, for low performing countries the difference between the 5th and 95th percentile was slightly above 350 points. This indicates that in low performing countries Science scores are more dispersed than high performing countries. In Malta, the difference between the 25th and 75th percentile is 142 scale points, the difference between the 10th and 90th percentile is 279 and the difference between the 5th and 95th percentile is 356 scale points. These percentile scores are essential to display the proportion of students in different countries below or above a specified threshold scale score. For instance, the 95th percentile for Malta is equal to the 90th percentile for

England indicating that the top 5% of students in Malta has the same level of Science attainment as the top 10% in England. The 5th percentile for Malta is equal to the 10th percentile for Morocco indicating that the bottom 5% of students in Malta has the same level of Science attainment as the bottom 10% in Morocco. The 25th percentile for Malta is equal to the 50th percentile for Kuwait indicating that the top 75% of Maltese students have a better Science score than the bottom half of Kuwaiti students

Figure 2.4: Percentage of students reaching International Benchmarks in Science

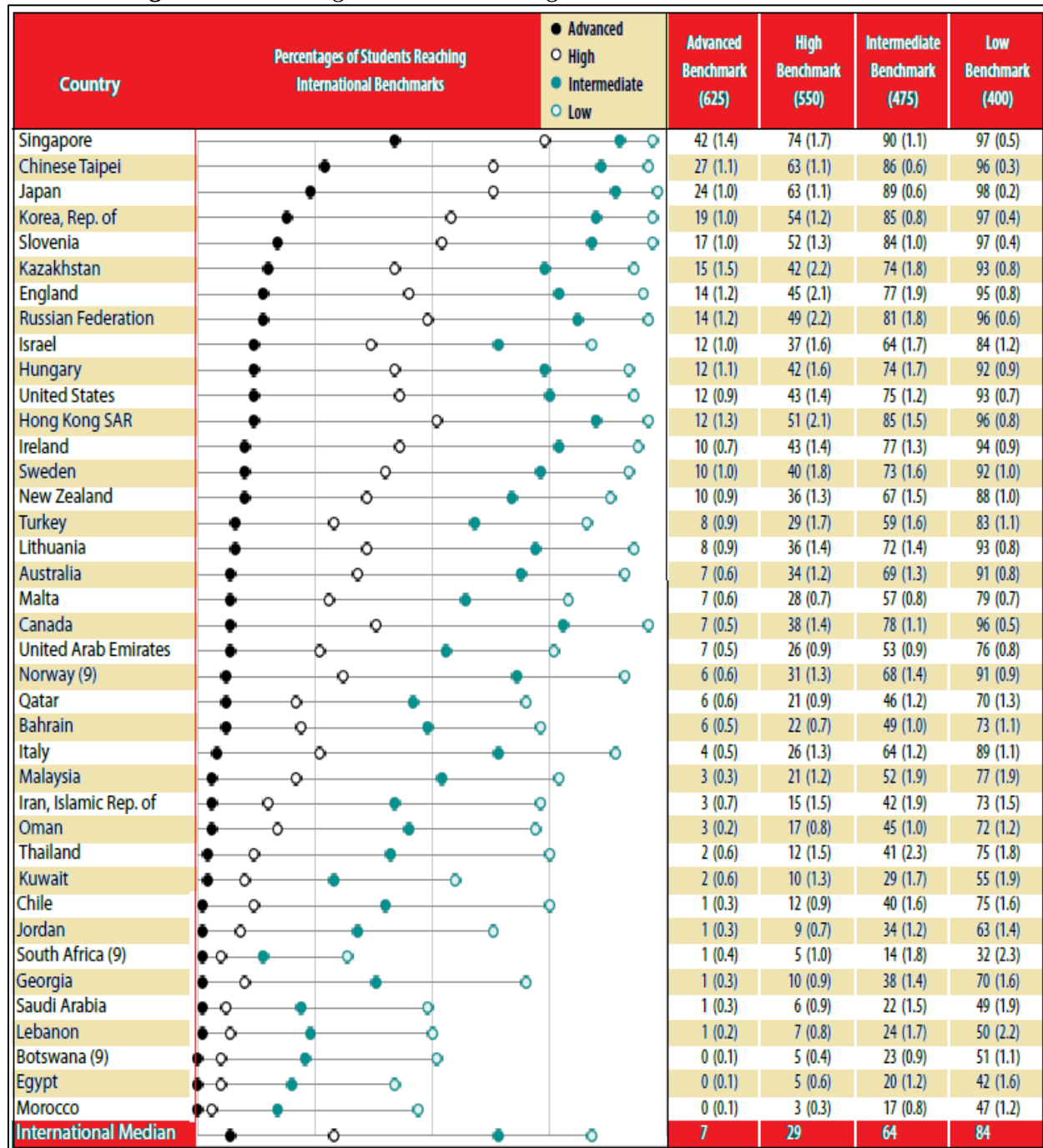
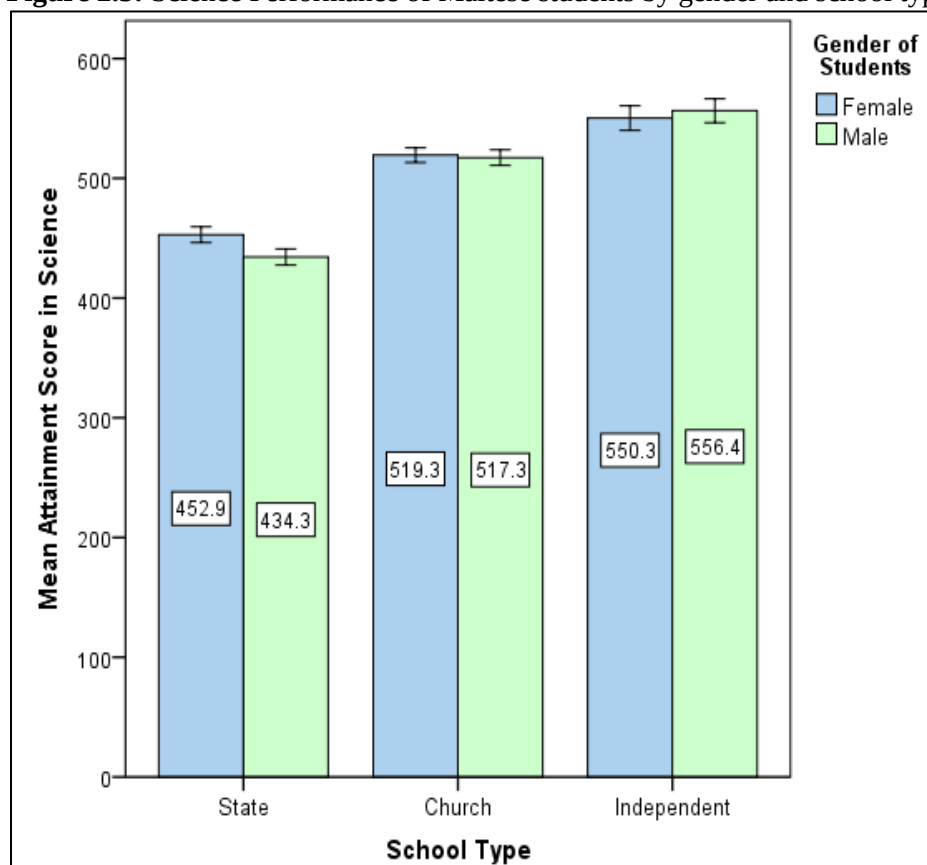


Figure 2.4 shows the proportion of students within the International Benchmarks, described in Chapter 1, for countries participating in TIMSS 2015. The international average shows that 7% of the students have a Science attainment score above 625, 22% have a Science attainment score between 550 and 625, 35% have a Science attainment score between 475 and 550, 20% have a Science attainment score between 400 and 475 and the remaining 16% have a Science attainment score below 400. The proportions for Malta are respectively 7%, 21%, 29%, 22% and 21%. The proportion of students in the advanced benchmark category was highest in Singapore (42%) and lowest in Botswana, Egypt and Morocco (approximately 0%), while the proportion of students in the low benchmark category was highest in South Africa (68%) and lowest in Japan (2%).

2.3 Gender Differences in Overall Science Attainment

Figure 2.6 shows that in 14 countries girls performed significantly better than boys in Science, which include Saudi Arabia (55), Bahrain (50), Kuwait (47), Oman (45), Jordan (41), United Arab Emirates (31), Qatar (30), Botswana (22), Thailand (20), Turkey (19), Lebanon (10), Malaysia (10), Malta (8) and Morocco (7). There are five countries where boys performed significantly better than girls in Science, which include Hungary (17), Chile (12), Hong Kong (10), Italy (10) and United States (5). In the remaining countries, gender discrepancy in Science achievement scores was not significant. The values in the brackets display the difference in the mean Science scores between the gender groups.

Figure 2.5: Science Performance of Maltese students by gender and school type



In 13 countries differences in mean Science scores were small (4 scale points or less) and were not found to be significant at the 0.05 criterion. The mean Science score for Maltese girls (485) exceeded that of boys (477) by around 8 scale points. Figure 2.5 shows that girls perform better in Science than boys in state and church schools, while boys perform better than girls in Independent schools. Gender bias in mean Science scores was significant in state schools only.

Figure 2.6: Gender differences in Science Performance

Country	Girls		Boys		Difference (Absolute Value)	Gender Difference	
	Percent of Students	Average Scale Score	Percent of Students	Average Scale Score		Girls Scored Higher	Boys Scored Higher
Saudi Arabia	51 (1.6)	423 (4.9)	49 (1.6)	368 (8.0)	55 (9.5)		
Bahrain	48 (0.9)	492 (3.2)	52 (0.9)	442 (3.4)	50 (5.0)		
Kuwait	50 (2.5)	434 (5.1)	50 (2.5)	387 (8.2)	47 (8.7)		
Oman	48 (1.7)	478 (2.9)	52 (1.7)	433 (3.6)	45 (4.4)		
Jordan	50 (2.6)	447 (4.0)	50 (2.6)	405 (5.3)	41 (6.7)		
United Arab Emirates	50 (2.5)	492 (3.5)	50 (2.5)	461 (4.4)	31 (6.7)		
Qatar	50 (3.0)	471 (3.6)	50 (3.0)	441 (5.2)	30 (6.0)		
Botswana (9)	51 (0.6)	403 (3.3)	49 (0.6)	381 (3.1)	22 (3.3)		
Thailand	54 (1.5)	465 (4.4)	46 (1.5)	445 (5.2)	20 (4.8)		
Turkey	48 (0.8)	503 (4.1)	52 (0.8)	484 (4.5)	19 (3.1)		
Egypt	53 (2.3)	377 (5.9)	47 (2.3)	364 (5.4)	13 (7.6)		
Lebanon	53 (1.6)	403 (4.9)	47 (1.6)	393 (6.7)	10 (4.7)		
Malaysia	50 (1.8)	476 (4.0)	50 (1.8)	466 (4.8)	10 (3.5)		
South Africa (9)	51 (1.1)	362 (6.7)	49 (1.1)	353 (5.5)	9 (5.1)		
Malta	49 (0.3)	485 (2.2)	51 (0.3)	477 (2.2)	8 (3.1)		
Morocco	46 (0.7)	397 (2.3)	54 (0.7)	390 (3.4)	7 (3.0)		
Kazakhstan	49 (0.9)	536 (5.2)	51 (0.9)	530 (4.5)	6 (3.9)		
Israel	49 (1.2)	510 (4.1)	51 (1.2)	504 (4.7)	6 (4.1)		
Iran, Islamic Rep. of	48 (0.9)	459 (4.4)	52 (0.9)	454 (6.6)	5 (8.0)		
Slovenia	48 (0.7)	553 (2.8)	52 (0.7)	549 (2.7)	4 (2.7)		
Ireland	50 (1.1)	531 (2.8)	50 (1.1)	529 (3.9)	2 (3.7)		
England	51 (1.6)	537 (4.7)	49 (1.6)	536 (4.5)	1 (5.2)		
Japan	51 (1.0)	571 (2.2)	49 (1.0)	570 (2.5)	1 (3.1)		
Lithuania	50 (0.8)	520 (3.3)	50 (0.8)	519 (3.4)	1 (3.7)		
New Zealand	51 (2.0)	513 (3.2)	49 (2.0)	512 (4.3)	1 (4.2)		
Georgia	47 (0.9)	444 (3.3)	53 (0.9)	443 (3.9)	1 (3.7)		
Sweden	48 (1.0)	523 (4.2)	52 (1.0)	522 (3.5)	1 (3.4)		
Singapore	49 (0.6)	596 (3.3)	51 (0.6)	597 (4.0)	1 (3.7)		
Chinese Taipei	49 (0.8)	568 (2.3)	51 (0.8)	571 (2.6)	3 (2.6)		
Korea, Rep. of	47 (0.5)	554 (2.2)	53 (0.5)	557 (2.8)	3 (2.7)		
Norway (9)	50 (0.7)	507 (3.1)	50 (0.7)	511 (3.2)	4 (2.9)		
Russian Federation	49 (0.9)	542 (4.6)	51 (0.9)	546 (4.3)	4 (3.0)		
Canada	51 (1.0)	524 (2.2)	49 (1.0)	529 (2.7)	5 (2.3)		
Australia	51 (1.6)	510 (3.4)	49 (1.6)	515 (3.0)	5 (3.4)		
United States	50 (0.6)	527 (3.1)	50 (0.6)	533 (3.0)	5 (2.0)		
Italy	49 (0.8)	494 (3.0)	51 (0.8)	504 (2.6)	10 (2.7)		
Hong Kong SAR	47 (2.1)	540 (4.2)	53 (2.1)	551 (4.9)	10 (4.6)		
Chile	48 (1.8)	448 (3.6)	52 (1.8)	460 (4.1)	12 (4.8)		
Hungary	50 (0.9)	519 (3.9)	50 (0.9)	535 (3.6)	17 (3.2)		
International Avg.	50 (0.2)	491 (0.6)	50 (0.2)	481 (0.7)			



Difference is statistically significant



Difference is not statistically significant

2.4 Attainment in Science in Content and Cognitive domains

Figure 2.7 displays the mean Science attainment score in the Content domains. Mean scores range from 348 to 609 in Biology, range from 369 to 593 in Chemistry, range from 359 to 608 in Physics and range from 330 to 581 in Earth Science. Singapore tops the list in Biology, Chemistry and Physics, while Chinese Taipei tops the list in Earth Science.

Figure 2.7: Achievement in Science Content domains

Country	Overall Science Average Scale Score	Biology (75 Items)	Chemistry (43 Items)	Physics (53 Items)	Earth Science (44 Items)
		Average Scale Score	Average Scale Score	Average Scale Score	Average Scale Score
Singapore	597 (3.2)	609 (3.5) ▲	593 (3.6) ▼	608 (3.1) ▲	565 (3.6) ▼
Japan	571 (1.8)	570 (2.9)	570 (2.4)	570 (2.3)	574 (2.0) ▲
Chinese Taipei	569 (2.1)	565 (2.2) ▼	579 (2.7) ▲	560 (3.0) ▼	581 (2.7) ▲
Korea, Rep. of	556 (2.2)	554 (2.2)	550 (2.5) ▼	564 (2.8) ▲	554 (2.7)
Slovenia	551 (2.4)	548 (2.8)	552 (2.6)	545 (2.9) ▼	564 (2.9) ▲
Hong Kong SAR	546 (3.9)	549 (4.7)	536 (4.1) ▼	540 (4.1) ▼	558 (4.3) ▲
Russian Federation	544 (4.2)	539 (4.4) ▼	558 (4.9) ▲	548 (4.2)	532 (4.7) ▼
England	537 (3.8)	542 (4.0) ▲	529 (4.5) ▼	535 (3.9)	536 (4.0)
Kazakhstan	533 (4.4)	520 (4.6) ▼	554 (5.2) ▲	543 (5.0) ▲	508 (5.4) ▼
Ireland	530 (2.8)	534 (2.9) ▲	517 (3.6) ▼	525 (3.2) ▼	542 (3.1) ▲
United States	530 (2.8)	540 (2.9) ▲	519 (3.2) ▼	516 (2.9) ▼	535 (3.1) ▲
Hungary	527 (3.4)	521 (3.3) ▼	534 (3.6) ▲	531 (4.0)	521 (3.9) ▼
Canada	526 (2.2)	534 (2.4) ▲	512 (2.2) ▼	521 (2.2) ▼	532 (2.3) ▲
Sweden	522 (3.4)	520 (3.6)	512 (3.6) ▼	524 (3.7)	532 (4.5) ▲
Lithuania	519 (2.8)	521 (3.1)	517 (3.2)	513 (3.6) ▼	518 (3.3)
New Zealand	513 (3.1)	520 (3.5) ▲	498 (3.5) ▼	508 (3.2) ▼	517 (3.6) ▲
Australia	512 (2.7)	522 (2.8) ▲	493 (3.3) ▼	505 (2.7) ▼	522 (2.9) ▲
Norway (9)	509 (2.8)	502 (2.6) ▼	503 (2.9) ▼	512 (3.1)	523 (3.3) ▲
Israel	507 (3.9)	504 (4.2)	516 (4.6) ▲	508 (4.0)	493 (4.0) ▼
Italy	499 (2.4)	496 (2.6) ▼	487 (2.4) ▼	496 (2.5)	514 (2.8) ▲
Turkey	493 (4.0)	491 (4.1)	493 (4.7)	506 (4.2) ▲	477 (3.9) ▼
Malta	481 (1.6)	473 (2.7) ▼	481 (2.1)	490 (1.8) ▲	481 (2.5)
United Arab Emirates	477 (2.3)	475 (2.4) ▼	481 (3.2) ▲	475 (2.5) ▼	475 (2.4)
Malaysia	471 (4.1)	466 (4.4) ▼	473 (4.0)	480 (3.9) ▲	460 (4.5) ▼
Bahrain	466 (2.2)	469 (2.6) ▲	462 (2.8)	461 (2.6) ▼	461 (3.5)
Qatar	457 (3.0)	454 (3.0)	455 (3.6)	459 (3.4)	446 (3.7) ▼
Iran, Islamic Rep. of	456 (4.0)	448 (3.8) ▼	458 (4.6)	475 (4.4) ▲	439 (4.5) ▼
Thailand	456 (4.2)	466 (4.1) ▲	445 (4.9) ▼	437 (4.6) ▼	459 (4.5) ▲
Oman	455 (2.7)	454 (2.7)	452 (2.7)	449 (3.0) ▼	456 (2.4)
Chile	454 (3.1)	459 (3.6) ▲	438 (3.6) ▼	439 (3.8) ▼	464 (3.2) ▲
Georgia	443 (3.1)	447 (3.1) ▲	456 (3.7) ▲	429 (4.6) ▼	420 (3.6) ▼
Jordan	426 (3.4)	420 (3.9) ▼	438 (3.8) ▲	424 (3.6)	416 (3.0) ▼
Kuwait	411 (5.2)	402 (5.9) ▼	413 (5.7)	411 (5.1)	408 (5.1)
Lebanon	398 (5.3)	366 (6.2) ▼	438 (6.2) ▲	412 (6.6) ▲	365 (6.4) ▼
Saudi Arabia	396 (4.5)	397 (5.1)	377 (5.0) ▼	385 (5.3) ▼	403 (4.3) ▲
Morocco	393 (2.5)	380 (2.5) ▼	400 (3.0) ▲	395 (2.9)	395 (2.2)
Botswana (9)	392 (2.7)	397 (2.9) ▲	390 (3.6)	384 (2.8) ▼	368 (3.1) ▼
Egypt	371 (4.3)	348 (5.0) ▼	395 (5.0) ▲	378 (4.7) ▲	351 (4.6) ▼
South Africa (9)	358 (5.6)	356 (5.9)	369 (6.1) ▲	359 (5.5)	330 (6.4) ▼

Malta's mean attainment score is highest in Physics (490) and lowest in Biology (473), where both scores are significantly different from the overall mean Malta science score (481). The mean attainment scores in Chemistry (481) and Earth Science (481) are comparable to the overall mean. The arrows indicate significant difference from the overall mean score of each country.

Figure 2.8: Achievement in Science Cognitive domains

Country	Overall Science Average Scale Score	Knowing (75 Items)		Applying (88 Items)		Reasoning (52 Items)	
		Average Scale Score	Difference from Overall Science Score	Average Scale Score	Difference from Overall Science Score	Average Scale Score	Difference from Overall Science Score
Singapore	597 (3.2)	594 (3.4)	-3 (1.0) ▼	600 (3.4)	3 (0.9) ▲	595 (3.2)	-2 (0.7) ▼
Japan	571 (1.8)	567 (2.2)	-3 (1.2) ▼	575 (1.9)	4 (0.8) ▲	570 (2.1)	-1 (1.1)
Chinese Taipei	569 (2.1)	589 (2.3)	20 (1.3) ▲	565 (2.0)	-4 (1.0) ▼	560 (2.0)	-9 (1.3) ▼
Korea, Rep. of	556 (2.2)	555 (2.9)	0 (2.0)	552 (2.2)	-3 (1.3) ▼	560 (2.8)	5 (1.7) ▲
Slovenia	551 (2.4)	558 (2.6)	7 (1.7) ▲	547 (2.3)	-4 (1.2) ▼	550 (2.3)	-1 (1.3)
Hong Kong SAR	546 (3.9)	547 (3.7)	2 (1.0)	541 (4.3)	-5 (1.5) ▼	550 (4.4)	4 (1.4) ▲
Russian Federation	544 (4.2)	558 (5.2)	14 (2.2) ▲	538 (4.6)	-6 (1.8) ▼	538 (3.9)	-7 (1.7) ▼
England	537 (3.8)	523 (4.1)	-14 (1.2) ▼	538 (3.9)	2 (1.4)	545 (4.0)	8 (1.4) ▲
Kazakhstan	533 (4.4)	529 (5.8)	-4 (2.6)	535 (4.5)	3 (0.9) ▲	528 (4.7)	-5 (2.1) ▼
Ireland	530 (2.8)	523 (3.2)	-7 (1.6) ▼	533 (3.0)	3 (1.8)	532 (3.0)	2 (2.2)
United States	530 (2.8)	532 (3.4)	2 (1.2)	531 (2.8)	1 (1.2)	526 (2.8)	-4 (0.9) ▼
Hungary	527 (3.4)	525 (3.5)	-2 (1.1) ▼	528 (3.4)	1 (1.6)	524 (3.8)	-3 (2.2)
Canada	526 (2.2)	518 (2.3)	-8 (1.6) ▼	526 (2.1)	-1 (0.9)	533 (2.2)	7 (0.8) ▲
Sweden	522 (3.4)	519 (3.2)	-3 (1.2) ▼	518 (3.5)	-4 (1.9) ▼	526 (4.0)	4 (2.2)
Lithuania	519 (2.8)	513 (3.1)	-6 (2.1) ▼	517 (3.4)	-3 (2.2)	525 (3.2)	6 (1.9) ▲
New Zealand	513 (3.1)	503 (3.2)	-10 (0.9) ▼	513 (3.5)	1 (1.2)	520 (3.3)	7 (1.7) ▲
Australia	512 (2.7)	510 (2.7)	-2 (1.1)	512 (2.9)	0 (0.8)	513 (2.8)	1 (1.0)
Norway (9)	509 (2.8)	500 (3.1)	-8 (1.5) ▼	507 (2.9)	-2 (1.7)	518 (3.0)	9 (1.3) ▲
Israel	507 (3.9)	503 (4.3)	-4 (1.3) ▼	504 (3.8)	-3 (1.1) ▼	511 (4.4)	4 (1.6) ▲
Italy	499 (2.4)	505 (2.6)	6 (1.4) ▲	496 (2.4)	-3 (1.5)	493 (2.8)	-6 (1.4) ▼
Turkey	493 (4.0)	489 (4.5)	-4 (1.1) ▼	492 (3.9)	-1 (1.5)	495 (4.2)	2 (1.4)
Malta	481 (1.6)	468 (2.1)	-14 (1.3) ▼	489 (1.8)	8 (1.5) ▲	479 (1.7)	-3 (1.1) ▼
United Arab Emirates	477 (2.3)	478 (2.5)	1 (1.3)	478 (2.4)	1 (0.8)	473 (2.4)	-4 (0.9) ▼
Malaysia	471 (4.1)	466 (5.1)	-5 (2.1) ▼	476 (4.2)	5 (0.8) ▲	467 (3.9)	-4 (0.9) ▼
Bahrain	466 (2.2)	462 (2.5)	-4 (1.7) ▼	464 (2.4)	-2 (1.0)	466 (2.8)	1 (1.8)
Qatar	457 (3.0)	448 (3.6)	-9 (2.3) ▼	460 (3.6)	3 (1.7)	454 (3.2)	-2 (1.7)
Iran, Islamic Rep. of	456 (4.0)	455 (4.8)	-1 (1.7) ▼	457 (4.0)	1 (0.9)	454 (4.0)	-3 (1.1) ▼
Thailand	456 (4.2)	469 (4.3)	14 (1.4) ▲	450 (4.7)	-6 (1.3) ▼	447 (4.0)	-9 (1.1) ▼
Oman	455 (2.7)	455 (2.9)	0 (1.1)	454 (2.9)	-1 (1.3)	454 (2.4)	0 (1.3)
Chile	454 (3.1)	466 (3.2)	12 (1.6) ▲	446 (3.0)	-8 (1.3) ▼	448 (3.6)	-5 (1.2) ▼
Georgia	443 (3.1)	452 (3.3)	9 (2.7) ▲	442 (3.1)	-1 (2.3)	432 (3.5)	-11 (1.8) ▼
Jordan	426 (3.4)	430 (3.3)	4 (1.7) ▲	425 (3.3)	-1 (1.3)	419 (3.6)	-7 (1.7) ▼
Kuwait	411 (5.2)	415 (5.2)	4 (1.9) ▲	406 (5.2)	-5 (1.5) ▼	400 (5.8)	-11 (1.6) ▼
Lebanon	398 (5.3)	403 (5.9)	5 (2.9)	398 (5.3)	0 (2.8)	381 (6.3)	-17 (2.5) ▼
Saudi Arabia	396 (4.5)	395 (5.0)	-2 (3.1)	383 (4.9)	-14 (2.2) ▼	405 (4.7)	8 (1.9) ▲
Morocco	393 (2.5)	395 (2.3)	2 (0.9)	391 (2.8)	-2 (0.8) ▼	385 (2.6)	-9 (1.2) ▼
Botswana (9)	392 (2.7)	371 (3.6)	-21 (1.8) ▼	398 (3.8)	7 (2.2) ▲	390 (2.6)	-2 (2.0)
Egypt	371 (4.3)	372 (5.2)	1 (2.1)	371 (4.4)	0 (1.4)	359 (4.8)	-12 (2.3) ▼
South Africa (9)	358 (5.6)	337 (6.7)	-20 (2.0) ▼	368 (5.9)	10 (1.5) ▲	350 (5.6)	-7 (1.5) ▼

Figure 2.8 displays the mean Science attainment score in the Cognitive domains. Mean scores range from 337 to 594 in Knowing, range from 368 to 489 in Applying and range from 350 to 595 in Reasoning. Singapore tops the list in all three cognitive domains.

Malta's mean attainment score is highest in Applying (489), followed by Reasoning (479) and Knowing (468). All mean scores are significantly different from the overall mean Malta science score (481). The arrows indicate significant difference from the overall mean score of each country.

Figure 2.9: Achievement in Science Content domains by Gender

Country	Biology		Chemistry		Physics		Earth Science	
	Girls	Boys	Girls	Boys	Girls	Boys	Girls	Boys
Australia	524 (3.4)	520 (3.3)	494 (4.2)	492 (3.5)	496 (3.3)	513 (3.0)	514 (3.5)	530 (3.4)
Bahrain	499 (3.4)	441 (3.6)	497 (3.7)	430 (4.1)	480 (3.4)	444 (4.0)	479 (4.1)	443 (4.8)
Botswana (9)	412 (3.9)	380 (3.4)	404 (4.3)	375 (4.9)	385 (4.5)	383 (3.5)	375 (4.4)	362 (3.3)
Canada	536 (2.5)	532 (2.8)	513 (2.3)	512 (2.8)	513 (2.4)	528 (2.6)	522 (2.6)	543 (3.0)
Chile	456 (4.4)	462 (4.2)	436 (4.2)	440 (5.4)	429 (4.8)	449 (4.1)	452 (3.9)	475 (4.3)
Chinese Taipei	566 (2.2)	564 (2.9)	584 (2.7)	574 (3.5)	552 (3.6)	567 (3.5)	574 (3.5)	588 (3.4)
Egypt	357 (6.7)	338 (6.1)	402 (6.9)	386 (5.7)	379 (6.6)	376 (6.0)	351 (6.6)	351 (5.4)
England	546 (5.0)	538 (4.7)	534 (5.4)	523 (5.3)	532 (4.6)	539 (4.8)	532 (4.8)	540 (4.8)
Georgia	450 (3.3)	444 (3.8)	462 (4.9)	451 (4.0)	423 (3.9)	435 (6.6)	414 (3.8)	425 (4.8)
Hong Kong SAR	547 (4.8)	550 (5.5)	537 (4.7)	535 (5.1)	530 (4.4)	549 (5.2)	543 (4.7)	571 (5.0)
Hungary	519 (3.8)	523 (3.3)	530 (4.0)	538 (4.4)	511 (4.9)	550 (4.1)	506 (4.5)	536 (4.2)
Iran, Islamic Rep. of	453 (4.4)	444 (6.3)	468 (5.4)	448 (7.6)	473 (5.2)	477 (7.2)	435 (5.4)	442 (7.1)
Ireland	540 (2.9)	528 (4.0)	524 (3.5)	510 (5.3)	518 (3.9)	532 (3.9)	536 (3.5)	548 (4.1)
Israel	510 (4.5)	498 (5.0)	523 (5.0)	509 (5.5)	508 (4.3)	509 (5.1)	488 (4.5)	497 (4.8)
Italy	494 (3.0)	497 (3.0)	485 (3.1)	490 (2.9)	484 (3.0)	508 (3.4)	504 (3.5)	524 (3.7)
Japan	574 (3.2)	567 (3.4)	575 (3.3)	565 (3.5)	567 (2.7)	572 (3.7)	572 (2.7)	575 (2.8)
Jordan	444 (4.6)	395 (5.6)	463 (4.9)	412 (6.2)	441 (4.6)	408 (5.7)	429 (4.1)	403 (5.2)
Kazakhstan	527 (5.5)	514 (4.7)	559 (6.1)	548 (5.1)	544 (6.0)	542 (5.0)	504 (6.1)	512 (5.7)
Korea, Rep. of	552 (2.5)	556 (2.7)	554 (2.6)	547 (3.4)	563 (3.1)	565 (3.4)	547 (3.6)	561 (3.8)
Kuwait	429 (5.8)	374 (9.3)	437 (5.7)	388 (9.0)	431 (5.2)	392 (8.1)	432 (5.4)	385 (7.7)
Lebanon	373 (5.7)	358 (8.9)	447 (6.1)	427 (7.5)	413 (7.8)	412 (7.4)	366 (5.9)	364 (8.6)
Lithuania	529 (3.6)	513 (3.8)	520 (3.6)	515 (3.8)	508 (4.5)	517 (4.6)	511 (4.2)	525 (4.1)
Malaysia	475 (4.4)	457 (5.1)	482 (4.1)	464 (4.6)	480 (4.2)	480 (4.9)	459 (4.4)	462 (5.5)
Malta	483 (3.2)	463 (3.4)	492 (3.7)	471 (2.7)	489 (3.5)	492 (3.4)	478 (3.0)	484 (3.6)
Morocco	387 (2.8)	373 (3.1)	409 (3.1)	392 (3.7)	391 (3.1)	399 (3.1)	396 (2.9)	394 (2.8)
New Zealand	526 (3.4)	513 (4.7)	500 (3.8)	495 (4.8)	502 (3.9)	515 (4.4)	510 (3.8)	524 (5.1)
Norway (9)	504 (3.1)	499 (3.0)	507 (3.5)	498 (4.0)	504 (3.6)	520 (4.0)	513 (4.3)	532 (3.8)
Oman	482 (2.8)	428 (3.8)	482 (2.9)	425 (3.9)	466 (3.7)	433 (3.9)	473 (2.7)	441 (3.6)
Qatar	473 (4.0)	435 (5.6)	474 (4.2)	436 (5.7)	469 (3.6)	450 (6.0)	457 (5.6)	434 (6.4)
Russian Federation	544 (4.8)	534 (4.8)	558 (5.4)	558 (5.6)	538 (4.8)	557 (4.6)	528 (5.2)	536 (4.9)
Saudi Arabia	430 (5.9)	363 (8.3)	409 (6.5)	344 (8.7)	410 (5.6)	360 (8.8)	421 (6.6)	384 (6.9)
Singapore	612 (3.6)	607 (4.4)	598 (3.9)	588 (4.4)	605 (3.6)	611 (3.9)	557 (4.9)	572 (4.4)
Slovenia	558 (3.0)	539 (3.1)	559 (3.2)	546 (3.4)	539 (3.8)	551 (3.2)	560 (3.3)	569 (3.4)
South Africa (9)	365 (6.9)	347 (5.8)	380 (7.0)	357 (5.8)	353 (6.6)	365 (5.6)	329 (7.4)	331 (6.7)
Sweden	527 (4.7)	514 (3.7)	517 (4.9)	509 (3.9)	519 (4.0)	530 (4.2)	527 (6.0)	537 (4.0)
Thailand	477 (4.2)	453 (5.2)	460 (4.9)	428 (6.3)	441 (5.0)	432 (6.0)	464 (5.0)	453 (5.6)
Turkey	504 (3.9)	479 (4.6)	511 (5.0)	477 (5.3)	515 (4.2)	497 (5.0)	480 (3.8)	475 (4.6)
United Arab Emirates	495 (3.5)	455 (4.5)	502 (4.0)	460 (5.2)	483 (3.7)	466 (4.8)	488 (3.6)	462 (4.5)
United States	542 (2.9)	538 (3.2)	520 (3.7)	518 (3.5)	508 (3.0)	524 (3.4)	526 (3.5)	544 (3.3)
International Avg.	493 (0.7)	475 (0.8)	495 (0.7)	476 (0.8)	484 (0.7)	486 (0.8)	481 (0.7)	483 (0.8)

Figure 2.9 shows a larger proportion of countries where girls perform significantly better than boys in Biology and Chemistry and a larger proportion of countries where boys perform significantly better than girls in Physics and Earth Science. This pattern is also visible for Maltese

students. The mean attainment scores of Maltese girls in Biology and Chemistry (483 and 492) respectively exceed the corresponding mean scores of Maltese boys (463 and 471) by at least 20 scale points and the difference is significant at the 0.05 level. The mean attainment scores of Maltese boys in Physics and Earth Science (492 and 484) respectively exceed the corresponding mean attainment scores of Maltese girls (489 and 478) by at least 3 scale points and the difference is not statistically significant. England is the only country where there is no significant difference between the mean attainment scores of boys and girls in all four areas of Content domain.

Figure 2.10: Achievement in Science Cognitive domains by gender

Country	Knowing		Applying		Reasoning	
	Girls	Boys	Girls	Boys	Girls	Boys
Australia	505 (3.2)	516 (3.1) ▲	512 (3.5)	513 (3.4)	511 (3.3)	515 (3.2)
Bahrain	487 (3.5) ▲	438 (3.5)	489 (3.3) ▲	441 (3.7)	493 (3.6) ▲	442 (4.3)
Botswana (9)	379 (5.0) ▲	363 (3.4)	409 (3.9) ▲	387 (4.5)	398 (3.2) ▲	381 (3.0)
Canada	512 (2.3)	524 (3.0) ▲	524 (2.4)	527 (2.6)	533 (2.6)	534 (2.5)
Chile	458 (3.6)	473 (4.5) ▲	442 (3.8)	450 (3.8)	443 (4.4)	454 (4.4) ▲
Chinese Taipei	582 (2.4)	596 (3.2) ▲	563 (2.2)	567 (2.7)	563 (2.5)	558 (2.6)
Egypt	376 (7.3)	368 (6.2)	378 (6.0) ▲	362 (5.6)	367 (6.2) ▲	350 (6.1)
England	520 (4.7)	525 (5.1)	543 (4.7)	534 (5.0)	545 (4.8)	545 (4.7)
Georgia	456 (3.4)	449 (4.9)	443 (3.3)	442 (3.8)	430 (4.2)	434 (4.3)
Hong Kong SAR	537 (4.1)	556 (4.6) ▲	536 (4.7)	545 (5.5)	548 (4.8)	552 (5.3)
Hungary	512 (4.8)	538 (3.6) ▲	522 (3.8)	535 (3.8) ▲	517 (4.4)	531 (4.0) ▲
Iran, Islamic Rep. of	456 (6.1)	455 (7.1)	461 (4.6)	454 (6.6)	458 (4.6)	450 (6.7)
Ireland	519 (3.2)	527 (4.6)	536 (3.1)	530 (4.4)	534 (2.8)	531 (4.6)
Israel	506 (4.5)	500 (5.3)	507 (4.1)	501 (4.7)	514 (4.7)	507 (5.1)
Italy	501 (3.7)	508 (3.2)	490 (3.0)	502 (2.7) ▲	489 (4.3)	498 (3.0)
Japan	563 (2.7)	572 (2.7) ▲	578 (2.5) ▲	571 (2.6)	573 (2.7)	568 (2.9)
Jordan	450 (4.5) ▲	410 (5.5)	448 (4.3) ▲	402 (5.3)	440 (4.3) ▲	398 (5.5)
Kazakhstan	528 (6.4)	529 (6.0)	540 (5.3) ▲	531 (4.4)	534 (5.6) ▲	522 (5.0)
Korea, Rep. of	549 (2.8)	561 (3.7) ▲	550 (2.3)	554 (2.8)	562 (2.8)	559 (3.4)
Kuwait	433 (5.6) ▲	396 (8.3)	431 (5.3) ▲	382 (8.4)	430 (5.6) ▲	369 (9.1)
Lebanon	406 (4.9)	399 (8.1)	405 (5.3) ▲	390 (7.4)	387 (6.4) ▲	375 (7.5)
Lithuania	511 (3.5)	516 (4.6)	519 (3.9)	514 (4.0)	527 (3.9)	524 (4.0)
Malaysia	470 (5.1) ▲	461 (5.9)	483 (4.0) ▲	469 (5.0)	470 (3.8) ▲	464 (4.6)
Malta	470 (2.3)	465 (3.6)	494 (2.6) ▲	484 (3.2)	485 (2.5) ▲	473 (3.0)
Morocco	396 (2.7)	394 (2.9)	396 (3.0) ▲	388 (3.0)	391 (2.8) ▲	379 (3.1)
New Zealand	499 (3.3)	507 (4.4)	515 (3.6)	512 (4.6)	523 (3.7)	516 (4.3)
Norway (9)	493 (3.5)	508 (3.6) ▲	506 (3.2)	508 (3.5)	520 (3.5)	517 (3.3)
Oman	477 (3.6) ▲	434 (3.9)	478 (3.2) ▲	431 (4.1)	478 (2.6) ▲	432 (3.7)
Qatar	460 (4.4) ▲	436 (6.2)	475 (4.5) ▲	444 (5.6)	471 (4.2) ▲	437 (5.4)
Russian Federation	555 (5.4)	560 (5.6)	537 (5.1)	540 (4.7)	535 (4.5)	540 (4.5)
Saudi Arabia	417 (5.0) ▲	372 (8.1)	413 (5.4) ▲	351 (8.5)	433 (5.5) ▲	375 (8.2)
Singapore	589 (3.4)	598 (4.5) ▲	601 (3.8)	599 (4.5)	595 (3.5)	594 (4.2)
Slovenia	555 (2.8)	561 (3.7)	551 (2.4) ▲	544 (2.9)	557 (3.1) ▲	544 (3.1)
South Africa (9)	342 (7.3)	332 (7.0)	373 (6.9) ▲	363 (5.8)	354 (6.8)	346 (5.7)
Sweden	515 (4.1)	524 (3.6) ▲	520 (4.1)	517 (3.7)	532 (4.7) ▲	522 (4.1)
Thailand	477 (4.5) ▲	460 (5.5)	461 (4.8) ▲	437 (5.9)	456 (4.3) ▲	437 (5.1)
Turkey	497 (4.5) ▲	482 (4.9)	504 (4.0) ▲	482 (4.4)	508 (4.4) ▲	484 (4.8)
United Arab Emirates	490 (3.9) ▲	466 (4.9)	496 (3.6) ▲	460 (4.5)	490 (3.7) ▲	457 (4.4)
United States	524 (3.6)	539 (3.6) ▲	530 (3.1)	532 (3.1)	525 (2.9)	527 (3.0)
International Avg.	487 (0.7) ▲	483 (0.8)	491 (0.7) ▲	479 (0.8)	490 (0.7) ▲	478 (0.8)

Figure 2.10 shows a larger proportion of countries where girls perform significantly better than boys in Applying and Reasoning, while for the Knowing cognitive domain the proportions are comparable. This pattern is also visible for Maltese students. The mean attainment scores of Maltese girls in the 'Knowing', 'Applying' and 'Reasoning' (470, 494 and 485) exceed the mean attainment scores of Maltese boys (465, 484 and 473) by at least 5 scale points; however the difference is significant in the last two cognitive domains. In England, Georgia, Iran, Ireland, Israel, Lithuania, New Zealand and Russian Federation there is no significant difference between the mean attainment scores of boys and girls in all three areas of Cognitive domain.

Figure 2.11: Percentage correct replies in Science Content and Cognitive Domains

Country	Overall Science	Science Content Domains				Science Cognitive Domains		
		Biology	Chemistry	Physics	Earth Science	Knowing	Applying	Reasoning
Australia	47 (0.5)	50 (0.6)	40 (0.6)	44 (0.5)	51 (0.5)	51 (0.5)	48 (0.6)	39 (0.6)
Bahrain	39 (0.3)	40 (0.4)	37 (0.5)	38 (0.3)	41 (0.5)	44 (0.4)	39 (0.4)	32 (0.4)
Botswana (9)	29 (0.3)	31 (0.4)	26 (0.4)	28 (0.3)	27 (0.3)	34 (0.3)	30 (0.3)	19 (0.4)
Canada	49 (0.4)	52 (0.4)	43 (0.5)	47 (0.5)	52 (0.5)	52 (0.5)	50 (0.4)	44 (0.5)
Chile	36 (0.5)	38 (0.5)	31 (0.5)	33 (0.5)	39 (0.6)	43 (0.5)	36 (0.5)	27 (0.6)
Chinese Taipei	59 (0.4)	59 (0.4)	60 (0.5)	56 (0.5)	62 (0.4)	65 (0.4)	59 (0.4)	51 (0.5)
Egypt	27 (0.5)	25 (0.5)	27 (0.6)	29 (0.5)	27 (0.5)	33 (0.6)	26 (0.5)	17 (0.4)
England	51 (0.8)	53 (0.9)	48 (0.9)	50 (0.8)	53 (0.8)	53 (0.7)	53 (0.8)	47 (1.0)
Georgia	35 (0.5)	36 (0.5)	36 (0.6)	33 (0.5)	33 (0.6)	42 (0.5)	34 (0.5)	25 (0.6)
Hong Kong SAR	53 (0.8)	54 (0.8)	49 (0.9)	52 (0.9)	57 (0.8)	57 (0.7)	53 (0.9)	48 (1.0)
Hungary	50 (0.7)	50 (0.6)	50 (0.8)	51 (0.7)	51 (0.7)	54 (0.6)	51 (0.7)	43 (0.8)
Iran, Islamic Rep. of	37 (0.7)	36 (0.7)	35 (0.9)	40 (0.8)	36 (0.7)	43 (0.7)	38 (0.7)	28 (0.8)
Ireland	50 (0.5)	52 (0.6)	46 (0.7)	48 (0.6)	55 (0.6)	53 (0.5)	52 (0.6)	44 (0.7)
Israel	46 (0.7)	47 (0.8)	47 (0.9)	47 (0.7)	46 (0.7)	50 (0.7)	47 (0.7)	41 (0.9)
Italy	44 (0.4)	45 (0.4)	39 (0.5)	43 (0.5)	49 (0.5)	49 (0.4)	45 (0.4)	35 (0.5)
Japan	59 (0.4)	60 (0.4)	56 (0.6)	58 (0.4)	61 (0.4)	61 (0.4)	61 (0.4)	53 (0.5)
Jordan	33 (0.4)	33 (0.4)	32 (0.6)	33 (0.5)	34 (0.5)	39 (0.4)	33 (0.5)	24 (0.5)
Kazakhstan	51 (1.0)	50 (1.0)	55 (1.2)	53 (1.1)	48 (1.0)	55 (1.0)	52 (1.0)	43 (1.1)
Korea, Rep. of	56 (0.5)	56 (0.4)	52 (0.6)	57 (0.6)	57 (0.5)	59 (0.5)	56 (0.5)	51 (0.5)
Kuwait	31 (0.8)	31 (0.8)	30 (0.8)	30 (0.8)	33 (0.8)	37 (0.7)	31 (0.8)	22 (0.9)
Lebanon	29 (0.7)	26 (0.7)	33 (0.9)	31 (0.8)	27 (0.6)	35 (0.7)	29 (0.8)	19 (0.7)
Lithuania	48 (0.6)	50 (0.6)	45 (0.7)	47 (0.6)	49 (0.7)	51 (0.5)	48 (0.6)	43 (0.7)
Malaysia	40 (0.7)	40 (0.7)	37 (0.7)	42 (0.7)	41 (0.7)	45 (0.6)	41 (0.7)	30 (0.7)
Malta	42 (0.3)	42 (0.3)	40 (0.4)	42 (0.4)	44 (0.4)	45 (0.3)	44 (0.3)	34 (0.4)
Morocco	27 (0.3)	26 (0.3)	26 (0.4)	27 (0.4)	29 (0.3)	33 (0.3)	27 (0.3)	18 (0.3)
New Zealand	47 (0.6)	49 (0.6)	42 (0.7)	45 (0.6)	50 (0.8)	49 (0.6)	48 (0.7)	41 (0.7)
Norway (9)	46 (0.5)	45 (0.6)	42 (0.6)	46 (0.6)	50 (0.7)	49 (0.5)	46 (0.6)	41 (0.7)
Oman	37 (0.4)	38 (0.4)	34 (0.5)	35 (0.4)	39 (0.4)	43 (0.4)	37 (0.4)	28 (0.4)
Qatar	38 (0.5)	39 (0.5)	35 (0.6)	38 (0.5)	40 (0.5)	43 (0.4)	39 (0.5)	30 (0.5)
Russian Federation	54 (0.9)	54 (1.0)	55 (1.1)	54 (0.9)	52 (0.9)	60 (1.0)	53 (0.9)	46 (0.9)
Saudi Arabia	28 (0.6)	29 (0.7)	24 (0.7)	26 (0.7)	31 (0.6)	34 (0.6)	27 (0.7)	21 (0.7)
Singapore	64 (0.7)	68 (0.7)	63 (0.8)	65 (0.7)	59 (0.7)	67 (0.6)	66 (0.7)	59 (0.8)
Slovenia	55 (0.5)	56 (0.5)	54 (0.6)	53 (0.5)	59 (0.6)	60 (0.5)	55 (0.5)	49 (0.6)
South Africa (9)	24 (0.7)	25 (0.8)	22 (0.7)	25 (0.6)	25 (0.8)	29 (0.7)	25 (0.8)	15 (0.7)
Sweden	49 (0.7)	49 (0.7)	45 (0.7)	48 (0.7)	52 (0.7)	52 (0.6)	49 (0.7)	43 (0.9)
Thailand	37 (0.8)	39 (0.8)	33 (0.8)	33 (0.8)	39 (0.9)	44 (0.8)	37 (0.9)	26 (0.8)
Turkey	43 (0.8)	44 (0.8)	43 (0.9)	45 (0.8)	42 (0.8)	48 (0.8)	43 (0.8)	37 (0.9)
United Arab Emirates	41 (0.4)	42 (0.4)	40 (0.5)	40 (0.4)	43 (0.4)	47 (0.4)	42 (0.4)	33 (0.4)
United States	50 (0.6)	53 (0.6)	46 (0.7)	46 (0.6)	53 (0.6)	54 (0.6)	52 (0.6)	43 (0.7)
International Avg.	43 (0.1)	44 (0.1)	41 (0.1)	42 (0.1)	45 (0.1)	48 (0.1)	44 (0.1)	36 (0.1)

Figure 2.11 displays the percentage of correct replies in Content and Cognitive Domains and overall Science. The percentage of correct replies obtained by Maltese students in overall Science is 42%, which is 1% lower than the international average (43%). In the content domains, Maltese students fared better in Earth Science questions (44%), followed by Biology (42%), Physics (42%) and Chemistry (40%). This is in line with other participating countries where the international percentages of correct replies in the Content domain areas are 45%, 44%, 42% and 41% respectively. In the cognitive domains, Maltese students fared better in 'Knowing' (45%), followed by 'Applying' (44%) and 'Reasoning' (34%). This is in line with other countries where the international percentages of correct replies in Cognitive domain areas are 48%, 44% and 36% respectively.

Figures 2.12 to 2.15 show that, on average, students attending Independent schools score significantly higher than students attending Church and State schools in all four content areas. In State schools, girls perform better than boys in all four content areas and differences are significant in Biology, Chemistry and Physics. Gender differences in Church and Independent schools are less conspicuous; however girls tend to perform better than boys in Biology and Chemistry, while boys tend to do better than girls in Chemistry and Earth Science. Figures 2.16 to 2.18 show that, on average, students attending Independent schools score significantly higher than students attending Church and State schools in all three cognitive areas. Girls attending state schools are, on average, scoring significantly higher than boys in all three cognitive areas; however, for students attending Church and Independent schools there is no gender bias. Figures 2.19 and 2.20 display significantly higher proportions of students attending Independent schools in the upper Science scale benchmarks and significantly higher proportions of students attending State schools in the lower scales.

Figure 2.12: Attainment of Maltese students in Biology by gender and school type

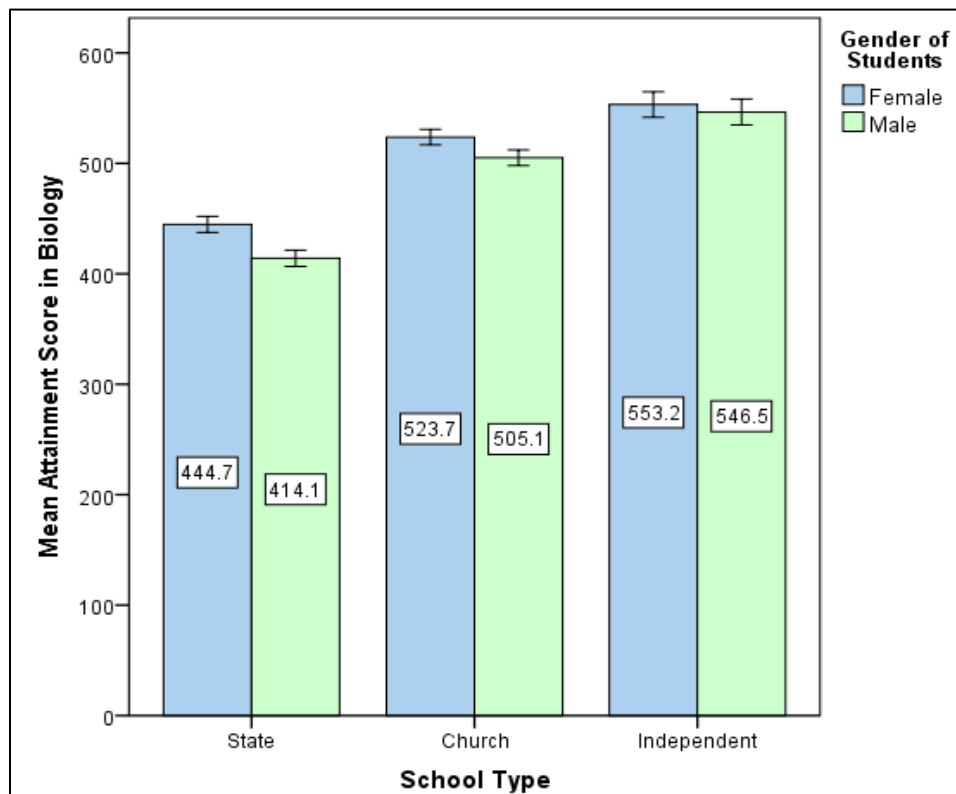


Figure 2.13: Attainment of Maltese students in Chemistry by gender and school type

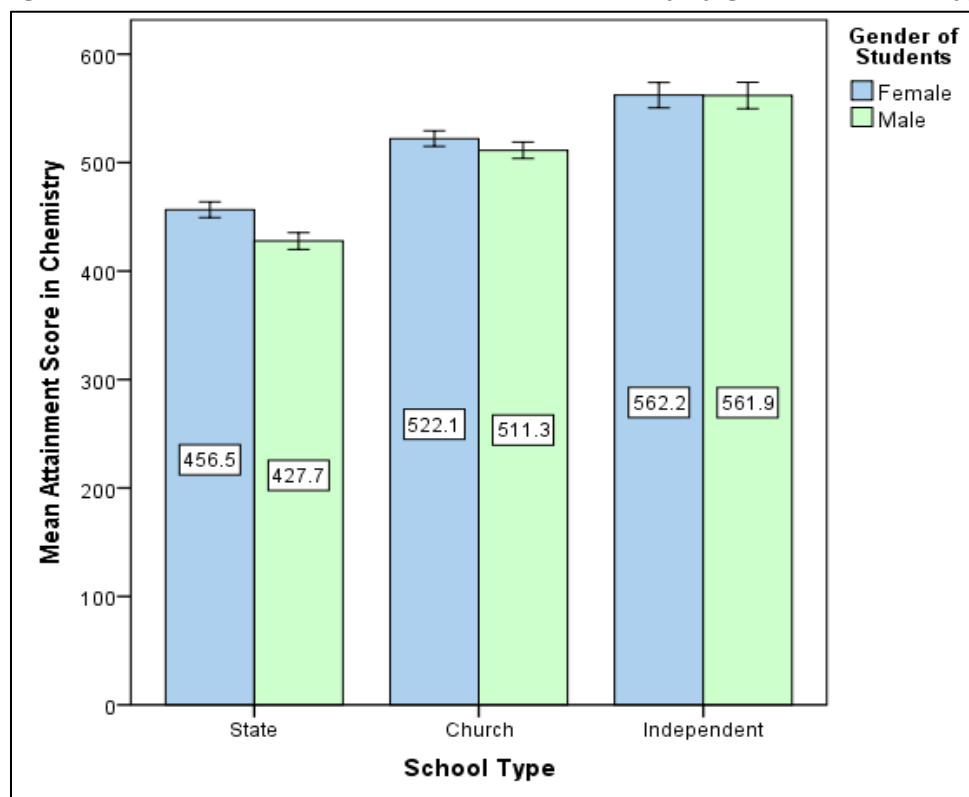


Figure 2.14: Attainment of Maltese students in Physics by gender and school type

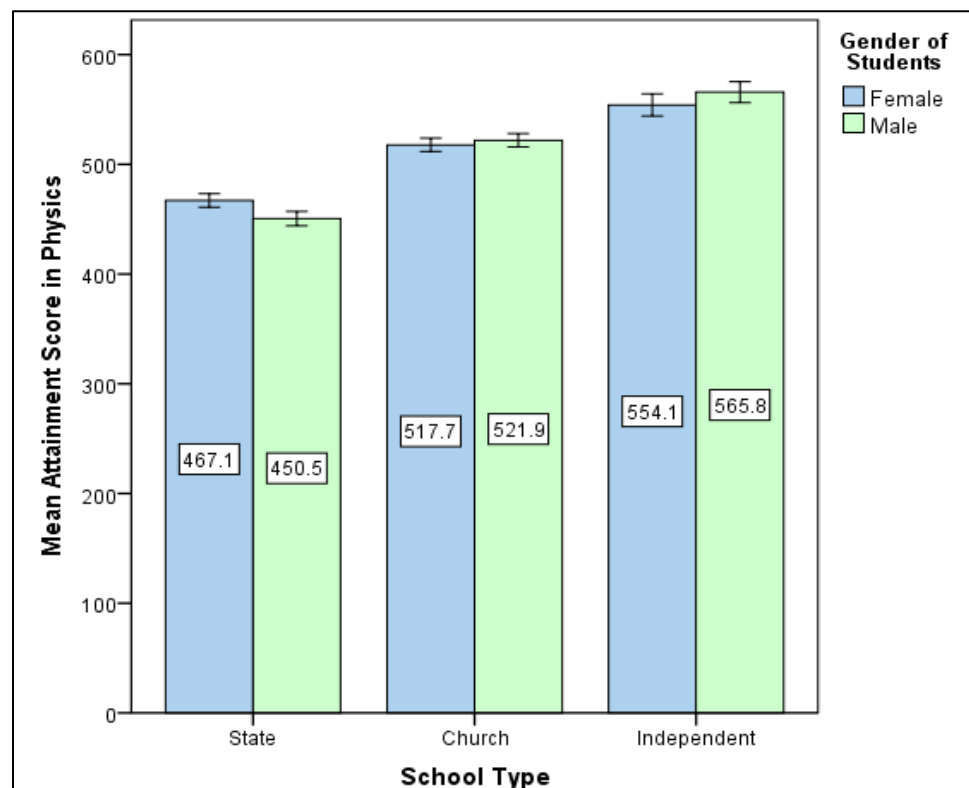


Figure 2.15: Attainment of Maltese students in Earth Science by gender and school type

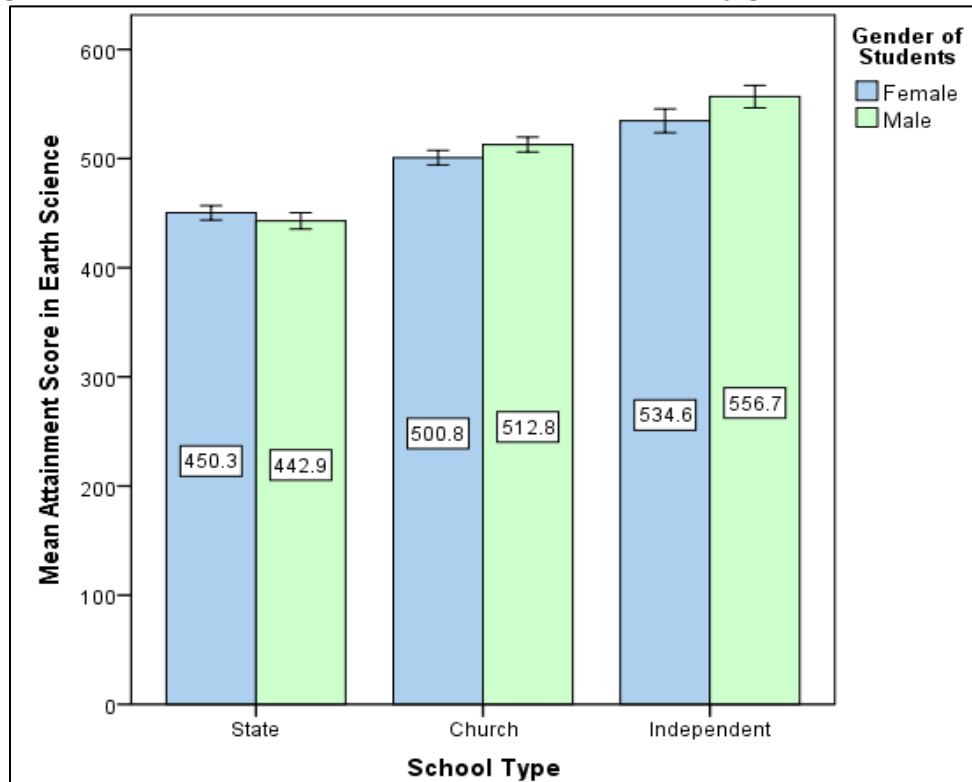


Figure 2.16: Science Attainment in 'Knowing' by gender and school type

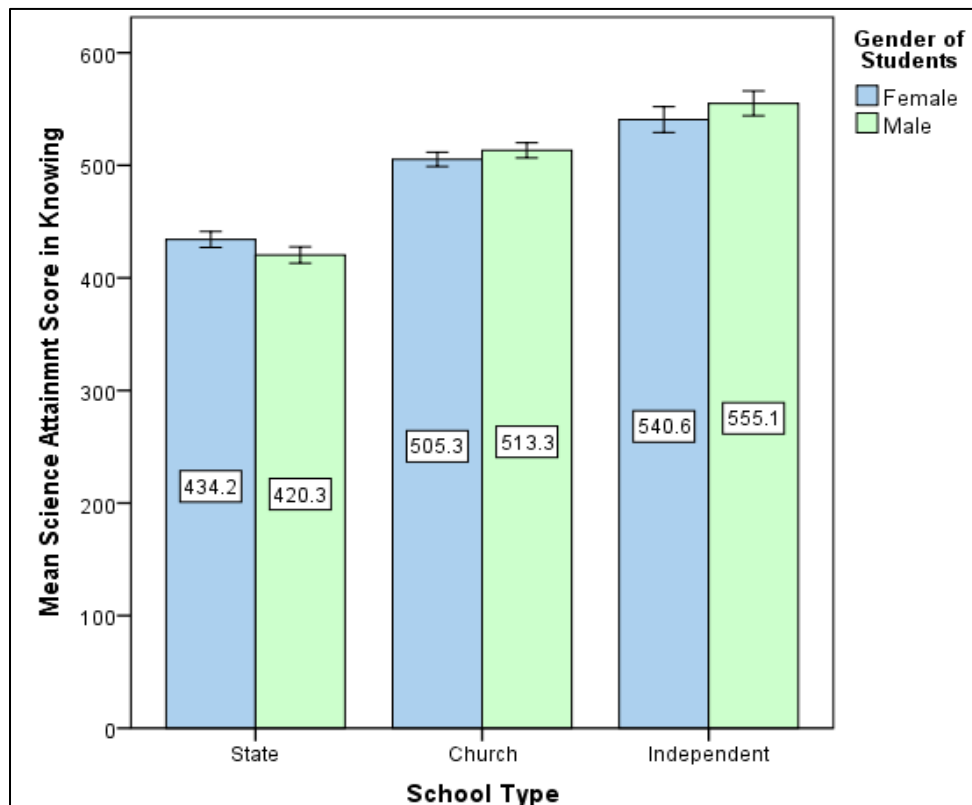


Figure 2.17: Science Attainment in 'Applying' by gender and school type

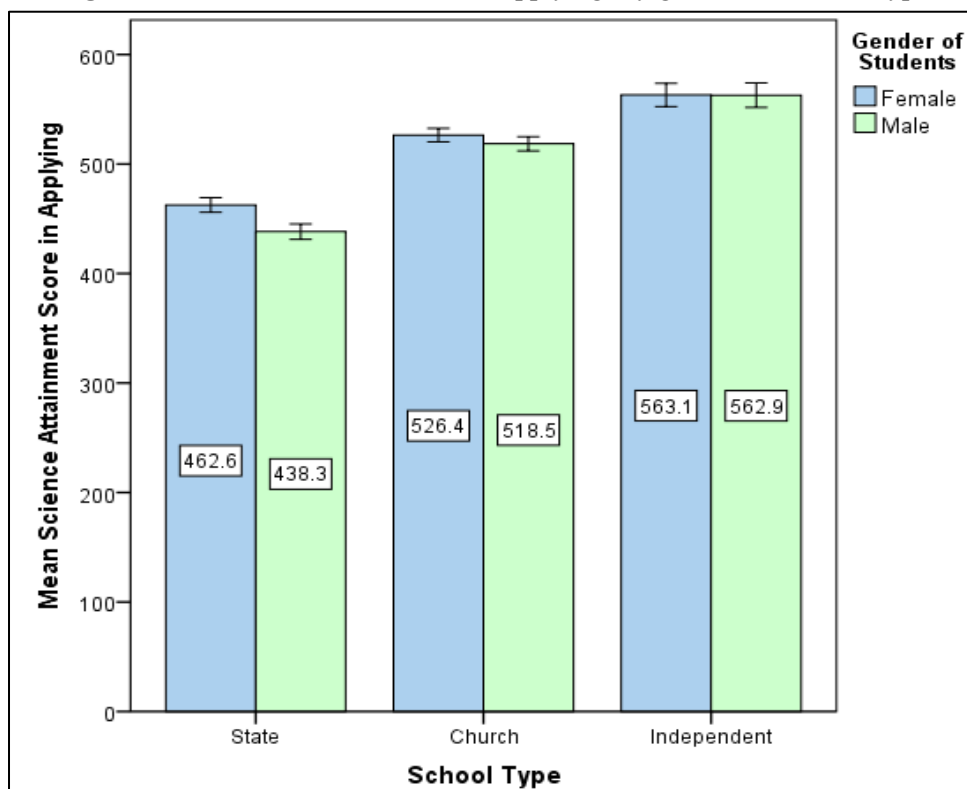


Figure 2.18: Science Attainment in 'Reasoning' by gender and school type

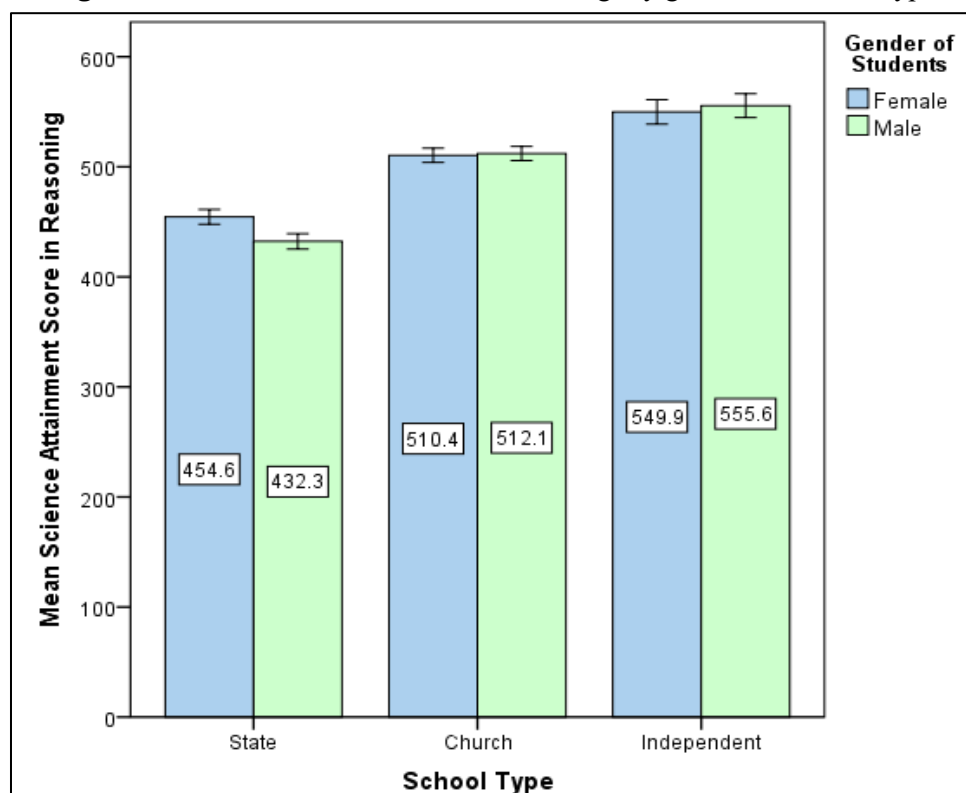


Figure 2.19: Science scale benchmarks of Maltese students by gender

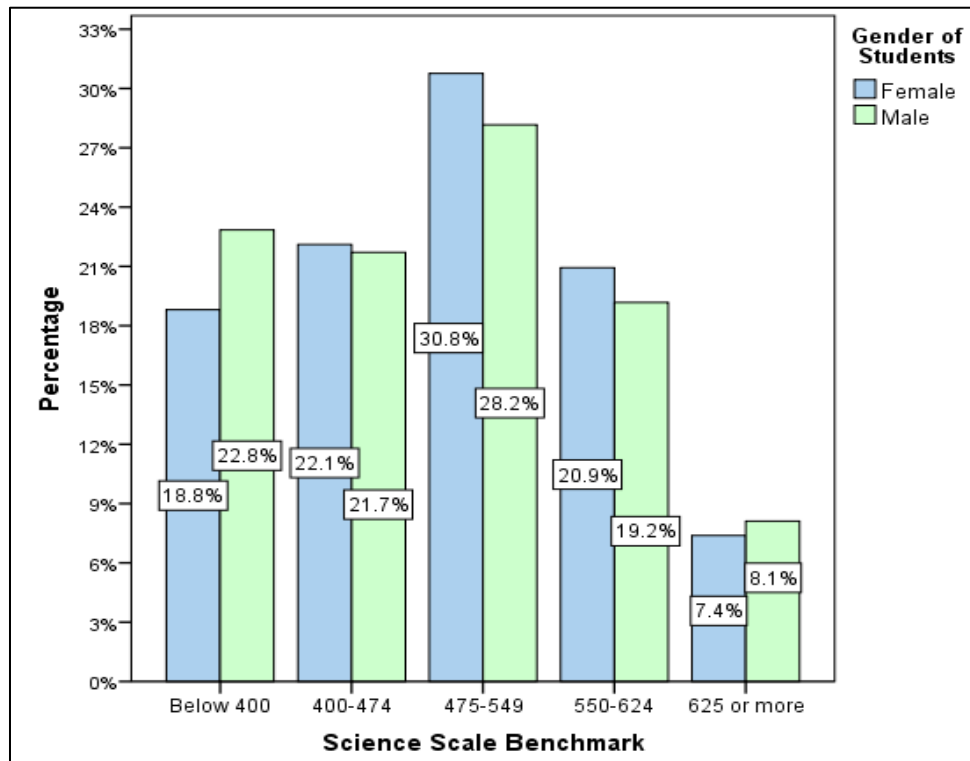
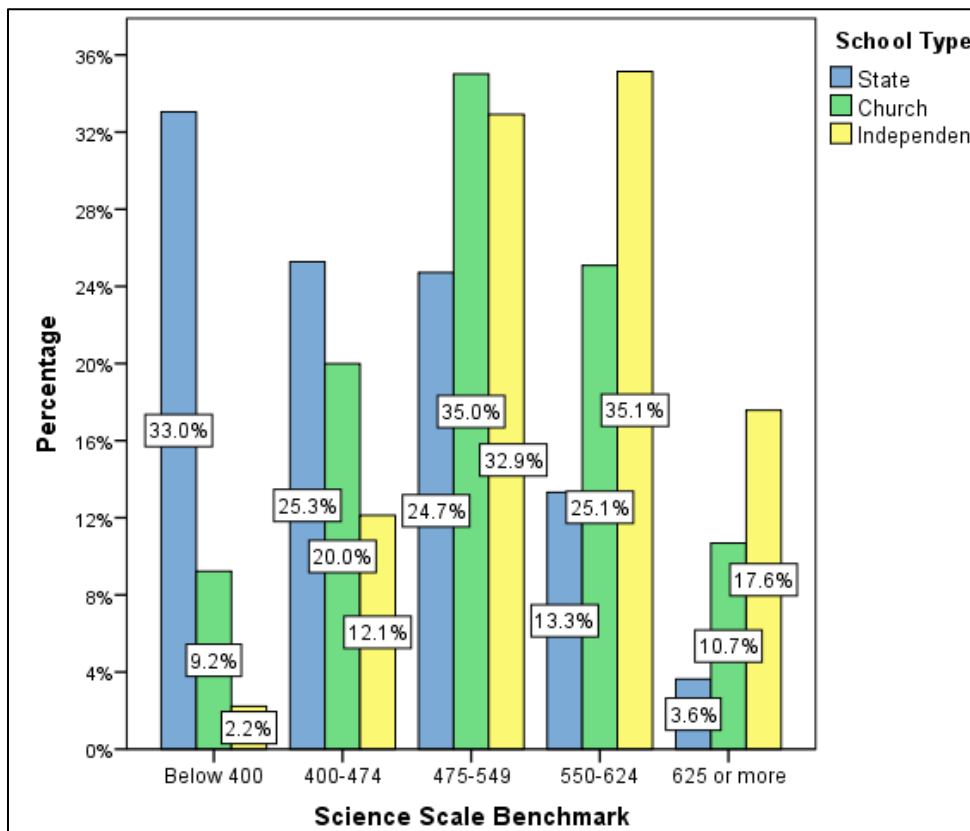


Figure 2.20: Science scale benchmarks of Maltese students by school type



2.5 Science Attainment differences in the 2007 and 2015 cycles

Figure 2.21 shows that the overall mean science score (481) in TIMSS 2015 exceeds the mean science score (457) in TIMSS 2007 and the difference (24 scale points) is significant at the 0.05 level. This significant improvement applies to both boys (19) and girls (29). It is interesting to note that while boys (458) scored marginally higher than girls (456) in the 2007 cycle, girls (485) scored significantly higher than boys (477) in the 2015 cycle.

Figure 2.21: Attainment in Science by gender and cycle

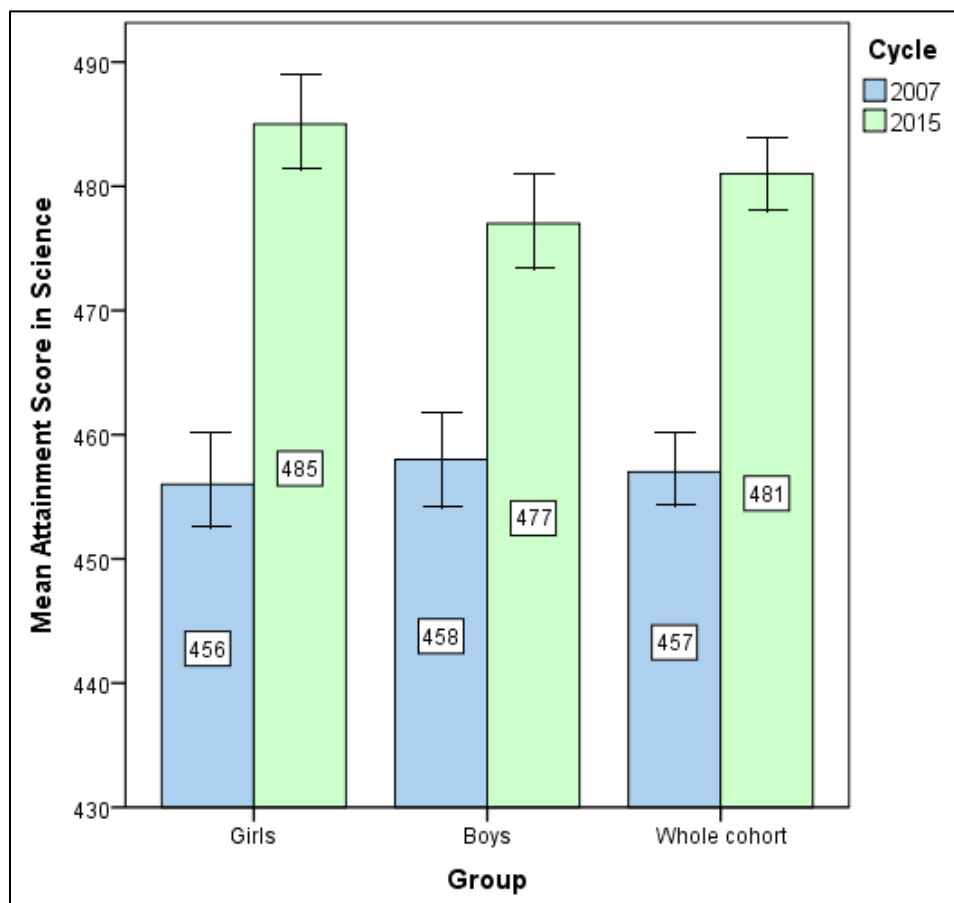
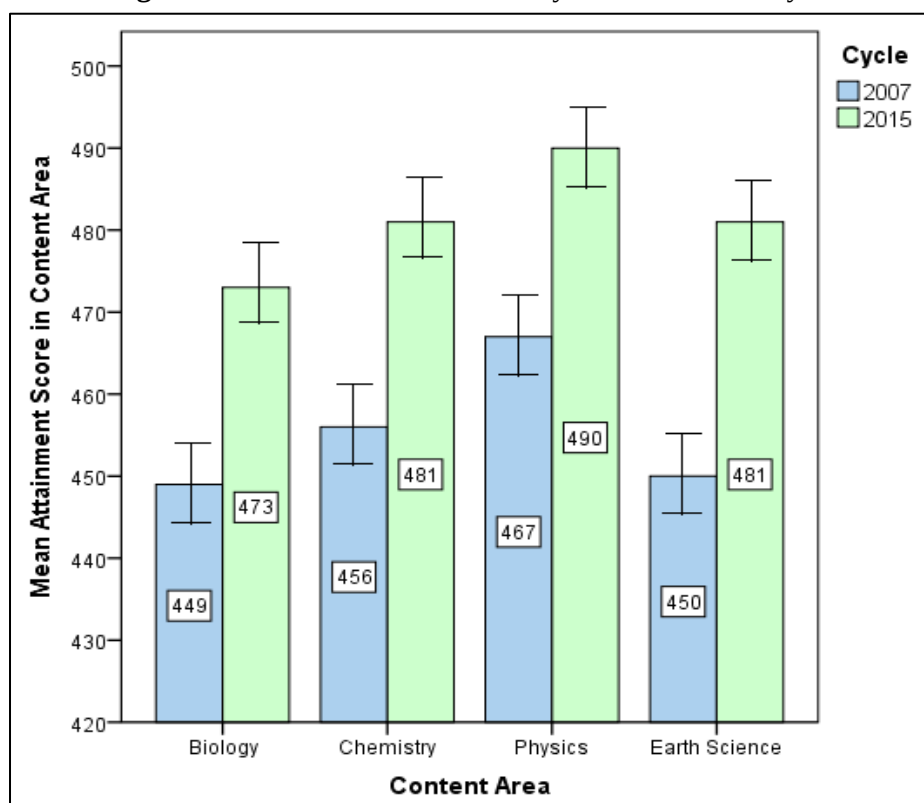
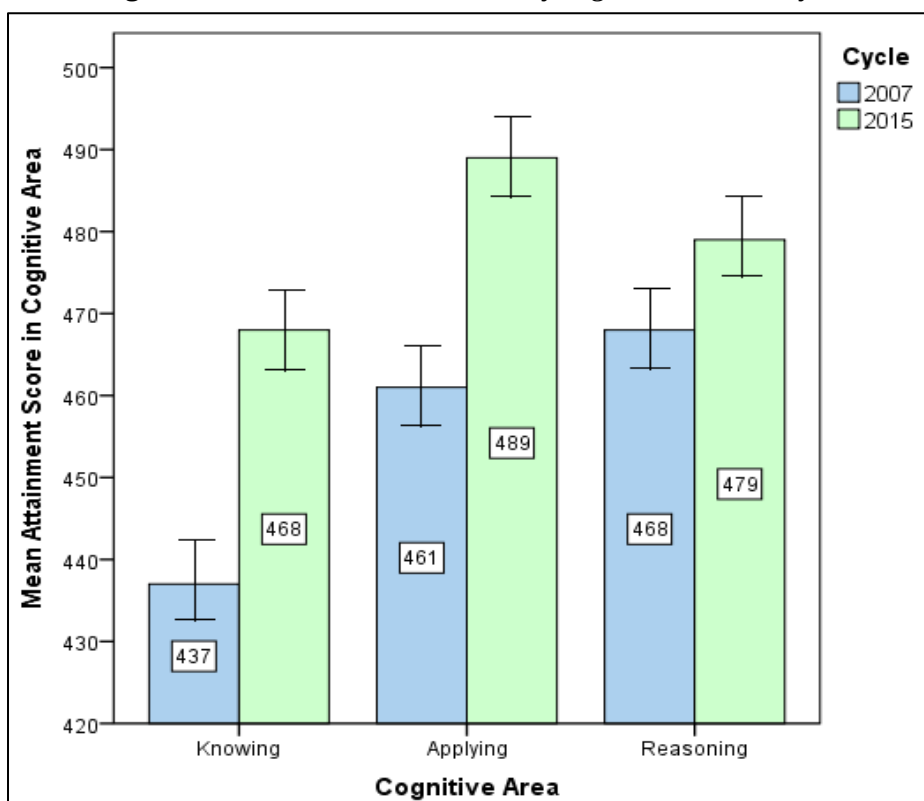


Figure 2.22 shows that the mean TIMSS 2015 scores in Biology (473), Chemistry (481), Physics (490) and Earth Science (481) exceed the corresponding mean TIMSS 2007 scores (449, 456, 467 and 450) by 24, 25, 23 and 31 scale points respectively, where all these increments are significant. Similar to the 2007 cycle, students in the 2015 cycle performed best in Physics, followed by Chemistry, Earth Science and Biology.

Figure 2.23 shows that the mean TIMSS 2015 scores in Knowing (468), Applying (489) and Reasoning (479) exceed the corresponding mean TIMSS 2007 scores (437, 461 and 468) by 31, 28, and 11 scale points respectively, where all these increments are significant. In the 2007 cycle, students performed best in Reasoning, while in the 2015 cycle students performed best in Applying. In both cycles students performed worst in Knowing.

Figure 2.22: Attainment in Science by content area and cycle**Figure 2.23:** Attainment in Science by cognitive area and cycle

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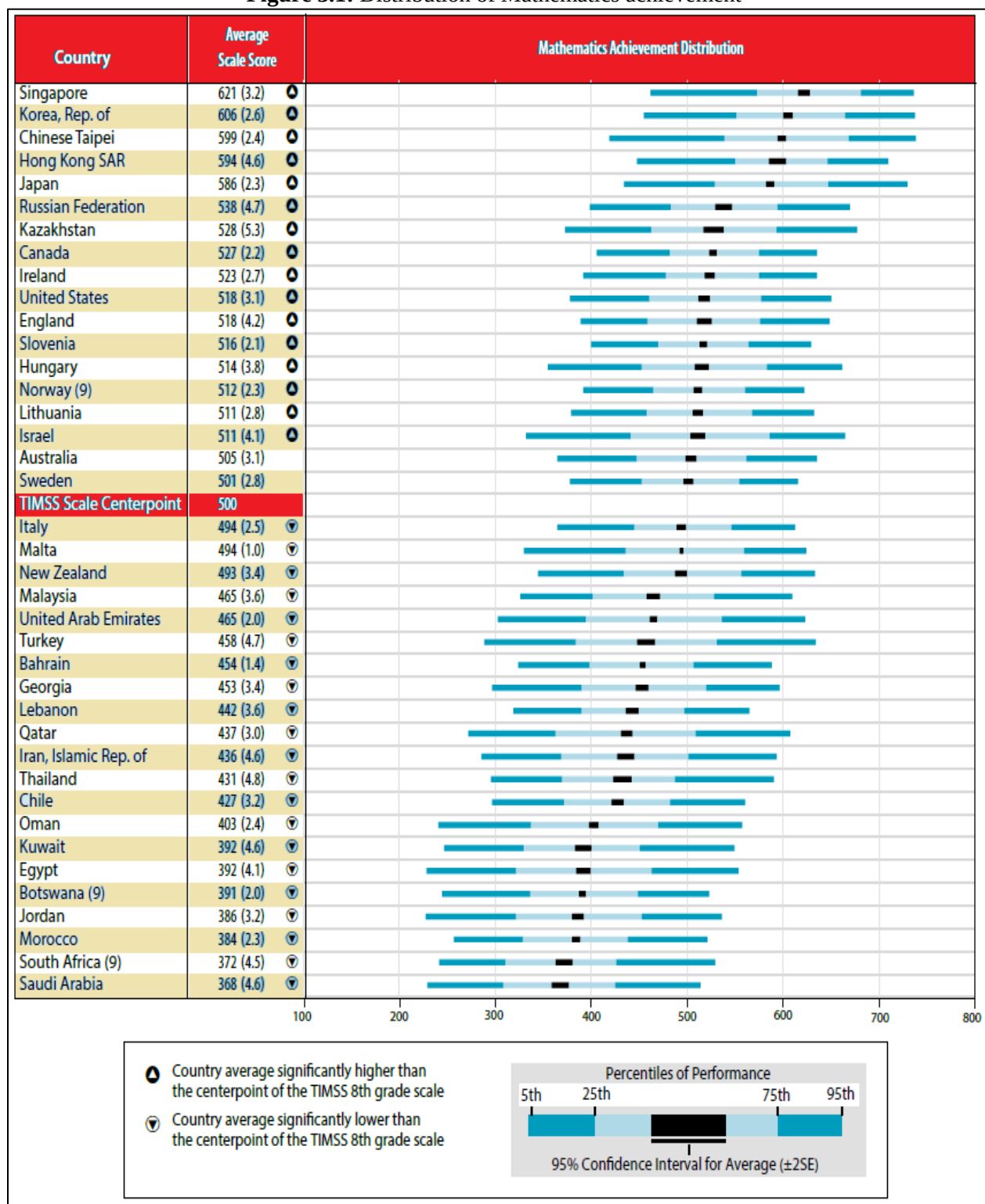
Students' Attainment in Mathematics

3.1 Introduction

This chapter presents the international and national results for Mathematics in TIMSS 2015. Firstly, the overall mean Mathematics attainment scores of 8th grade students are compared between 39 participating countries and then the mean scores are compared for the content and cognitive domains described in Chapter 1. The reporting of these results includes both mean scores and percentages achieving the international benchmarks, as both are important. In some graphical displays the 95% confidence intervals of the average Mathematics achievement scores, quartiles and other percentiles are also provided. Attainment in Mathematics is compared between boys and girls for each country separately. Moreover, this chapter contrasts overall achievement in Mathematics between Maltese students attending different school types (church, independent and state) and between Maltese students participating in the 2007 and 2015 cycles. The seven benchmarking entities (Florida, Quebec, Ontario, Norway, Dubai, Buenos Aires and Abu Dhabi) are excluded from this analysis.

3.2 Overall Achievement in Mathematics in TIMSS 2015

Singapore, Republic of Korea, Chinese Taipei, Hong Kong and Japan attained the highest mean scores in Mathematics of the participating countries in TIMSS 2015 for 8th grade students. The mean Mathematics score of Singapore is significantly higher than those of all other participating countries. Malta's average Mathematics score (494) is 6 scale points lower than the international TIMSS mean Mathematics score (500) and was ranked 20th out of a total of 39 countries. In fact, Malta did much better in Mathematics than Science. Mathematics attainment of Maltese students was comparable to students from Italy (494) and New Zealand (494) but was significantly higher to 18 countries including Malaysia (465), United Arab Emirates (465), Turkey (458), Bahrain (454), Georgia (453), Lebanon (442), Qatar (437), Iran (436), Thailand (431), Chile (427), Oman (403), Kuwait (392), Egypt (392), Botswana (391), Jordan (386), Morocco (384), South Africa (372) and Saudi Arabia (368). The 18 countries that scored significantly higher than Malta in Mathematics included Singapore (621), Republic of Korea (606), Chinese Taipei (599), Hong Kong (594), Japan (562), Russian Federation (538), Kazakhstan (528), Canada (527), Ireland (523), United States (518), England (518), Slovenia (516), Hungary (514), Norway (512), Lithuania (511), Israel (511), Australia (505) and Sweden (501).

Figure 3.1: Distribution of Mathematics achievement

The 5th and 95th percentiles of the Maltese Mathematics scores are 330 and 623 respectively, which implies that the bottom 5% of the students scored lower than 330 and the top 5% scored higher than 623. The 10th, 25th, 50th, 75th and 90th percentiles are 370, 436, 504, 558 and 601 respectively.

Figure 3.2: Multiple Comparison of Mean Mathematics Achievement

Country	Average Scale Score	Singapore	Korea, Rep. of	Chinese Taipei	Hong Kong SAR	Japan	Russian Federation	Kazakhstan	Canada	Ireland	United States	England	Slovenia	Hungary	Norway (9)	Lithuania	Israel	Australia	Sweden	Italy	Malta	New Zealand	Malaysia	United Arab Emirates	Turkey	Bahrain	Georgia	Lebanon	Qatar	Iran, Islamic Rep. of	Thailand	Chile	Oman	Kuwait	Egypt	Botswana (9)	Jordan	Morocco	South Africa (9)	Saudi Arabia		
Singapore	621 (3.2)																																									
Korea, Rep. of	606 (2.6)	▼																																								
Chinese Taipei	599 (2.4)	▼	▼																																							
Hong Kong SAR	594 (4.6)	▼	▼	▼																																						
Japan	586 (2.3)	▼	▼	▼	▼																																					
Russian Federation	538 (4.7)	▼	▼	▼	▼	▼																																				
Kazakhstan	528 (5.3)	▼	▼	▼	▼	▼	▼																																			
Canada	527 (2.2)	▼	▼	▼	▼	▼	▼	▼																																		
Ireland	523 (2.7)	▼	▼	▼	▼	▼	▼	▼	▼																																	
United States	518 (3.1)	▼	▼	▼	▼	▼	▼	▼	▼	▼																																
England	518 (4.2)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼																															
Slovenia	516 (2.1)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼																														
Hungary	514 (3.8)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼																													
Norway (9)	512 (2.3)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼																												
Lithuania	511 (2.8)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼																											
Israel	511 (4.1)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼																										
Australia	505 (3.1)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼																									
Sweden	501 (2.8)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼																								
Italy	494 (2.5)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼																							
Malta	494 (1.0)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼																						
New Zealand	493 (3.4)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼																					
Malaysia	465 (3.6)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼																				
United Arab Emirates	465 (2.0)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼																			
Turkey	458 (4.7)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼																		
Bahrain	454 (1.4)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼																	
Georgia	453 (3.4)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼																
Lebanon	442 (3.6)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼															
Qatar	437 (3.0)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼														
Iran, Islamic Rep. of	436 (4.6)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼													
Thailand	431 (4.8)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼												
Chile	427 (3.2)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼											
Oman	403 (2.4)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼										
Kuwait	392 (4.6)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼									
Egypt	392 (4.1)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼								
Botswana (9)	391 (2.0)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼							
Jordan	386 (3.2)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼						
Morocco	384 (2.3)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼					
South Africa (9)	372 (4.5)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼				
Saudi Arabia	368 (4.6)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼			

Figure 3.1 displays the mean Mathematics scores on the TIMSS achievement scale, listed together with the standard errors for each country. These standard errors range from 1.0 (Malta) to 4.8 (Thailand). Malta's standard error is much lower than all other countries since the Maltese sample comprised almost the whole population of Year 9 students. This implies that the 95% confidence interval (darkened area) for the actual mean Mathematics score of 8th grade Maltese students will have a narrower range compared to other countries indicating that the sample score provides a better estimate of the population score. Mean Mathematics scores of two countries differ significantly when their corresponding confidence interval are disjoint or overlap slightly.

Figure 3.2 depicts whether or not the differences in average achievement between pairs of countries are statistically significant. Selecting a country of interest and reading across the table, an arrow pointing up indicates better performance and an arrow pointing down indicates poorer performance than the comparison country. The absence of arrows indicates no significant difference in performance.

Figure 3.3: Percentiles scores of Mathematics Achievement

Country	5th Percentile	10th Percentile	25th Percentile	50th Percentile	75th Percentile	90th Percentile	95th Percentile
Australia	365 (5.6)	397 (5.8)	449 (4.3)	507 (3.6)	563 (3.3)	610 (4.2)	637 (6.0)
Bahrain	324 (2.6)	352 (2.8)	399 (2.0)	453 (1.9)	507 (2.0)	557 (3.4)	588 (5.1)
Botswana (9)	245 (5.8)	278 (3.9)	337 (2.9)	395 (2.0)	449 (2.8)	496 (2.7)	523 (3.2)
Canada	406 (4.1)	434 (3.1)	482 (3.0)	531 (2.6)	576 (2.1)	613 (2.4)	635 (3.7)
Chile	297 (7.2)	323 (5.1)	372 (4.3)	427 (3.8)	482 (3.3)	531 (4.4)	560 (5.0)
Chinese Taipei	419 (5.3)	459 (3.8)	539 (3.3)	612 (2.7)	669 (3.2)	714 (3.7)	739 (4.1)
Egypt	229 (6.4)	265 (5.8)	322 (4.9)	393 (4.5)	463 (5.0)	521 (4.9)	553 (4.1)
England	389 (7.4)	414 (5.5)	460 (6.2)	517 (5.6)	577 (5.1)	624 (4.1)	649 (5.4)
Georgia	297 (7.9)	331 (5.0)	390 (4.4)	456 (4.3)	520 (4.4)	570 (3.5)	596 (3.6)
Hong Kong SAR	448 (11.1)	489 (9.3)	550 (5.1)	602 (3.8)	647 (4.6)	686 (5.0)	710 (6.0)
Hungary	355 (5.5)	390 (6.8)	452 (4.5)	518 (4.8)	582 (4.2)	632 (5.3)	660 (5.7)
Iran, Islamic Rep. of	286 (4.5)	316 (5.3)	369 (4.8)	434 (5.1)	501 (5.8)	560 (7.2)	594 (9.4)
Ireland	392 (7.5)	426 (6.0)	478 (3.4)	530 (2.9)	574 (2.6)	612 (4.0)	634 (4.7)
Israel	332 (8.2)	371 (5.8)	441 (5.8)	518 (5.0)	586 (4.6)	637 (3.9)	664 (4.6)
Italy	365 (5.5)	397 (4.4)	445 (3.9)	498 (2.6)	547 (3.1)	588 (3.5)	612 (3.4)
Japan	434 (4.8)	470 (4.5)	529 (3.0)	589 (2.9)	647 (3.2)	699 (3.7)	729 (3.4)
Jordan	228 (5.7)	263 (4.6)	321 (4.1)	387 (3.9)	452 (3.1)	505 (3.9)	535 (3.9)
Kazakhstan	373 (6.5)	404 (6.1)	463 (6.3)	530 (6.7)	593 (7.2)	645 (7.2)	677 (7.4)
Korea, Rep. of	455 (4.6)	491 (4.2)	551 (3.8)	611 (2.7)	665 (3.0)	711 (3.6)	738 (3.7)
Kuwait	247 (7.1)	279 (5.8)	330 (4.3)	389 (4.4)	452 (5.9)	512 (10.1)	550 (12.2)
Lebanon	319 (5.9)	345 (4.9)	390 (5.5)	443 (5.1)	497 (3.5)	539 (3.7)	565 (4.1)
Lithuania	379 (4.2)	409 (5.3)	458 (2.8)	515 (3.5)	568 (2.8)	608 (4.1)	632 (4.9)
Malaysia	326 (5.4)	353 (5.2)	402 (4.8)	464 (4.2)	528 (4.0)	580 (3.3)	609 (3.9)
Malta	330 (3.2)	370 (2.7)	436 (2.2)	504 (1.8)	558 (1.7)	601 (1.7)	623 (2.0)
Morocco	257 (3.7)	284 (3.4)	329 (2.5)	381 (2.9)	438 (2.6)	492 (3.2)	522 (4.5)
New Zealand	345 (5.6)	378 (5.8)	433 (4.3)	494 (3.5)	555 (3.2)	605 (4.6)	633 (5.5)
Norway (9)	392 (5.7)	420 (3.6)	465 (3.6)	515 (2.6)	560 (2.4)	600 (3.3)	622 (3.9)
Oman	241 (5.3)	278 (4.2)	339 (2.7)	405 (2.9)	470 (3.1)	527 (2.9)	557 (3.4)
Qatar	272 (5.4)	305 (4.5)	363 (4.0)	436 (4.0)	509 (3.4)	572 (4.7)	607 (5.6)
Russian Federation	399 (5.2)	429 (5.7)	483 (5.9)	542 (5.0)	594 (4.9)	641 (4.9)	669 (5.5)
Saudi Arabia	230 (7.9)	261 (7.4)	309 (5.1)	364 (4.9)	425 (5.0)	480 (6.9)	514 (8.9)
Singapore	462 (7.1)	505 (7.9)	572 (5.2)	633 (3.9)	680 (2.4)	715 (2.1)	735 (2.0)
Slovenia	400 (4.6)	425 (5.8)	470 (2.8)	518 (2.7)	564 (2.6)	605 (3.0)	629 (3.4)
South Africa (9)	242 (4.9)	267 (4.3)	311 (3.7)	364 (4.4)	426 (6.9)	491 (9.2)	529 (10.2)
Sweden	378 (6.4)	406 (6.0)	452 (3.4)	504 (3.6)	553 (3.7)	590 (3.5)	613 (4.1)
Thailand	296 (5.4)	322 (4.5)	369 (5.1)	425 (5.5)	486 (5.9)	549 (8.7)	590 (13.1)
Turkey	289 (7.5)	324 (6.1)	385 (5.1)	454 (5.0)	531 (5.9)	599 (7.1)	634 (7.2)
United Arab Emirates	303 (3.7)	336 (3.0)	395 (2.4)	466 (2.6)	535 (2.4)	591 (3.3)	623 (3.4)
United States	378 (3.8)	408 (4.5)	461 (3.4)	521 (3.6)	577 (3.6)	624 (4.4)	651 (4.8)

Figure 3.3 shows the ranges in Mathematics achievement for the middle group of students (25th to 75th percentiles) and for the lowest and highest attainers (5th and 95th percentiles). For high and low performing countries the difference between the 5th and 95th percentile ranged between 260 and 330, while the difference between the 25th and 75th percentile ranged between 90 and 150. In Malta, the difference between the 25th and 75th percentile is 122 scale points, the difference between the 10th and 90th percentile is 231 and the difference between the 5th and 95th percentile is 293 scale points. These percentile scores are essential to display the proportion of students in different countries below or above a specified threshold scale score. For instance, the 50th percentile for Qatar is equal to the 25th percentile for Malta indicating that

the weakest 25% of students in Malta has the same level in Mathematics attainment as the weakest 50% in Qatar. Similarly, the 25th percentile for Kuwait is equal to the 5th percentile for Malta indicating that the weakest 5% of students in Malta has the same level of Mathematics attainment as the bottom 25% in Kuwait. On the other hand, the 90th percentile for United States exceeds marginally the 95th percentile for Malta indicating that the top 5% of Maltese students performed similarly to the top 10% of American students

Figure 3.4: Percentage of students reaching International Benchmarks in Mathematics

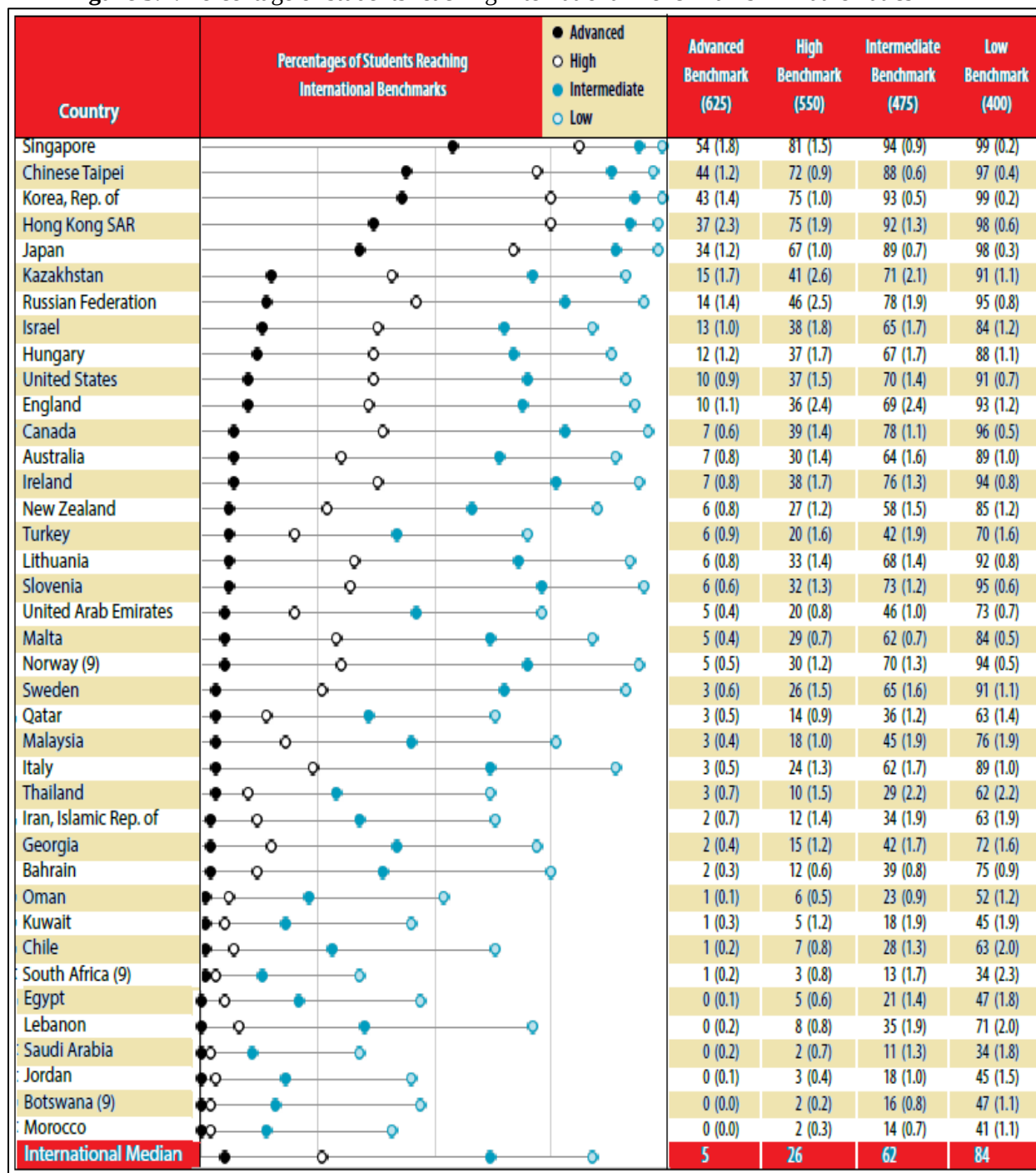
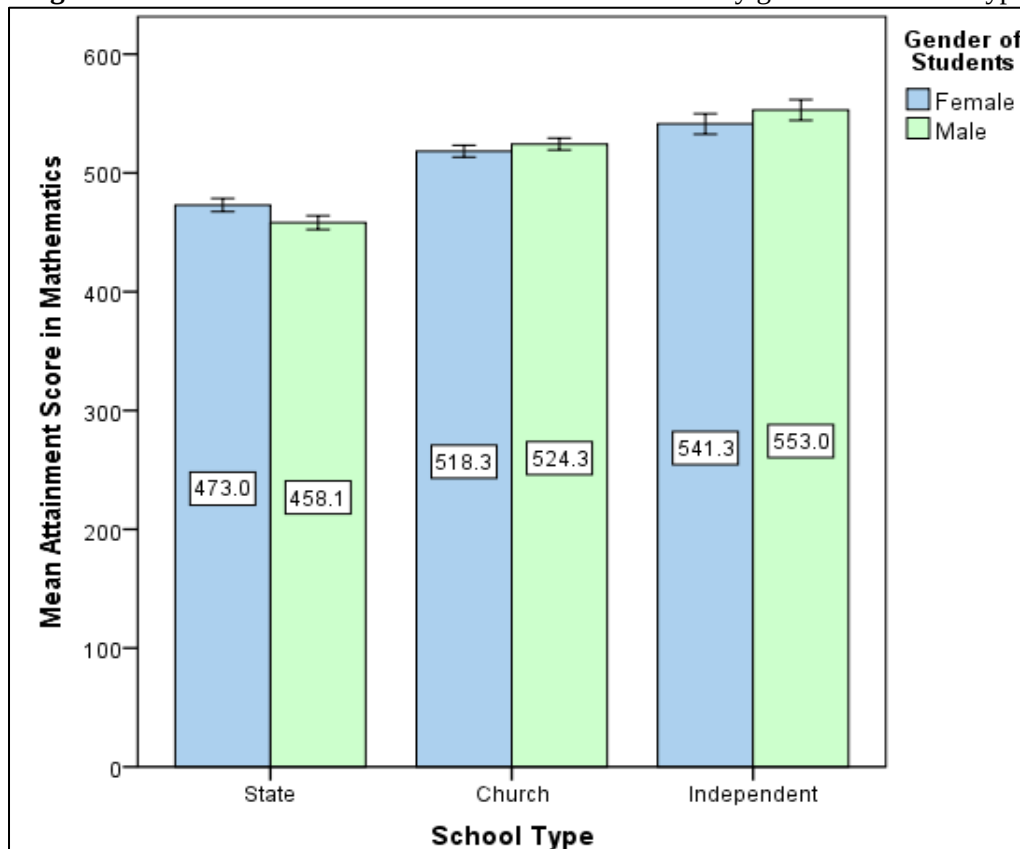


Figure 3.4 shows the proportion of students within the International Benchmarks, described in Chapter 1 for countries participating in TIMSS 2015. The international average shows that 5% of the students have a Mathematics attainment score above 625, 21% have an attainment score between 550 and 625, 36% have an attainment score between 475 and 550, 22% have a score between 400 and 475 and the remaining 16% have a Mathematics attainment score below 400. The proportions for Malta are respectively 5%, 24%, 33%, 22% and 16%, which are fairly comparable to the international average proportions. The proportion of students in the advanced benchmark category is highest in Singapore (54%) and lowest in Lebanon, Botswana, Morocco, Jordan, Saudi Arabia and Egypt (approximately 0%), while the proportion of students in the low category is highest in South Africa and Saudi Arabia (66%) and lowest in Singapore (1%).

3.3 Gender Differences in Overall Mathematics Attainment

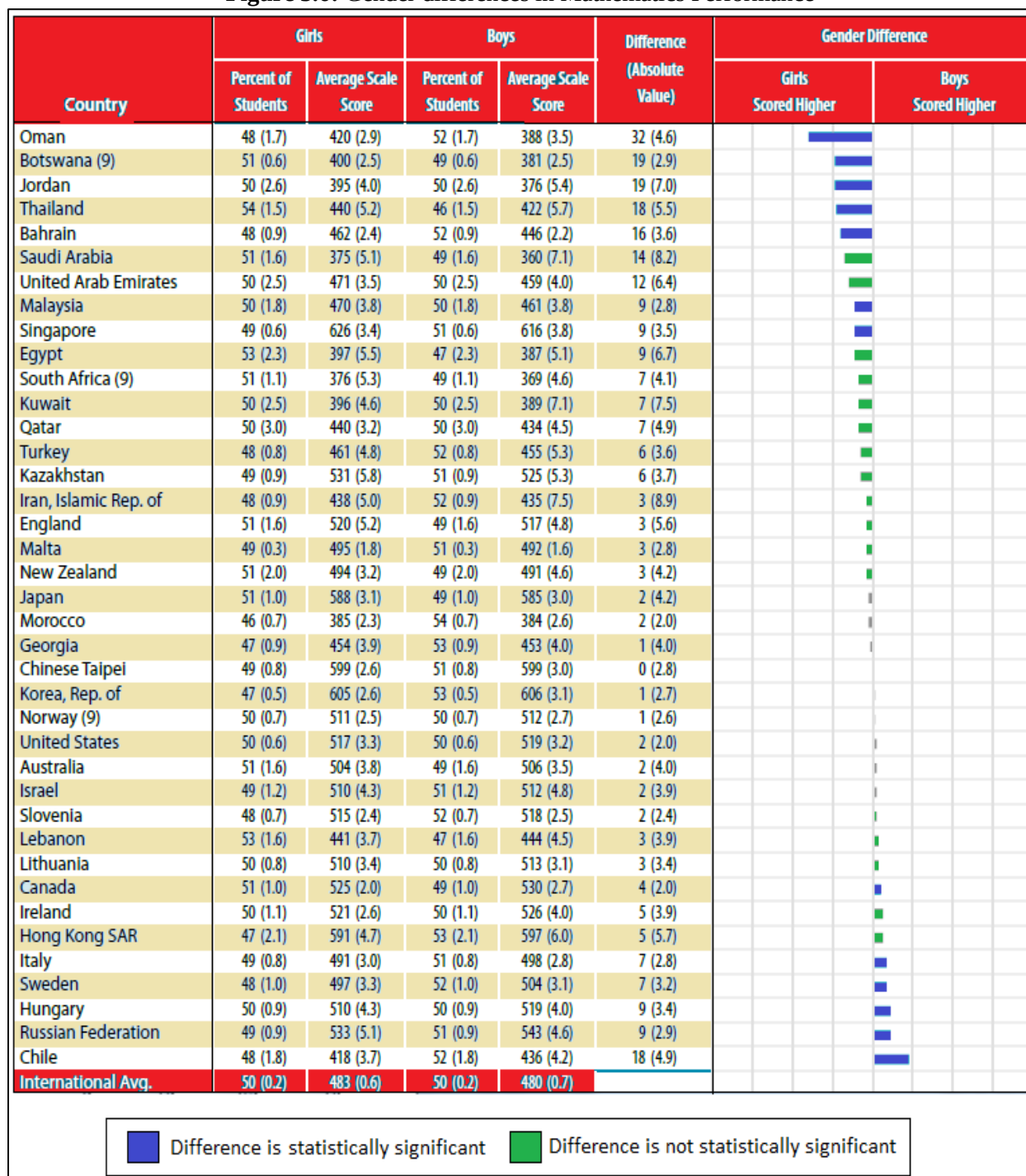
Figure 3.6 shows that in seven countries girls performed significantly better than boys in Mathematics, which include Oman (32), Botswana (19), Jordan (19), Thailand (18), Bahrain (16), Malaysia (9) and Singapore (9). There are six countries where boys performed significantly better than girls in Mathematics, which include Chile (18), Russian Federation (9), Hungary (9), Sweden (7), Italy (7) and Canada (4). In the remaining countries, gender discrepancy in Mathematics scores was not significant. The values in the brackets display the difference in the mean Mathematics scores between the gender groups.

Figure 3.5: Mathematics Performance of Maltese students by gender and school type



In 16 countries, including Malta, differences in mean Mathematics scores were small (3 scale points or less) and were not found to be significant at the 0.05 criterion. The mean Mathematics score for Maltese girls (495) exceeded that of boys (492) by around 3 scale points. Figure 3.5 shows that girls perform better in Mathematics than boys in state schools, while boys perform better than girls in church and independent schools. Gender bias in mean Mathematics scores was significant in state schools only.

Figure 3.6: Gender differences in Mathematics Performance



3.4 Attainment in Mathematics in Content and Cognitive domains

Figure 3.7 displays the mean Mathematics attainment score in the Content domains. Mean scores range from 352 to 629 in Numbers, range from 372 to 623 in Algebra, range from 342 to 617 in Geometry and range from 346 to 617 in Data and Chance. Singapore tops the list in all four content areas.

Figure 3.7: Achievement in Mathematics Content domains

Country	Overall Mathematics Average Scale Score	Number (64 Items)	Algebra (61 Items)	Geometry (43 Items)	Data and Chance (41 Items)
		Average Scale Score	Average Scale Score	Average Scale Score	Average Scale Score
Singapore	621 (3.2)	629 (3.2) ▲	623 (3.4)	617 (3.5) ▼	617 (3.4) ▼
Korea, Rep. of	606 (2.6)	601 (2.4) ▼	612 (2.9) ▲	612 (3.4) ▲	600 (2.4) ▼
Chinese Taipei	599 (2.4)	590 (2.4) ▼	613 (2.8) ▲	607 (2.6) ▲	588 (2.5) ▼
Hong Kong SAR	594 (4.6)	594 (4.9)	593 (4.7)	602 (5.1) ▲	597 (5.9)
Japan	586 (2.3)	572 (2.4) ▼	596 (2.8) ▲	598 (2.6) ▲	589 (2.3) ▲
Russian Federation	538 (4.7)	533 (4.5) ▼	558 (5.2) ▲	536 (5.6)	507 (5.0) ▼
Kazakhstan	528 (5.3)	516 (5.1) ▼	555 (5.6) ▲	529 (6.4)	492 (5.5) ▼
Canada	527 (2.2)	537 (2.4) ▲	513 (2.2) ▼	527 (2.5)	534 (2.9) ▲
Ireland	523 (2.7)	544 (3.3) ▲	501 (2.8) ▼	503 (3.1) ▼	534 (3.8) ▲
United States	518 (3.1)	520 (3.1) ▲	525 (3.1) ▲	500 (3.2) ▼	522 (3.5) ▲
England	518 (4.2)	528 (4.5) ▲	492 (4.7) ▼	514 (4.1) ▼	541 (4.7) ▲
Slovenia	516 (2.1)	524 (2.4) ▲	498 (2.5) ▼	522 (2.8) ▲	525 (2.7) ▲
Hungary	514 (3.8)	518 (4.0) ▲	503 (4.1) ▼	518 (4.2) ▲	519 (3.9) ▲
Norway (9)	512 (2.3)	529 (2.6) ▲	471 (2.7) ▼	498 (2.5) ▼	542 (3.2) ▲
Lithuania	511 (2.8)	511 (2.8)	497 (3.3) ▼	515 (3.1) ▲	521 (2.7) ▲
Israel	511 (4.1)	518 (4.0) ▲	517 (4.7) ▲	487 (4.6) ▼	503 (4.9) ▼
Australia	505 (3.1)	511 (3.2) ▲	491 (3.4) ▼	500 (3.1) ▼	519 (3.1) ▲
Sweden	501 (2.8)	513 (2.9) ▲	482 (3.2) ▼	478 (3.4) ▼	512 (3.7) ▲
Italy	494 (2.5)	494 (2.7)	481 (3.0) ▼	504 (3.5) ▲	496 (2.7)
Malta	494 (1.0)	501 (1.6) ▲	492 (1.8)	484 (1.7) ▼	487 (2.6) ▼
New Zealand	493 (3.4)	500 (3.5) ▲	475 (3.5) ▼	488 (3.2) ▼	509 (3.7) ▲
Malaysia	465 (3.6)	472 (3.6) ▲	467 (3.4)	455 (3.9) ▼	451 (3.8) ▼
United Arab Emirates	465 (2.0)	464 (1.9)	485 (2.0) ▲	447 (2.4) ▼	449 (2.5) ▼
Turkey	458 (4.7)	447 (4.6) ▼	459 (4.6)	463 (4.9) ▲	467 (5.2) ▲
Bahrain	454 (1.4)	436 (2.0) ▼	483 (2.1) ▲	449 (2.5) ▼	453 (2.2)
Georgia	453 (3.4)	457 (3.4) ▲	469 (3.8) ▲	441 (3.9) ▼	421 (3.7) ▼
Lebanon	442 (3.6)	440 (4.1)	466 (4.0) ▲	444 (4.0)	395 (4.6) ▼
Qatar	437 (3.0)	435 (2.9)	452 (2.6) ▲	433 (3.0)	417 (3.9) ▼
Iran, Islamic Rep. of	436 (4.6)	432 (4.7) ▼	437 (5.1)	448 (4.7) ▲	417 (5.0) ▼
Thailand	431 (4.8)	430 (5.0)	429 (5.1)	429 (4.9)	425 (4.6) ▼
Chile	427 (3.2)	427 (3.3)	413 (3.4) ▼	428 (3.4)	429 (3.8)
Oman	403 (2.4)	389 (2.6) ▼	426 (2.7) ▲	415 (2.8) ▲	376 (3.0) ▼
Kuwait	392 (4.6)	395 (4.8)	384 (4.8) ▼	382 (5.3) ▼	377 (5.0) ▼
Egypt	392 (4.1)	393 (3.7)	420 (4.3) ▲	393 (4.1)	338 (4.4) ▼
Botswana (9)	391 (2.0)	393 (3.2)	400 (2.3) ▲	377 (2.5) ▼	374 (3.1) ▼
Jordan	386 (3.2)	380 (3.2) ▼	418 (3.5) ▲	381 (3.4) ▼	346 (4.0) ▼
Morocco	384 (2.3)	382 (2.1)	372 (2.3) ▼	410 (3.0) ▲	353 (2.9) ▼
South Africa (9)	372 (4.5)	368 (4.7) ▼	394 (4.3) ▲	364 (4.5) ▼	357 (4.9) ▼
Saudi Arabia	368 (4.6)	352 (4.5) ▼	391 (4.4) ▲	342 (5.3) ▼	361 (4.9) ▼

Malta's mean attainment score is highest in Numbers (501), followed by Algebra (492), Data and Chance (487) and Geometry (484). With the exception of Algebra all mean scores for the other content areas were significantly different from the overall mean Malta Mathematics score (494). The arrows indicate significant difference from the overall mean score of each country.

Figure 3.8: Achievement in Mathematics Cognitive domains

Country	Overall Mathematics Average Scale Score	Knowing (69 items)		Applying (94 items)		Reasoning (46 items)	
		Average Scale Score	Difference from Overall Mathematics Score	Average Scale Score	Difference from Overall Mathematics Score	Average Scale Score	Difference from Overall Mathematics Score
Singapore	621 (3.2)	633 (3.4)	12 (0.7) ▲	619 (3.2)	-2 (1.6)	616 (3.7)	-5 (1.6) ▼
Korea, Rep. of	606 (2.6)	607 (2.8)	1 (1.2)	606 (2.8)	0 (1.1)	608 (2.7)	2 (1.3)
Chinese Taipei	599 (2.4)	598 (2.9)	-1 (1.2)	602 (2.5)	3 (0.7) ▲	602 (2.5)	3 (1.1) ▲
Hong Kong SAR	594 (4.6)	600 (5.1)	5 (2.1) ▲	595 (4.5)	1 (1.1)	591 (5.1)	-3 (1.4) ▼
Japan	586 (2.3)	578 (2.6)	-9 (1.2) ▼	592 (2.3)	5 (0.8) ▲	591 (2.6)	4 (1.5) ▲
Russian Federation	538 (4.7)	543 (5.6)	5 (1.4) ▲	541 (4.6)	3 (0.8) ▲	528 (5.0)	-10 (1.2) ▼
Kazakhstan	528 (5.3)	533 (6.3)	5 (2.0) ▲	527 (5.4)	-1 (1.1)	525 (5.5)	-3 (1.5) ▼
Canada	527 (2.2)	520 (2.3)	-7 (0.9) ▼	528 (2.2)	1 (0.7)	534 (2.4)	7 (1.0) ▲
Ireland	523 (2.7)	527 (3.0)	4 (1.8) ▲	520 (3.0)	-3 (1.1) ▼	521 (3.1)	-2 (1.9) ▼
United States	518 (3.1)	528 (3.5)	10 (1.2) ▲	515 (3.2)	-4 (0.6) ▼	514 (3.1)	-4 (0.8) ▼
England	518 (4.2)	513 (4.1)	-5 (0.9) ▼	519 (4.1)	1 (1.0)	522 (4.4)	4 (1.9) ▲
Slovenia	516 (2.1)	518 (2.4)	2 (1.3)	514 (2.1)	-2 (0.8) ▼	516 (2.7)	0 (1.5)
Hungary	514 (3.8)	511 (3.9)	-3 (1.3) ▼	516 (3.8)	2 (1.1)	515 (3.9)	1 (1.4)
Norway (9)	512 (2.3)	500 (2.3)	-11 (1.2) ▼	516 (2.3)	5 (1.1) ▲	516 (2.5)	4 (1.5) ▲
Lithuania	511 (2.8)	502 (3.1)	-9 (2.0) ▼	520 (2.6)	9 (1.0) ▲	501 (3.0)	-10 (1.5) ▼
Israel	511 (4.1)	511 (4.2)	0 (1.2)	512 (4.0)	1 (0.8)	510 (4.4)	-1 (1.5)
Australia	505 (3.1)	504 (3.1)	-1 (1.5)	502 (3.0)	-3 (1.0) ▼	512 (3.1)	7 (1.2) ▲
Sweden	501 (2.8)	484 (2.8)	-16 (1.0) ▼	507 (2.8)	6 (1.2) ▲	509 (3.5)	9 (2.3) ▲
Italy	494 (2.5)	489 (2.7)	-6 (1.4) ▼	495 (2.6)	1 (1.2)	500 (2.8)	6 (1.2) ▲
Malta	494 (1.0)	499 (1.5)	5 (1.0) ▲	493 (1.5)	0 (1.4)	484 (2.2)	-9 (1.9) ▼
New Zealand	493 (3.4)	488 (3.4)	-5 (1.1) ▼	493 (3.3)	0 (1.3)	499 (3.5)	6 (1.6) ▲
Malaysia	465 (3.6)	472 (3.8)	7 (0.7) ▲	463 (3.6)	-2 (1.0) ▼	453 (3.7)	-12 (1.3) ▼
United Arab Emirates	465 (2.0)	476 (2.2)	11 (1.0) ▲	457 (2.1)	-7 (0.9) ▼	461 (2.2)	-4 (1.1) ▼
Turkey	458 (4.7)	447 (4.9)	-11 (1.6) ▼	460 (4.3)	2 (1.4)	472 (4.8)	15 (1.5) ▲
Bahrain	454 (1.4)	463 (2.3)	9 (2.0) ▲	445 (1.7)	-9 (1.2) ▼	452 (2.2)	-2 (2.0)
Georgia	453 (3.4)	456 (4.1)	3 (1.8)	454 (3.6)	1 (1.5)	441 (4.5)	-13 (2.1) ▼
Lebanon	442 (3.6)	456 (3.8)	13 (1.3) ▲	439 (3.9)	-4 (1.4) ▼	406 (4.5)	-37 (2.1) ▼
Qatar	437 (3.0)	440 (3.1)	3 (1.8)	435 (2.9)	-2 (2.0)	431 (2.8)	-6 (2.0) ▼
Iran, Islamic Rep. of	436 (4.6)	435 (4.9)	-1 (2.2)	434 (4.4)	-2 (1.8)	436 (4.7)	0 (1.8)
Thailand	431 (4.8)	425 (5.1)	-6 (1.2) ▼	431 (4.7)	0 (1.5)	435 (4.8)	4 (1.7) ▲
Chile	427 (3.2)	423 (3.4)	-5 (2.3) ▼	427 (3.3)	-1 (2.4)	432 (3.3)	4 (2.3)
Oman	403 (2.4)	401 (3.1)	-2 (1.9) ▼	401 (2.5)	-2 (1.2) ▼	402 (3.1)	-1 (1.8)
Kuwait	392 (4.6)	398 (4.7)	5 (2.0) ▲	389 (4.5)	-3 (2.3)	374 (4.5)	-19 (2.1) ▼
Egypt	392 (4.1)	399 (4.3)	7 (1.2) ▲	385 (3.9)	-7 (1.0) ▼	379 (4.3)	-13 (1.8) ▼
Botswana (9)	391 (2.0)	394 (3.0)	3 (1.9)	385 (2.3)	-5 (1.3) ▼	389 (2.0)	-2 (1.0)
Jordan	386 (3.2)	391 (3.2)	5 (1.4) ▲	378 (3.2)	-7 (1.2) ▼	380 (3.3)	-6 (1.9) ▼
Morocco	384 (2.3)	382 (2.4)	-2 (1.9)	385 (2.2)	1 (1.5)	374 (2.8)	-10 (1.9) ▼
South Africa (9)	372 (4.5)	371 (5.2)	-1 (1.1)	362 (4.6)	-10 (1.3) ▼	383 (4.2)	11 (1.4) ▲
Saudi Arabia	368 (4.6)	359 (4.9)	-8 (1.6) ▼	364 (4.2)	-4 (2.4)	374 (4.0)	6 (2.0) ▲

Figure 3.8 displays the mean Mathematics attainment score in the Cognitive domains. Mean scores range from 359 to 633 in Knowing, range from 362 to 619 in Applying and range from 374 to 616 in Reasoning. Singapore tops the list in all three cognitive domains.

Malta's mean attainment score is highest in Knowing (499), followed by Applying (493) and Reasoning (484). With the exception of Applying all mean scores of the other cognitive areas are significantly different from the overall mean Malta Mathematics score (494). The arrows indicate significant difference from the overall mean score of each country.

Figure 3.9: Achievement in Mathematics Content domains by Gender

Country	Number		Algebra		Geometry		Data and Chance	
	Girls	Boys	Girls	Boys	Girls	Boys	Girls	Boys
Australia	506 (4.1)	517 (3.5) ♀	492 (4.3)	489 (3.7)	500 (4.0)	500 (3.6)	518 (4.1)	520 (3.6)
Bahrain	437 (3.3)	434 (2.2)	492 (2.2) ♀	474 (3.0)	459 (3.9) ♀	440 (3.7)	462 (3.6) ♀	444 (3.4)
Botswana (9)	404 (3.9) ♀	382 (3.7)	410 (3.0) ♀	389 (2.5)	374 (3.2)	380 (4.0)	386 (3.5) ♀	361 (4.8)
Canada	532 (2.4)	542 (2.9) ♀	512 (2.2)	514 (2.8)	525 (2.4)	528 (3.2)	532 (2.9)	536 (3.5)
Chile	413 (3.9)	440 (4.1) ♀	411 (3.8)	415 (4.5)	419 (4.7)	435 (4.3) ♀	419 (4.4)	439 (4.9) ♀
Chinese Taipei	585 (2.7)	594 (3.0) ♀	617 (2.8)	610 (3.8)	610 (2.9)	604 (3.3)	586 (3.3)	590 (3.0)
Egypt	394 (5.2)	392 (4.2)	427 (5.6) ♀	412 (5.4)	398 (6.0)	387 (4.6)	344 (6.2)	332 (6.0)
England	524 (5.9)	531 (5.3)	497 (5.8)	488 (5.5)	519 (5.1)	509 (5.0)	544 (5.5)	539 (5.7)
Georgia	453 (3.7)	460 (4.2)	474 (4.6)	464 (4.8)	441 (4.1)	440 (4.8)	422 (4.4)	421 (5.7)
Hong Kong SAR	590 (5.2)	598 (6.3)	593 (4.7)	593 (6.2)	601 (5.2)	602 (6.6)	593 (6.7)	601 (7.1)
Hungary	508 (4.6)	527 (4.5) ♀	503 (4.5)	502 (4.5)	517 (4.8)	520 (4.6)	513 (4.7)	525 (4.4) ♀
Iran, Islamic Rep. of	426 (5.3)	437 (7.6)	447 (6.2)	428 (8.3)	455 (5.5)	441 (7.7)	416 (5.5)	418 (8.4)
Ireland	540 (3.2)	549 (4.7) ♀	502 (2.8)	500 (4.0)	500 (3.1)	507 (4.3)	530 (4.1)	538 (5.1)
Israel	510 (4.6)	525 (4.5) ♀	521 (4.9)	513 (5.4)	492 (5.3)	483 (5.3)	499 (5.4)	507 (5.5)
Italy	484 (3.5)	503 (2.9) ♀	485 (3.4) ♀	478 (3.2)	508 (4.4)	500 (3.6)	491 (3.4)	501 (3.4) ♀
Japan	569 (3.4)	576 (3.4)	601 (3.9) ♀	590 (3.6)	600 (3.9)	595 (3.2)	591 (3.4)	587 (3.5)
Jordan	381 (4.6)	380 (5.0)	438 (4.2) ♀	397 (5.7)	392 (4.5) ♀	369 (5.4)	353 (5.0)	339 (6.4)
Kazakhstan	516 (5.6)	517 (5.5)	564 (6.0) ♀	546 (5.8)	533 (6.9)	526 (6.7)	493 (6.2)	491 (6.0)
Korea, Rep. of	594 (2.7)	608 (2.9) ♀	616 (3.1) ♀	608 (3.6)	613 (3.4)	611 (4.3)	599 (2.7)	601 (3.2)
Kuwait	392 (4.5)	398 (7.1)	390 (5.2)	379 (7.6)	390 (4.9)	374 (9.0)	385 (5.2) ♀	369 (7.6)
Lebanon	437 (4.4)	444 (5.0)	468 (3.8)	463 (5.1)	442 (4.3)	445 (6.1)	394 (4.9)	397 (6.1)
Lithuania	506 (3.4)	516 (3.8) ♀	502 (3.9) ♀	493 (4.0)	516 (3.9)	513 (4.2)	517 (3.1)	526 (3.5) ♀
Malaysia	474 (3.9)	469 (3.9)	476 (3.8) ♀	458 (3.6)	457 (4.1)	453 (4.3)	456 (4.5) ♀	447 (4.3)
Malta	498 (2.2)	503 (2.1) ♀	498 (1.8) ♀	487 (2.7)	486 (2.4)	482 (2.6)	488 (3.7)	485 (3.3)
Morocco	383 (2.4)	382 (2.6)	380 (2.4) ♀	366 (2.8)	407 (3.5)	412 (2.9) ♀	353 (3.1)	354 (3.2)
New Zealand	496 (3.4)	503 (5.1)	479 (3.4)	470 (4.9)	489 (3.2)	488 (4.8)	511 (3.8)	506 (5.0)
Norway (9)	523 (3.1)	534 (2.9) ♀	470 (3.3)	472 (3.3)	500 (3.2)	495 (2.9)	544 (3.6)	541 (4.1)
Oman	397 (3.4) ♀	382 (3.6)	449 (3.6) ♀	406 (3.8)	430 (3.9) ♀	401 (3.9)	395 (4.5) ♀	359 (4.4)
Qatar	430 (3.4)	440 (4.2)	460 (3.2) ♀	444 (4.6)	441 (3.5) ♀	424 (4.5)	421 (4.1)	413 (6.0)
Russian Federation	523 (5.1)	542 (4.4) ♀	559 (5.7)	558 (5.0)	534 (6.3)	537 (5.5)	500 (5.1)	514 (5.5) ♀
Saudi Arabia	351 (5.0)	353 (7.1)	398 (4.8)	384 (7.0)	353 (6.5) ♀	331 (8.1)	370 (5.5)	352 (7.9)
Singapore	633 (3.5) ♀	625 (3.8)	630 (3.4) ♀	615 (4.5)	621 (3.7)	613 (4.3)	621 (3.7)	614 (4.2)
Slovenia	516 (2.8)	531 (2.8) ♀	503 (3.5) ♀	494 (2.4)	522 (3.5)	523 (3.4)	525 (3.2)	524 (3.2)
South Africa (9)	369 (5.7)	368 (4.6)	400 (5.2) ♀	387 (4.1)	366 (5.3)	362 (4.7)	362 (5.9) ♀	351 (5.0)
Sweden	505 (3.2)	520 (3.2) ♀	482 (3.4)	482 (3.9)	479 (4.5)	477 (3.2)	508 (4.1)	516 (4.2) ♀
Thailand	437 (5.5) ♀	423 (5.8)	441 (5.3) ♀	416 (6.4)	438 (5.2) ♀	419 (6.5)	433 (5.4) ♀	415 (5.7)
Turkey	443 (4.7)	452 (5.2) ♀	469 (4.7) ♀	450 (4.9)	472 (4.8) ♀	454 (5.6)	470 (5.5)	464 (6.2)
United Arab Emirates	464 (3.5)	464 (3.8)	495 (3.5) ♀	475 (3.9)	456 (4.1) ♀	439 (4.2)	455 (4.0)	443 (4.7)
United States	515 (3.3)	524 (3.2) ♀	529 (3.3) ♀	521 (3.3)	499 (3.5)	501 (3.3)	520 (3.8)	523 (3.7)
International Avg.	478 (0.7)	484 (0.7) ♀	489 (0.7) ♀	478 (0.7)	481 (0.7) ♀	475 (0.8)	475 (0.7) ♀	472 (0.8)

Figure 3.9 shows a larger proportion of countries where girls perform significantly better than boys in Algebra and Geometry and a larger proportion of countries where boys perform significantly better than girls in Numbers. This pattern is also visible for Maltese students. The mean

attainment scores of Maltese girls in Algebra, Geometry and Data and Chance (498, 486 and 488) respectively exceed the corresponding mean scores of Maltese boys (487, 482 and 485). On the other hand, the mean attainment scores of Maltese boys in Numbers (503) exceed the mean scores of Maltese girls (498); however, gender differences are significant solely in Numbers and Algebra. England, Georgia, Hong Kong, Iran, Lebanon and New Zealand are the only country where there is no significant gender difference in the mean attainment scores of all four content areas.

Figure 3.10: Achievement in Mathematics Cognitive domains by gender

Country	Knowing		Applying		Reasoning	
	Girls	Boys	Girls	Boys	Girls	Boys
Australia	505 (3.8)	504 (3.4)	500 (3.9)	504 (3.6)	511 (3.8)	513 (3.7)
Bahrain	469 (3.3) ●	458 (3.1)	453 (2.5) ●	438 (2.5)	463 (2.8) ●	442 (3.1)
Botswana (9)	404 (3.3) ●	382 (3.5)	394 (3.3) ●	376 (3.4)	396 (2.5) ●	381 (2.9)
Canada	518 (2.4)	523 (2.8) ●	526 (2.1)	531 (2.7) ●	532 (2.3)	536 (2.9)
Chile	414 (3.9)	430 (4.3) ●	416 (3.7)	436 (4.4) ●	423 (4.4)	440 (4.2) ●
Chinese Taipei	598 (3.0)	598 (3.5)	601 (2.5)	603 (3.4)	604 (2.9)	601 (3.5)
Egypt	404 (6.1)	394 (5.3)	386 (5.6)	384 (4.4)	386 (5.8) ●	370 (5.4)
England	517 (5.2)	509 (4.8)	520 (5.1)	519 (4.8)	524 (5.2)	521 (5.2)
Georgia	457 (4.5)	455 (4.9)	452 (3.8)	456 (4.5)	443 (4.7)	439 (5.3)
Hong Kong SAR	599 (5.2)	601 (6.5)	593 (4.5)	597 (6.0)	587 (5.2)	595 (6.5)
Hungary	508 (4.5)	514 (4.4)	510 (4.4)	522 (4.1) ●	512 (4.5)	518 (4.2)
Iran, Islamic Rep. of	437 (5.2)	434 (8.2)	435 (4.7)	434 (7.4)	438 (5.3)	435 (7.7)
Ireland	526 (2.9)	529 (4.2)	517 (2.7)	524 (4.4)	520 (3.4)	523 (4.3)
Israel	511 (4.4)	511 (5.1)	509 (4.3)	515 (4.8)	509 (4.7)	510 (5.0)
Italy	487 (3.2)	490 (3.1)	492 (3.3)	498 (2.8) ●	496 (3.3)	503 (3.4)
Japan	579 (3.7)	576 (3.3)	592 (3.3)	591 (3.1)	593 (3.6)	588 (3.5)
Jordan	399 (4.2) ●	382 (5.3)	385 (4.2)	372 (5.3)	393 (4.1) ●	366 (5.7)
Kazakhstan	539 (6.7) ●	528 (6.7)	528 (5.9)	526 (5.5)	530 (5.8) ●	519 (5.9)
Korea, Rep. of	608 (2.9)	606 (3.6)	605 (2.8)	607 (3.7)	606 (3.3)	609 (3.7)
Kuwait	399 (5.0)	396 (7.3)	391 (4.6)	388 (6.8)	379 (6.3)	369 (7.2)
Lebanon	454 (4.1)	458 (4.8)	437 (4.3)	440 (5.0)	406 (5.1)	405 (5.8)
Lithuania	502 (3.9)	502 (3.3)	518 (3.1)	521 (3.3)	501 (3.5)	502 (3.6)
Malaysia	482 (4.0) ●	462 (4.2)	465 (3.9)	461 (4.0)	454 (3.9)	452 (4.2)
Malta	501 (2.3)	497 (1.9)	494 (2.1)	493 (1.8)	486 (2.5)	483 (2.7)
Morocco	384 (2.9)	380 (2.8)	385 (2.8)	385 (2.3)	374 (3.3)	374 (3.0)
New Zealand	487 (3.2)	489 (4.7)	494 (3.1)	492 (4.8)	501 (3.3)	496 (5.0)
Norway (9)	500 (2.7)	501 (2.6)	515 (3.0)	517 (2.5)	515 (3.2)	517 (2.8)
Oman	419 (3.9) ●	385 (4.0)	413 (3.1) ●	389 (3.6)	422 (3.5) ●	385 (4.2)
Qatar	440 (3.2)	440 (5.3)	437 (3.0)	433 (4.6)	441 (3.1) ●	422 (4.7)
Russian Federation	538 (6.2)	548 (5.5) ●	535 (5.2)	546 (4.5) ●	522 (5.6)	533 (5.0) ●
Saudi Arabia	361 (5.9)	358 (7.8)	369 (5.5)	358 (6.3)	389 (5.5) ●	358 (6.2)
Singapore	641 (3.8) ●	626 (3.9)	623 (3.5) ●	616 (3.7)	621 (4.4) ●	612 (4.2)
Slovenia	518 (2.8)	518 (2.8)	512 (2.7)	516 (2.5)	515 (3.0)	516 (3.2)
South Africa (9)	377 (5.9) ●	365 (5.8)	363 (5.5)	361 (4.6)	387 (5.2) ●	379 (4.1)
Sweden	480 (3.4)	489 (3.4) ●	503 (3.1)	510 (3.2) ●	508 (4.3)	511 (3.8)
Thailand	435 (5.6) ●	415 (6.0)	439 (5.1) ●	423 (5.4)	443 (5.1) ●	426 (5.8)
Turkey	450 (5.2)	444 (5.2)	461 (4.5)	458 (4.7)	477 (5.0) ●	467 (5.1)
United Arab Emirates	482 (3.8)	469 (4.1)	461 (3.7)	453 (4.4)	470 (3.7) ●	452 (4.2)
United States	529 (3.7)	527 (3.6)	513 (3.4)	516 (3.4)	512 (3.1)	516 (3.4)
International Avg.	483 (0.7) ●	479 (0.8)	481 (0.6)	480 (0.7)	482 (0.7) ●	477 (0.7)

Figure 3.10 shows a larger proportion of countries where girls perform significantly better than boys in Knowing and Reasoning, while for the Applying cognitive area the proportions are comparable. This pattern is also visible for Maltese students. The mean attainment scores of Maltese girls in the 'Knowing', 'Applying' and 'Reasoning' (501, 494 and 486) exceed the mean attainment scores of Maltese boys (497, 493 and 483); however the differences are not significant. Besides Malta, Australia, Chinese Taipei, England, Georgia, Hong Kong, Iran, Ireland, Israel, Japan, Korea, Kuwait, Lebanon, Lithuania, Morocco, New Zealand, Norway, Slovenia and United States do not have significant gender difference in the mean attainment scores in all cognitive areas.

Figure 3.11: Percentage correct replies in Mathematics Content and Cognitive Domains

Country	Overall Mathematics	Mathematics Content Domains				Mathematics Cognitive Domains		
		Number	Algebra	Geometry	Data and Chance	Knowing	Applying	Reasoning
Australia	45 (0.7)	51 (0.8)	35 (0.7)	40 (0.8)	55 (0.7)	54 (0.7)	43 (0.7)	36 (0.8)
Bahrain	35 (0.3)	33 (0.4)	36 (0.4)	31 (0.4)	42 (0.4)	47 (0.4)	32 (0.3)	25 (0.5)
Botswana (9)	23 (0.3)	25 (0.4)	20 (0.3)	20 (0.3)	28 (0.3)	32 (0.3)	21 (0.3)	15 (0.2)
Canada	50 (0.6)	57 (0.7)	40 (0.6)	46 (0.6)	58 (0.6)	58 (0.6)	49 (0.6)	41 (0.6)
Chile	28 (0.5)	30 (0.6)	22 (0.5)	26 (0.5)	37 (0.6)	36 (0.6)	27 (0.5)	21 (0.5)
Chinese Taipei	68 (0.5)	69 (0.6)	67 (0.7)	65 (0.6)	69 (0.5)	74 (0.6)	68 (0.6)	60 (0.6)
Egypt	25 (0.5)	26 (0.6)	25 (0.7)	22 (0.6)	26 (0.5)	36 (0.7)	22 (0.5)	15 (0.5)
England	48 (1.1)	54 (1.3)	37 (1.1)	43 (1.1)	60 (1.1)	56 (1.1)	47 (1.2)	39 (1.1)
Georgia	34 (0.7)	37 (0.8)	33 (0.9)	29 (0.7)	36 (0.6)	45 (0.9)	32 (0.7)	23 (0.7)
Hong Kong SAR	68 (1.1)	72 (1.1)	62 (1.2)	64 (1.1)	72 (1.0)	76 (1.0)	67 (1.1)	57 (1.3)
Hungary	48 (0.9)	52 (1.0)	41 (1.0)	45 (1.0)	55 (0.8)	56 (0.9)	47 (1.0)	38 (1.0)
Iran, Islamic Rep. of	31 (0.9)	32 (1.0)	28 (0.9)	30 (0.9)	36 (0.9)	40 (1.0)	29 (0.9)	23 (0.9)
Ireland	49 (0.7)	60 (0.8)	39 (0.7)	40 (0.7)	58 (0.7)	61 (0.7)	48 (0.7)	38 (0.7)
Israel	47 (0.9)	52 (1.0)	45 (1.0)	39 (0.9)	52 (0.9)	57 (1.0)	46 (1.0)	37 (0.9)
Italy	42 (0.6)	45 (0.7)	33 (0.7)	41 (0.7)	49 (0.6)	50 (0.6)	41 (0.7)	33 (0.7)
Japan	65 (0.5)	66 (0.5)	62 (0.7)	64 (0.6)	71 (0.5)	71 (0.5)	65 (0.5)	57 (0.6)
Jordan	23 (0.4)	22 (0.5)	24 (0.6)	21 (0.4)	26 (0.4)	32 (0.6)	21 (0.4)	15 (0.3)
Kazakhstan	50 (1.4)	51 (1.4)	53 (1.5)	47 (1.5)	48 (1.2)	61 (1.3)	49 (1.5)	39 (1.4)
Korea, Rep. of	69 (0.6)	72 (0.6)	67 (0.7)	67 (0.7)	72 (0.5)	76 (0.5)	69 (0.6)	61 (0.7)
Kuwait	24 (0.8)	25 (1.0)	21 (0.8)	21 (0.7)	30 (0.9)	33 (1.0)	22 (0.9)	14 (0.7)
Lebanon	30 (0.7)	32 (0.8)	31 (0.8)	28 (0.8)	29 (0.7)	44 (0.9)	27 (0.7)	17 (0.6)
Lithuania	46 (0.7)	50 (0.7)	38 (0.8)	43 (0.7)	55 (0.6)	54 (0.7)	47 (0.7)	34 (0.7)
Malaysia	36 (0.8)	41 (0.9)	31 (0.7)	32 (0.7)	41 (0.8)	48 (0.9)	34 (0.8)	25 (0.6)
Malta	43 (0.3)	48 (0.4)	38 (0.4)	37 (0.4)	49 (0.4)	54 (0.3)	41 (0.4)	31 (0.4)
Morocco	22 (0.3)	22 (0.3)	19 (0.3)	23 (0.3)	25 (0.3)	30 (0.4)	20 (0.3)	14 (0.2)
New Zealand	42 (0.8)	47 (0.9)	33 (0.8)	37 (0.7)	53 (0.8)	50 (0.8)	41 (0.8)	34 (0.8)
Norway (9)	46 (0.6)	55 (0.7)	31 (0.5)	39 (0.6)	61 (0.7)	53 (0.6)	46 (0.6)	36 (0.6)
Oman	26 (0.4)	25 (0.4)	26 (0.4)	25 (0.4)	30 (0.4)	35 (0.5)	24 (0.4)	18 (0.3)
Qatar	32 (0.5)	34 (0.7)	30 (0.6)	28 (0.5)	37 (0.5)	42 (0.6)	30 (0.6)	22 (0.5)
Russian Federation	53 (1.3)	56 (1.3)	53 (1.4)	49 (1.4)	52 (1.1)	63 (1.3)	52 (1.3)	40 (1.3)
Saudi Arabia	21 (0.6)	19 (0.6)	20 (0.6)	18 (0.5)	28 (0.6)	28 (0.7)	19 (0.5)	14 (0.5)
Singapore	74 (0.8)	80 (0.8)	70 (0.9)	68 (0.8)	75 (0.7)	82 (0.7)	73 (0.8)	64 (1.0)
Slovenia	47 (0.5)	53 (0.6)	36 (0.5)	45 (0.6)	56 (0.6)	58 (0.6)	45 (0.5)	37 (0.6)
South Africa (9)	21 (0.7)	21 (0.8)	20 (0.7)	19 (0.5)	26 (0.7)	30 (0.9)	19 (0.6)	15 (0.5)
Sweden	43 (0.7)	50 (0.8)	34 (0.8)	35 (0.6)	53 (0.8)	49 (0.7)	43 (0.7)	35 (0.7)
Thailand	30 (1.0)	32 (1.1)	25 (1.0)	27 (0.9)	36 (0.9)	37 (1.1)	28 (1.0)	22 (0.9)
Turkey	36 (1.0)	36 (1.1)	32 (1.0)	34 (1.0)	45 (1.0)	43 (1.0)	35 (1.0)	30 (1.0)
United Arab Emirates	37 (0.4)	39 (0.5)	36 (0.4)	31 (0.4)	42 (0.5)	49 (0.5)	34 (0.4)	27 (0.4)
United States	48 (0.8)	53 (0.9)	45 (0.8)	40 (0.8)	56 (0.8)	60 (0.8)	46 (0.8)	37 (0.8)
International Avg.	41 (0.1)	44 (0.1)	37 (0.1)	37 (0.1)	47 (0.1)	50 (0.1)	40 (0.1)	32 (0.1)

Figure 3.11 displays the percentage of correct replies in Content and Cognitive Domains and overall Mathematics. The percentage of correct replies obtained by Maltese students in overall Mathematics was 43%, which is marginally higher than the international average (41%). Maltese students fared better in Data and Chance (49%) and Numbers (48%) than Algebra (38%) and Geometry (37%). This is in line with other countries where the international average percentages of correct replies in the Content domain areas are (47%, 44%, 37% and 37%) respectively. Similarly, Maltese students fared significantly better in 'Knowing' (54%) than 'Applying' (41%) and 'Reasoning' (31%). This is in line with other countries where the international average percentages of correct replies in Cognitive domain areas are (50%, 40% and 32%) respectively.

Figures 3.12 to 3.15 show that, on average, students attending Independent schools score significantly higher than students attending Church and State schools in all four content areas. In State schools, girls perform better than boys in all four content areas and differences are significant in Algebra and Geometry. In Church and Independent schools, boys tend to perform better than girls in all four content areas; however, most of these differences are not significant. Figures 3.16 to 3.18 show that, on average, students attending Independent schools score significantly higher than students attending Church and State schools in all three cognitive areas. Girls attending state schools are, on average, scoring significantly higher than boys in all three cognitive areas. On the other hand, boys attending Church and Independent schools are scoring marginally higher than girls; however, differences are not significant. Figures 3.19 and 3.20 display significantly higher proportions of students attending Independent schools in the upper Mathematics scale benchmarks and significantly higher proportions of students attending State schools in the lower scales.

Figure 3.12: Attainment of Maltese students in Numbers by gender and school type

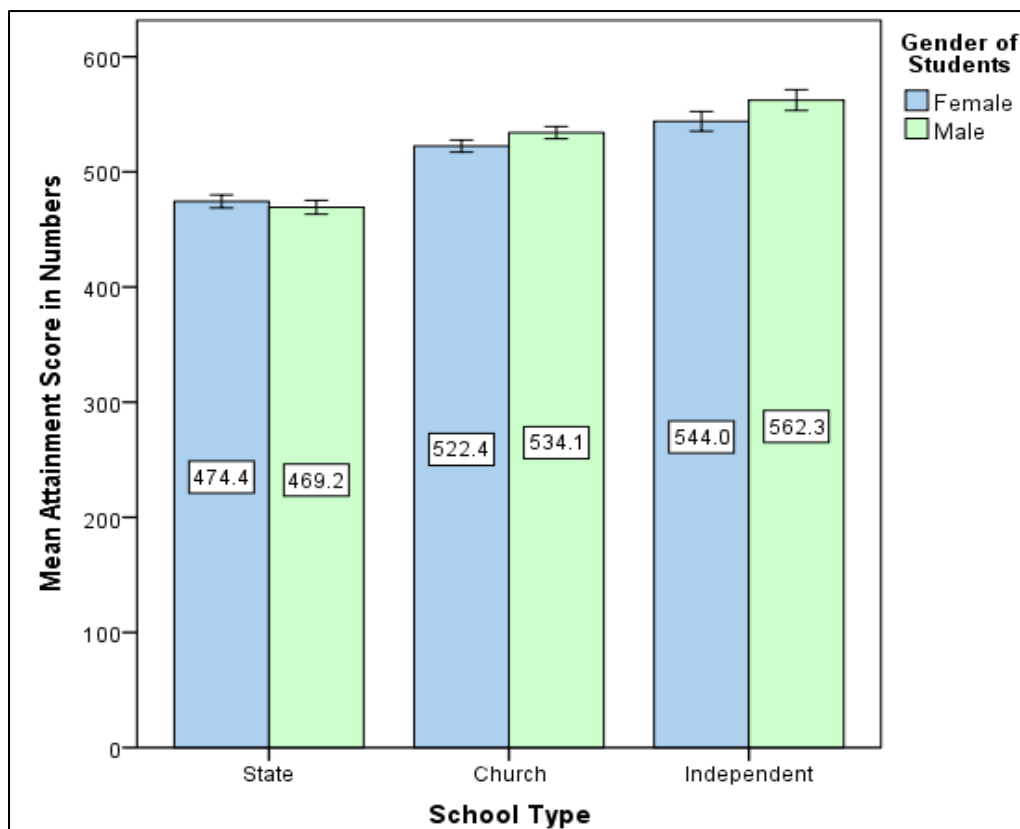


Figure 3.13: Attainment of Maltese students in Algebra by gender and school type

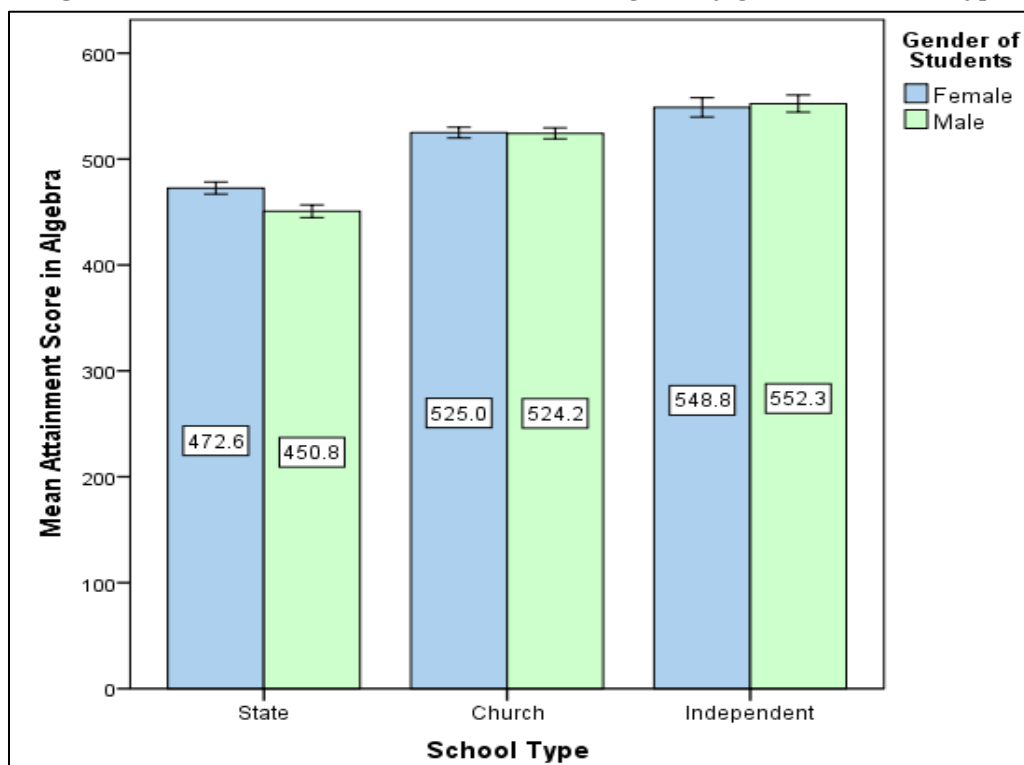


Figure 3.14: Attainment of Maltese students in Geometry by gender and school type

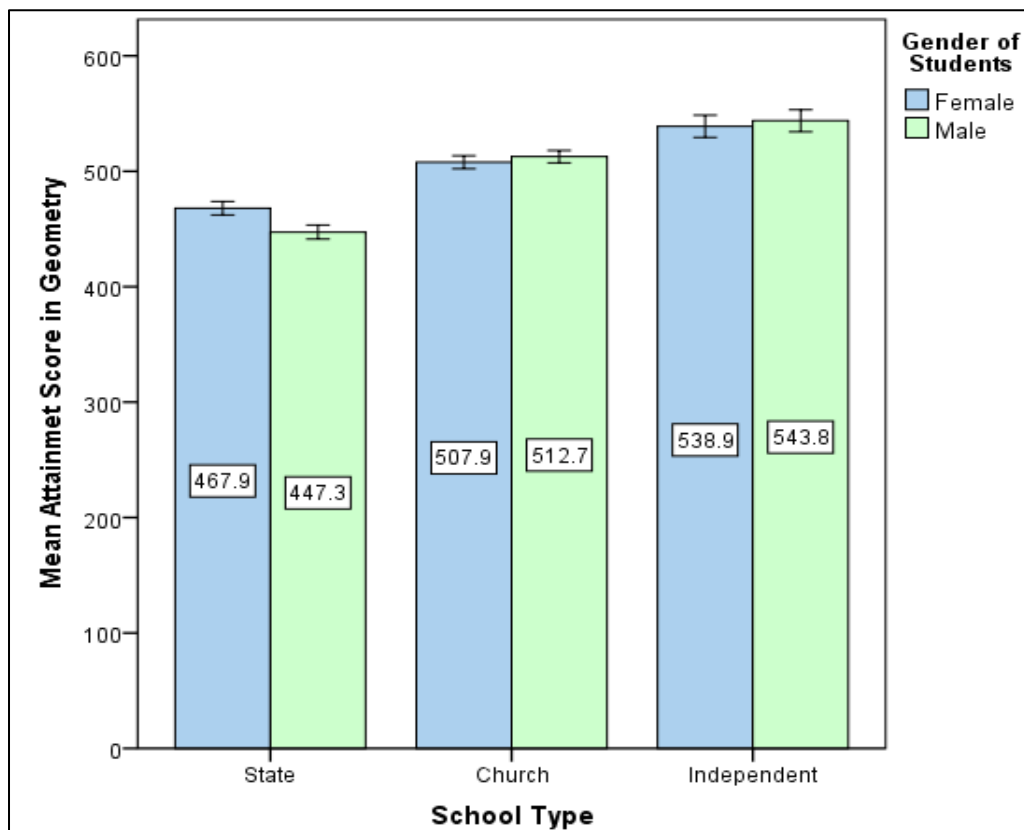


Figure 3.15: Attainment of Maltese students in Data and Chance by gender and school type

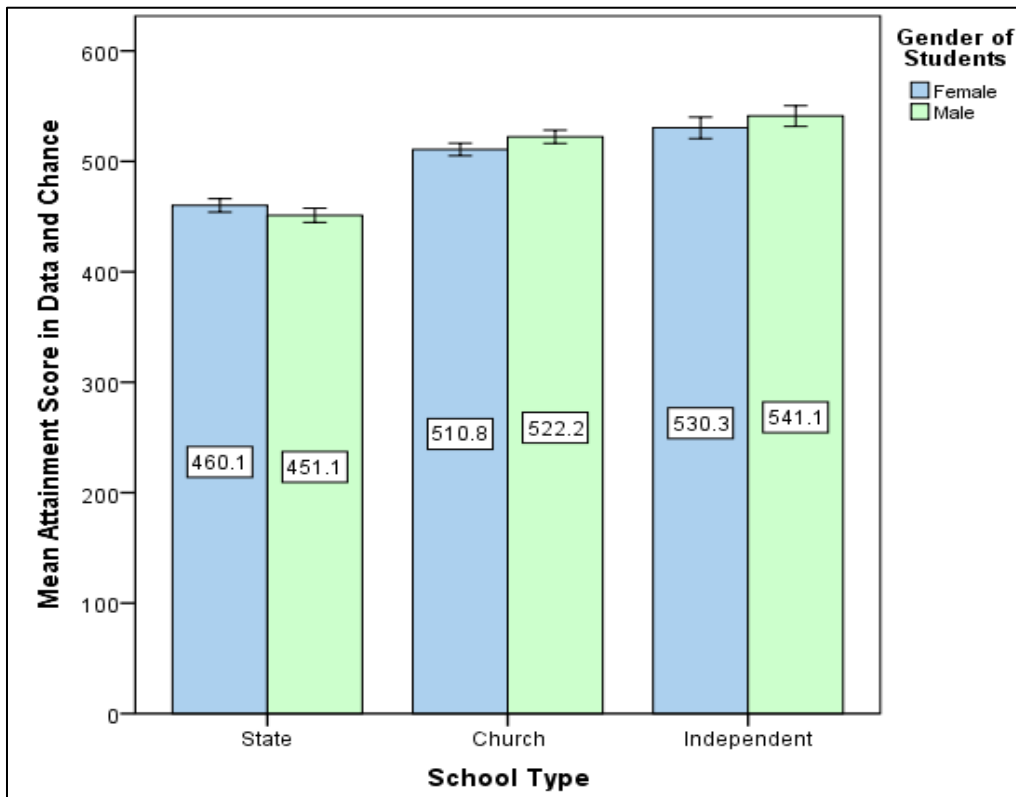


Figure 3.16: Mathematics Attainment in 'Knowing' by gender and school type

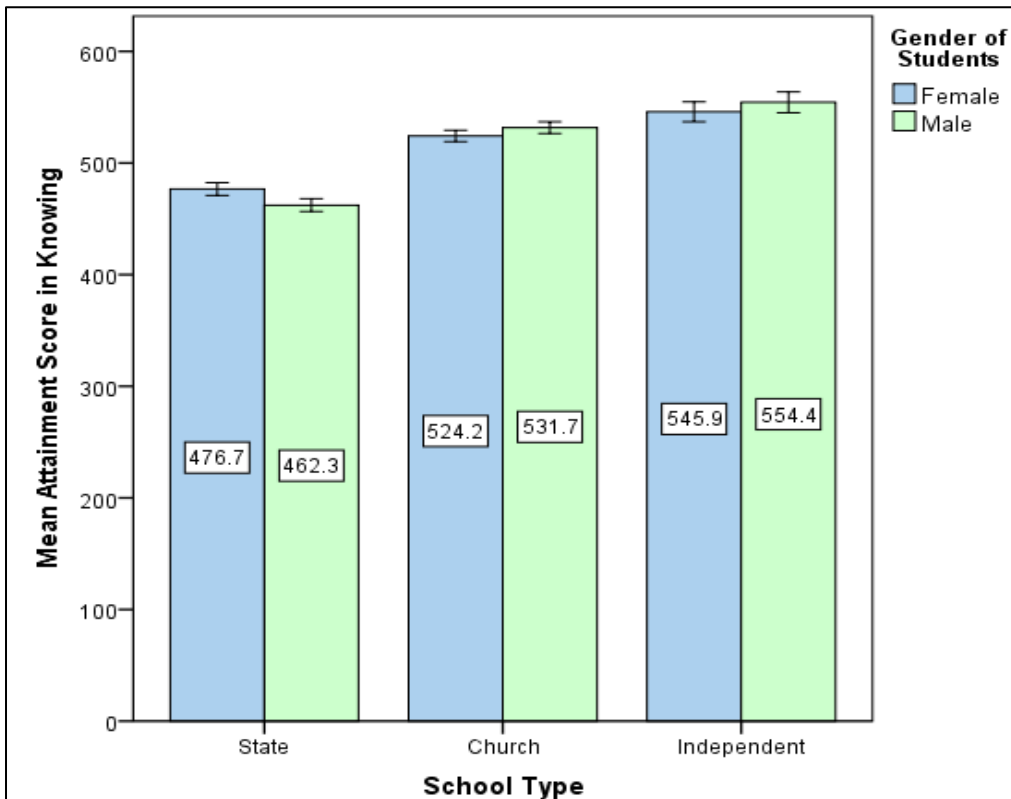


Figure 3.17: Mathematics Attainment in 'Applying' by gender and school type

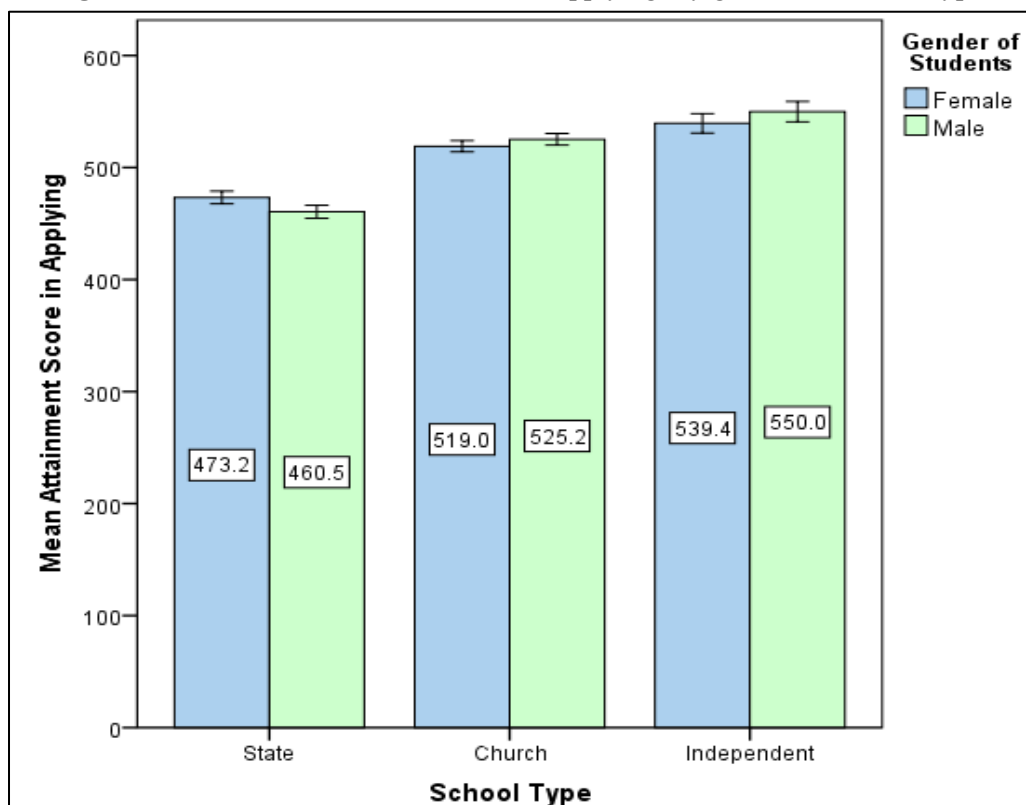


Figure 3.18: Mathematics Attainment in 'Reasoning' by gender and school type

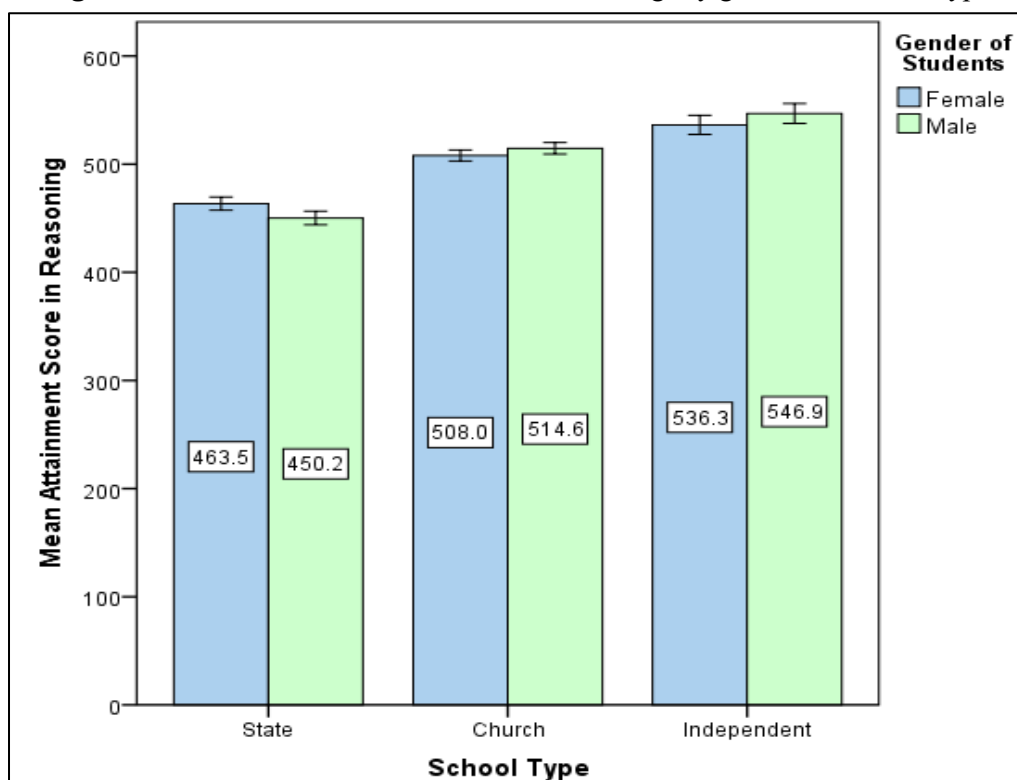


Figure 3.19: Mathematics scale benchmarks of Maltese students by gender

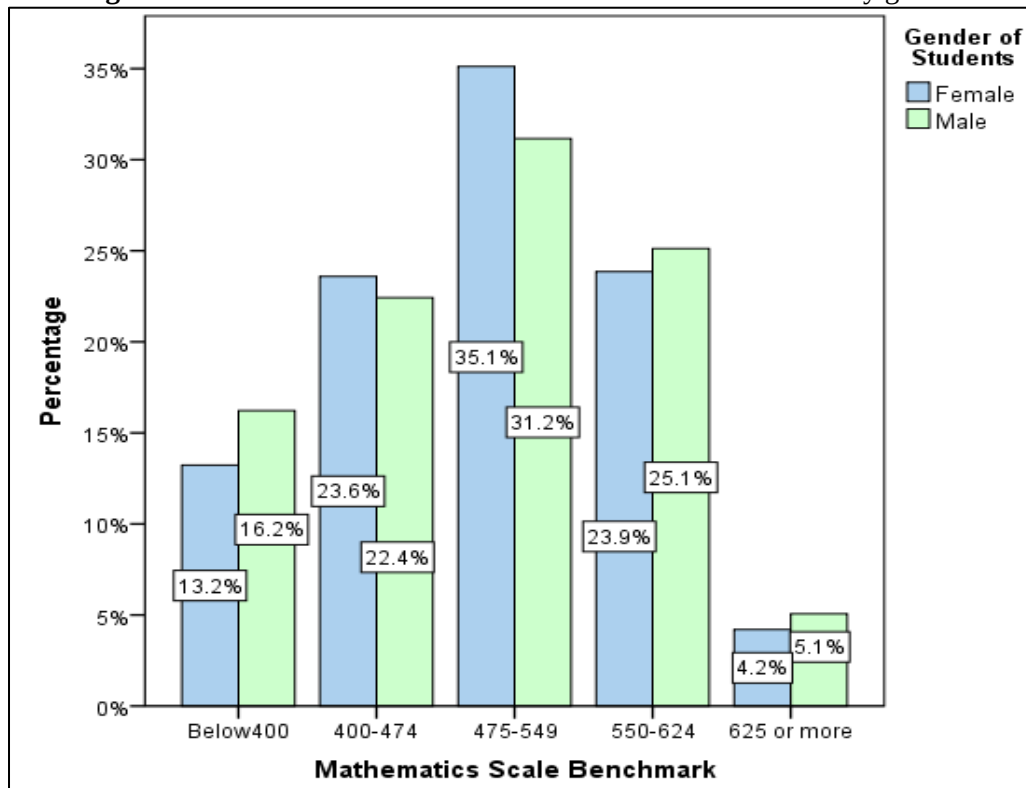
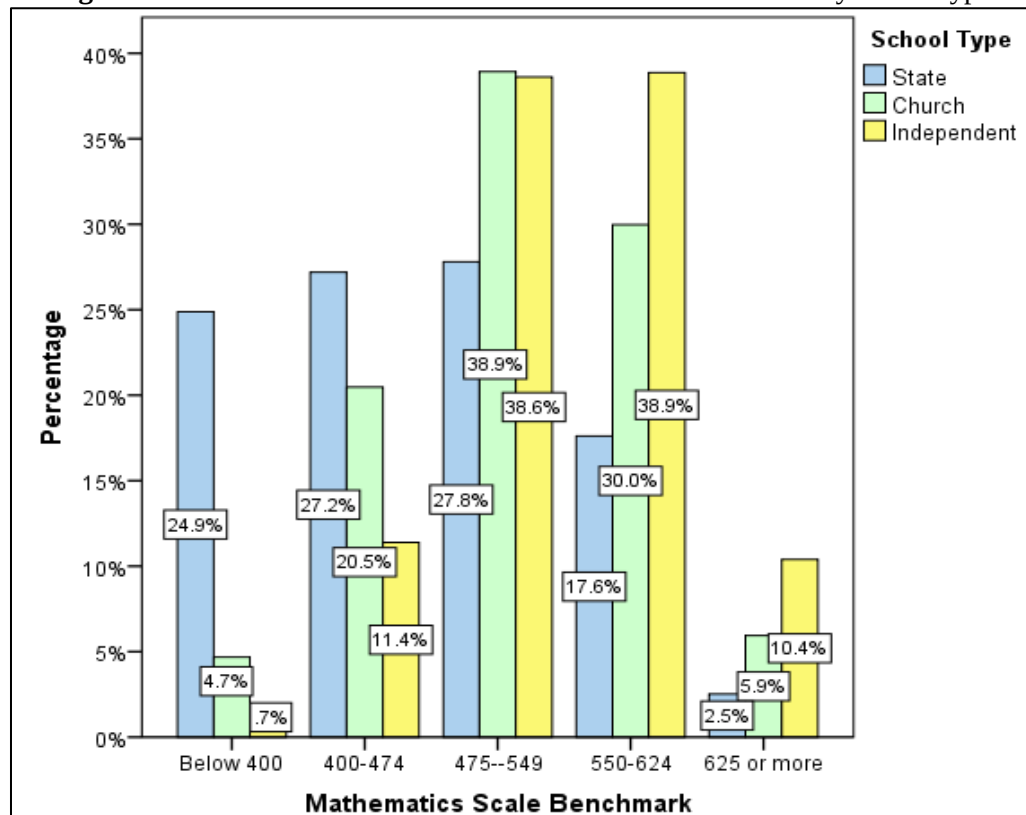


Figure 3.20: Mathematics scale benchmarks of Maltese students by school type



3.5 Mathematics Attainment differences in the 2007 and 2015 cycles

Figure 3.21 shows that the overall mean Mathematics score (494) in TIMSS 2015 exceeds the mean Mathematics score (488) in TIMSS 2007 and the difference (6 scale points) is significant at the 0.05 level. This improvement applies to both boys (7) and girls (4); however, the change is not significant. In the 2007 cycle boys and girls had the same score (488) in mathematical attainment, while in the 2015 cycle girls (495) scored marginally higher than boys (492); however, the difference is not significant at the 0.05 criterion.

Figure 3.21: Attainment in Mathematics by gender and cycle

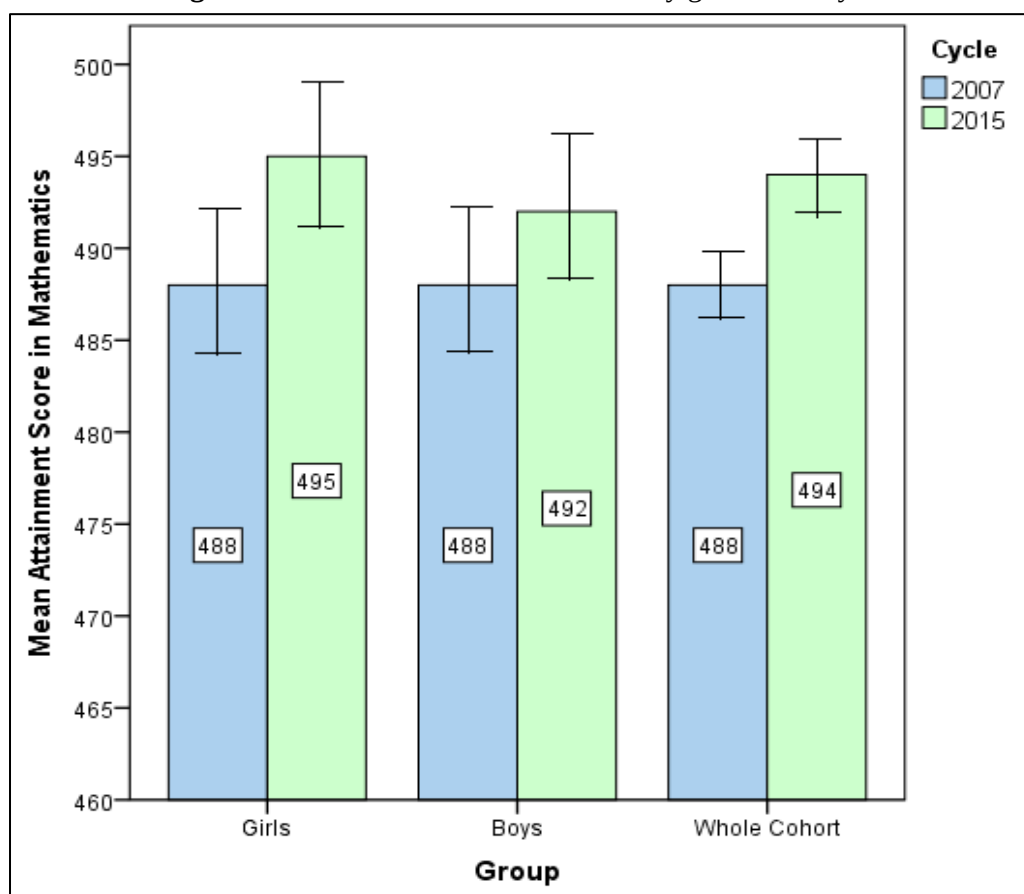


Figure 3.22 shows that the mean TIMSS 2015 scores in Numbers (501), Algebra (492) and Data and Chance (487) exceed the corresponding mean TIMSS 2007 scores (499, 475 and 487) by 2, 17 and 5 scale points respectively. However, the mean 2007 score in Geometry (494) exceeds the mean 2015 score (484) by 10 scale points. Changes in mean attainment scores are significant in Algebra and Geometry but not in Numbers and Data and Chance.

Figure 3.23 shows that the mean TIMSS 2015 scores in Knowing (499), Applying (493) and Reasoning (484) exceed the corresponding mean TIMSS 2007 scores (490, 491 and 474) by 9, 2 and 10 scale points respectively. Increments in mean attainment score in 'Knowing' and 'Reasoning' are significant, but the change in 'Applying' is not significant. In both cycles, students performed best in 'Knowing' and performed worst in 'Reasoning'.

Figure 3.22: Attainment in Mathematics by content area and cycle

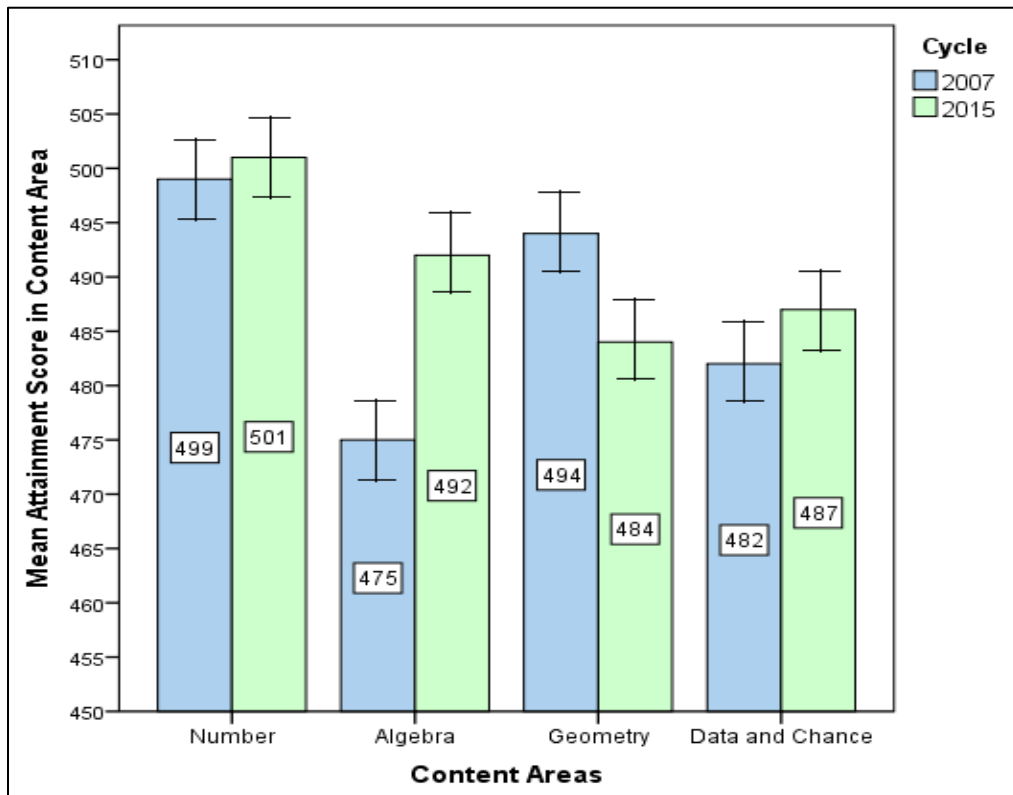
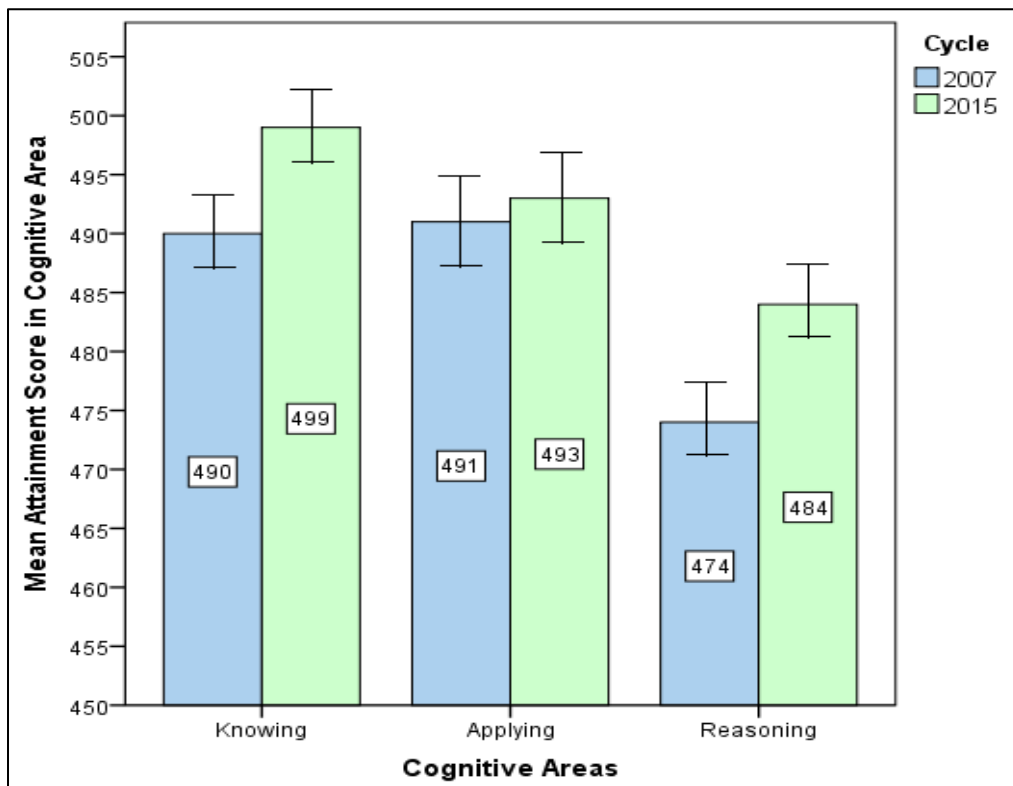


Figure 3.23: Attainment in Mathematics by cognitive area and cycle



4

Home Language and Learning Resources

4.1 Introduction

This chapter analyzes students' resources for learning at home by considering the number of books available at home, the highest education level of either parents and the availability of home study supports including internet connection and own room to study. A scale measuring home resources for learning is generated and is related to attainment in Mathematics and Science. The mean home resources score is compared between different countries and between different school types in Malta. This chapter also investigates the proportion of Maltese students who speak English regularly at home and how much this factor affects attainment in Mathematics and Science.

4.2 Home resources for learning

The presence of educational resources at home has potential advantages for students. The parents' level of education and material possessions such as books and computers are related to attainment in Mathematics and Science. Parents with a high level of education are more likely to provide academic and psychological support for their children than parents with a low level of education. Moreover, the availability of computers and books at home enhances learning and students who do not own these resources are educationally disadvantaged.

A scale score for home educational resources was generated by considering three aspects – highest level of education of either parent; the number of books at home suggested by the student and the availability of an internet connection and whether the student has an own room. Tables 4.1 to 4.3 display the responses of the Maltese participants for each of the three aspects.

Table 4.1: Number of books at home as reported by Maltese students

How many books are there in your home?	Frequency	Percentage
0-10 books	407	10.8%
11-25 books	811	21.5%
26-100 books	1247	33.0%
101-200 books	743	19.7%
More than 200 books	572	15.1%

Table 4.2: Highest Parental Education Level as reported by Maltese students

What is the highest level of education completed by the child's father and mother?	Father	Mother
Primary or no schooling	20.6%	20.8%
Lower secondary	5.0%	5.3%
Upper secondary	15.0%	18.4%
Post-secondary, non-tertiary	3.0%	2.6%
Short-cycle tertiary	3.2%	4.2%
Bachelor's or equivalent	3.6%	4.0%
Postgraduate degree	8.6%	6.2%
Don't know	41.0%	38.5%

Table 4.3: Items found at home as reported by Maltese students

Do you have any of these things at home?	Yes	No
Your own room	79.2%	20.8%
Internet connection	99.1%	0.9%

The generated home learning resources score was categorised into three levels. Students with 'Many Resources' had a score of at least 12.4, which is the point on the scale corresponding to students reporting they had more than 100 books at home, had the two home study supports and at least one of the parents had tertiary education. On the other hand, students with 'Few Resources' had a score at most 7.3, which is the scale point corresponding to students reporting that they had 25 or fewer books at home, neither of the two home study supports are available, and neither parent had gone beyond upper-secondary education, on average. All other students were assigned to the 'Some Resources' category.

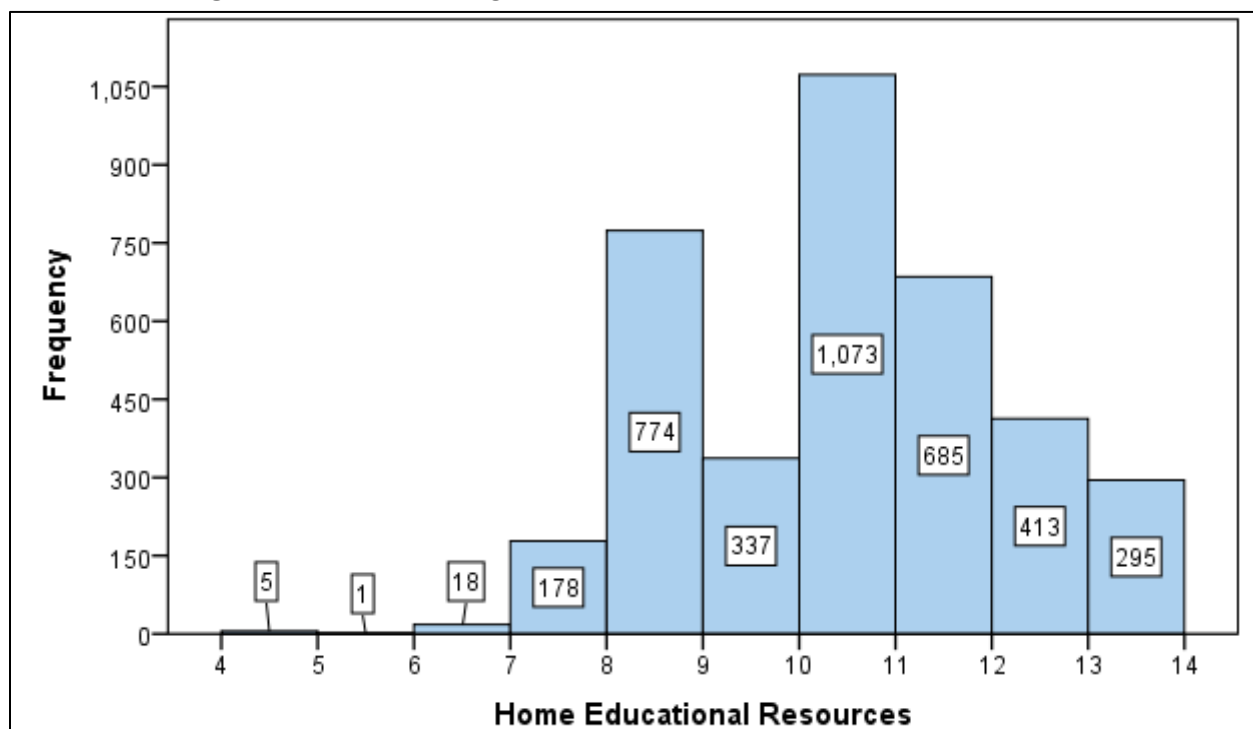
Figure 4.1: Home learning resources score distribution for Maltese students


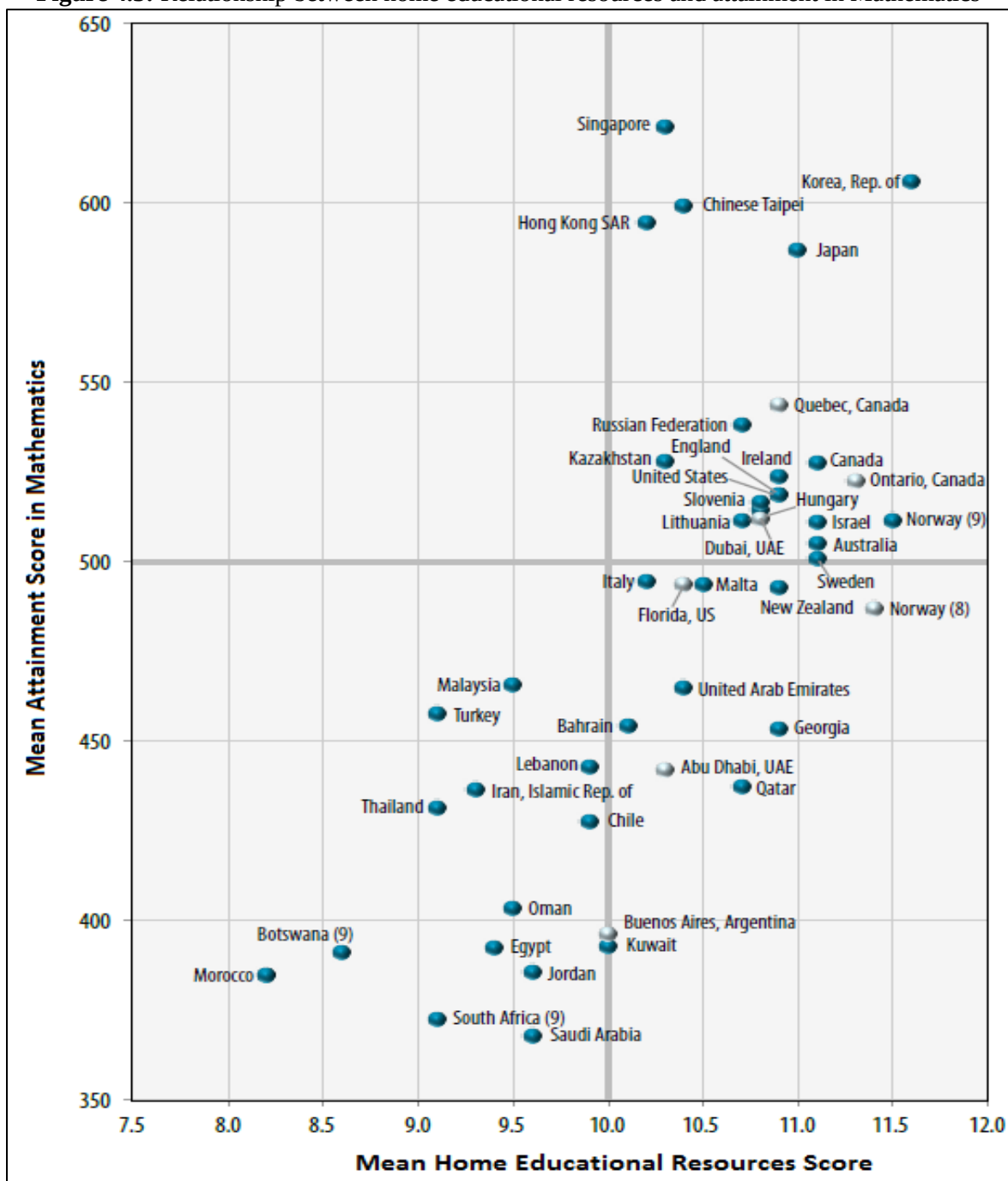
Figure 4.1 displays the home learning resources score distribution of Maltese students having mean 10.5 and standard deviation 1.64. 5.3% of the students scored less than 8, 29.4% scored between 8 and 10, 46.6% scored between 10 to 12 and 18.7% scored more than 12.

Figure 4.2: Home educational resources and attainment in Mathematics

Country	Many Resources		Some Resources		Few Resources		Average Scale Score
	Percent of Students	Average Achievement	Percent of Students	Average Achievement	Percent of Students	Average Achievement	
Korea, Rep. of	37 (1.3)	638 (3.3)	60 (1.2)	589 (2.4)	3 (0.2)	524 (8.1)	11.6 (0.05)
Norway (9)	29 (1.2)	546 (3.3)	69 (1.1)	499 (2.0)	1 (0.2)	~ ~	11.5 (0.05)
Georgia	23 (1.1)	492 (4.4)	70 (1.1)	448 (3.9)	7 (0.6)	392 (8.7)	10.9 (0.06)
Sweden	23 (1.1)	543 (3.2)	74 (1.2)	491 (2.6)	3 (0.5)	449 (9.8)	11.1 (0.04)
Australia	23 (0.9)	548 (3.1)	73 (0.9)	497 (3.1)	4 (0.4)	439 (10.6)	11.1 (0.04)
Hungary	22 (1.5)	590 (4.4)	70 (1.3)	503 (3.0)	7 (0.7)	397 (7.8)	10.8 (0.07)
United States	22 (0.9)	567 (3.7)	71 (0.9)	509 (2.9)	7 (0.5)	469 (4.7)	10.9 (0.04)
Canada	21 (0.9)	563 (3.1)	76 (0.8)	520 (2.0)	2 (0.3)	~ ~	11.1 (0.04)
Ireland	20 (0.9)	567 (3.6)	74 (0.8)	518 (2.5)	6 (0.6)	450 (10.4)	10.9 (0.05)
Japan	19 (0.9)	638 (3.2)	77 (0.8)	577 (2.1)	4 (0.3)	515 (6.4)	11.0 (0.04)
England	19 (1.0)	584 (4.7)	76 (1.0)	507 (4.2)	5 (0.4)	462 (7.1)	10.9 (0.05)
New Zealand	19 (0.7)	550 (3.3)	75 (0.6)	486 (3.2)	6 (0.5)	416 (6.6)	10.9 (0.04)
Israel	16 (0.7)	581 (4.5)	82 (0.7)	512 (4.5)	2 (0.3)	~ ~	11.1 (0.04)
Chinese Taipei	15 (0.9)	658 (3.7)	73 (0.9)	600 (2.3)	12 (0.6)	521 (4.3)	10.4 (0.04)
Lithuania	14 (1.1)	564 (5.2)	81 (1.2)	506 (2.5)	5 (0.4)	447 (9.5)	10.7 (0.05)
Qatar	14 (0.6)	498 (4.3)	78 (0.8)	435 (3.0)	8 (0.5)	362 (6.1)	10.6 (0.03)
Slovenia	14 (0.7)	553 (3.6)	83 (0.7)	513 (2.0)	3 (0.4)	455 (8.0)	10.8 (0.04)
Malta	13 (0.5)	551 (3.3)	75 (0.7)	494 (1.2)	12 (0.5)	436 (3.9)	10.5 (0.03)
Italy	13 (0.9)	540 (3.6)	72 (1.0)	497 (2.3)	15 (0.9)	444 (5.5)	10.2 (0.05)
Russian Federation	12 (0.6)	567 (5.3)	83 (0.6)	535 (4.8)	5 (0.4)	512 (10.4)	10.7 (0.04)
United Arab Emirates	12 (0.4)	519 (4.2)	77 (0.4)	465 (1.9)	11 (0.4)	406 (3.3)	10.4 (0.03)
Hong Kong SAR	12 (1.0)	634 (5.6)	74 (1.0)	595 (4.4)	15 (0.9)	560 (6.5)	10.2 (0.07)
Singapore	12 (0.4)	668 (2.7)	77 (0.6)	622 (3.2)	11 (0.5)	565 (5.4)	10.3 (0.03)
Kazakhstan	11 (1.1)	554 (11.3)	79 (1.1)	528 (4.9)	11 (0.9)	502 (11.3)	10.3 (0.07)
Iran, Islamic Rep. of	9 (0.8)	514 (8.1)	55 (1.2)	449 (4.9)	36 (1.5)	397 (4.1)	9.3 (0.08)
Bahrain	8 (0.4)	490 (5.8)	78 (0.7)	456 (1.6)	13 (0.6)	429 (3.8)	10.1 (0.03)
Lebanon	7 (0.6)	471 (6.7)	73 (1.0)	448 (3.8)	20 (0.9)	418 (4.6)	9.9 (0.04)
Turkey	7 (0.8)	575 (8.5)	54 (1.2)	476 (4.1)	40 (1.7)	414 (4.6)	9.1 (0.09)
Chile	6 (0.5)	490 (6.6)	78 (0.9)	432 (3.1)	16 (0.9)	385 (4.8)	9.9 (0.04)
Oman	6 (0.3)	451 (5.6)	66 (0.8)	409 (2.5)	28 (1.0)	383 (3.5)	9.5 (0.04)
Saudi Arabia	6 (0.6)	409 (10.5)	69 (1.3)	373 (4.7)	25 (1.4)	346 (5.2)	9.6 (0.06)
Jordan	5 (0.4)	430 (8.7)	73 (1.0)	395 (3.1)	22 (1.1)	350 (4.1)	9.6 (0.05)
Kuwait	5 (0.7)	450 (20.8)	82 (1.0)	395 (4.8)	13 (0.8)	360 (4.6)	10.0 (0.05)
Egypt	5 (0.3)	426 (6.9)	67 (1.0)	404 (4.3)	28 (1.0)	365 (4.9)	9.4 (0.04)
Malaysia	4 (0.3)	535 (5.2)	72 (1.0)	473 (3.7)	24 (1.0)	431 (4.5)	9.5 (0.04)
Thailand	3 (0.5)	539 (16.0)	60 (1.1)	440 (5.5)	37 (1.2)	408 (4.3)	9.1 (0.05)
South Africa (9)	3 (0.4)	477 (20.5)	66 (1.1)	380 (5.2)	31 (1.2)	349 (3.1)	9.1 (0.06)
Botswana (9)	2 (0.2)	~ ~	51 (1.1)	402 (2.7)	47 (1.2)	379 (2.1)	8.6 (0.05)
Morocco	2 (0.2)	~ ~	43 (0.9)	396 (3.1)	55 (1.0)	374 (2.0)	8.2 (0.05)
International Avg.	13 (0.1)	540 (1.3)	72 (0.2)	481 (0.6)	15 (0.1)	431 (1.1)	

Figure 4.2 shows that the proportion of Maltese pupils with ‘Many Resources’ (13%) is identical to the international average (13%), the proportion with ‘Some Resources’ (75%) is larger than the international average (72%), while the proportion with ‘Few Resources’ (12%) is lower than the international average (15%). Korea has the largest mean scale score (11.6) indicating richest home learning resources. It is followed by Norway (11.5), Sweden (11.1), Australia (11.1), Canada (11.1), Israel (11.1) and Japan (11.0). Malta’s mean scale score (10.5) is above the international average (10.2).

Figure 4.3: Relationship between home educational resources and attainment in Mathematics



Figures 4.2 and 4.3 both show a strong positive relationship between the home resources scale score for learning and the mathematics attainment score. The mean Mathematics attainment scores of students with 'Many', 'Some' and 'Few' resources are 540, 481 and 431 respectively. This pattern applies to all the participating countries including Malta. In fact, the mean Mathematics scores of Maltese students with 'Many', 'Some' and 'Few' resources are 551, 494 and 436 respectively.

Table 4.4: Mean home educational resources and mean mathematics scores by school type

School Type	Mean Home Resources Score	Mean Mathematics Score
State	10.0	465.6
Church	10.9	521.4
Independent	11.5	547.4

Figure 4.4: Relationship between home resources and Mathematics scores by school type

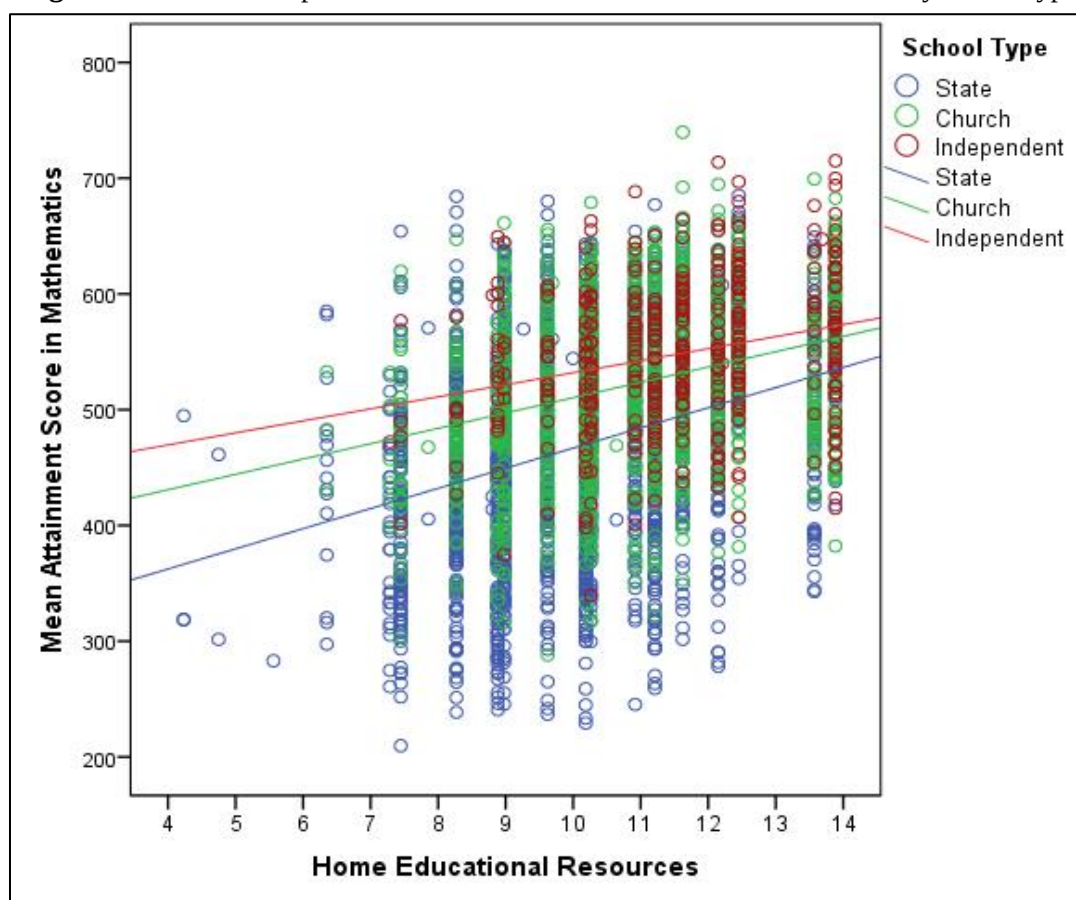


Table 4.4 shows that students attending independent schools have the highest mean home educational resources score and the highest mean mathematics attainment scores, while students attending state schools have the lowest mean scores. Differences in mean scores are significant at the 0.05 level of significance. Figure 4.4 shows that this positive relationship between the home resources score for learning and the mathematics attainment score applies to all Maltese students attending state, church and independent schools.

A similar approach was used to relate home educational resources with attainment in science. Figures 4.5 shows that the mean Science attainment scores of students with 'Many', 'Some' and 'Few' resources are 547, 486 and 432 respectively and this pattern applies to all the participating countries including Malta. In fact, the mean Mathematics scores of Maltese students with 'Many', 'Some' and 'Few' resources are 557, 481 and 412 respectively.

Figure 4.5: Home educational resources and attainment in Science

Country	Many Resources		Some Resources		Few Resources		Average Scale Score
	Percent of Students	Average Achievement	Percent of Students	Average Achievement	Percent of Students	Average Achievement	
Korea, Rep. of	37 (1.3)	584 (3.2)	60 (1.2)	541 (2.1)	3 (0.2)	483 (9.1)	11.6 (0.05)
Norway (9)	29 (1.2)	549 (3.3)	69 (1.1)	494 (2.6)	1 (0.2)	~ ~	11.5 (0.05)
Georgia	23 (1.1)	481 (3.8)	70 (1.1)	439 (3.6)	7 (0.6)	375 (7.9)	10.9 (0.06)
Sweden	23 (1.1)	578 (4.0)	74 (1.2)	510 (3.1)	3 (0.5)	437 (12.2)	11.1 (0.04)
Australia	23 (0.9)	562 (2.8)	73 (0.9)	503 (2.5)	4 (0.4)	429 (8.4)	11.1 (0.04)
Hungary	22 (1.5)	592 (3.9)	70 (1.3)	517 (2.8)	7 (0.7)	425 (7.9)	10.8 (0.07)
United States	22 (0.9)	579 (3.2)	71 (0.9)	521 (2.6)	7 (0.5)	476 (4.6)	10.9 (0.04)
Canada	21 (0.9)	567 (3.1)	76 (0.8)	518 (2.0)	2 (0.3)	~ ~	11.1 (0.04)
Ireland	20 (0.9)	580 (3.1)	74 (0.8)	523 (2.6)	6 (0.6)	445 (12.8)	10.9 (0.05)
Japan	19 (0.9)	610 (3.0)	77 (0.8)	564 (1.7)	4 (0.3)	511 (6.0)	11.0 (0.04)
England	19 (1.0)	606 (4.6)	76 (1.0)	525 (3.6)	5 (0.4)	470 (7.1)	10.9 (0.05)
New Zealand	19 (0.7)	575 (3.1)	75 (0.6)	505 (3.0)	6 (0.5)	430 (5.9)	10.9 (0.04)
Israel	16 (0.7)	581 (4.4)	82 (0.7)	509 (4.2)	2 (0.3)	~ ~	11.1 (0.04)
Chinese Taipei	15 (0.9)	625 (3.0)	73 (0.9)	570 (1.9)	12 (0.6)	501 (4.1)	10.4 (0.04)
Lithuania	14 (1.1)	573 (5.6)	81 (1.2)	514 (2.4)	5 (0.4)	449 (8.9)	10.7 (0.05)
Qatar	14 (0.6)	515 (4.3)	78 (0.8)	456 (3.2)	8 (0.5)	374 (6.2)	10.6 (0.03)
Slovenia	14 (0.7)	595 (3.4)	83 (0.7)	547 (2.3)	3 (0.4)	469 (10.6)	10.8 (0.04)
Malta	13 (0.5)	557 (4.0)	75 (0.7)	481 (1.7)	12 (0.5)	412 (4.7)	10.5 (0.03)
Italy	13 (0.9)	548 (4.1)	72 (1.0)	502 (2.0)	15 (0.9)	444 (5.5)	10.2 (0.05)
Russian Federation	12 (0.6)	576 (4.9)	83 (0.6)	541 (4.3)	5 (0.4)	509 (9.7)	10.7 (0.04)
United Arab Emirates	12 (0.4)	533 (3.8)	77 (0.4)	478 (2.2)	11 (0.4)	414 (4.2)	10.4 (0.03)
Hong Kong SAR	12 (1.0)	584 (4.9)	74 (1.0)	546 (3.7)	15 (0.9)	513 (5.7)	10.2 (0.07)
Singapore	12 (0.4)	654 (3.0)	77 (0.6)	598 (3.2)	11 (0.5)	532 (5.5)	10.3 (0.03)
Kazakhstan	11 (1.1)	558 (10.0)	79 (1.1)	533 (4.2)	11 (0.9)	507 (9.6)	10.3 (0.07)
Iran, Islamic Rep. of	9 (0.8)	532 (7.0)	55 (1.2)	469 (4.3)	36 (1.5)	418 (3.8)	9.3 (0.08)
Bahrain	8 (0.4)	512 (6.5)	78 (0.7)	468 (2.6)	13 (0.6)	433 (4.7)	10.1 (0.03)
Lebanon	7 (0.6)	436 (9.5)	73 (1.0)	407 (5.7)	20 (0.9)	363 (6.7)	9.9 (0.04)
Turkey	7 (0.8)	593 (6.9)	54 (1.2)	510 (3.6)	40 (1.7)	455 (3.9)	9.1 (0.09)
Chile	6 (0.5)	518 (5.9)	78 (0.9)	458 (3.1)	16 (0.9)	412 (4.4)	9.9 (0.04)
Oman	6 (0.3)	496 (5.5)	66 (0.8)	460 (2.8)	28 (1.0)	438 (4.0)	9.5 (0.04)
Saudi Arabia	6 (0.6)	442 (11.6)	69 (1.3)	404 (4.6)	25 (1.4)	370 (5.7)	9.6 (0.06)
Jordan	5 (0.4)	477 (8.2)	73 (1.0)	439 (3.2)	22 (1.1)	382 (4.4)	9.6 (0.05)
Kuwait	5 (0.7)	474 (15.2)	82 (1.0)	414 (5.4)	13 (0.8)	370 (6.1)	10.0 (0.05)
Egypt	5 (0.3)	413 (8.1)	67 (1.0)	383 (4.3)	28 (1.0)	341 (5.7)	9.4 (0.04)
Malaysia	4 (0.3)	544 (5.9)	72 (1.0)	480 (4.0)	24 (1.0)	432 (5.7)	9.5 (0.04)
Thailand	3 (0.5)	551 (11.3)	60 (1.1)	464 (4.8)	37 (1.2)	434 (4.1)	9.1 (0.05)
South Africa (9)	3 (0.4)	489 (24.1)	66 (1.1)	368 (6.5)	31 (1.2)	327 (3.9)	9.1 (0.06)
Botswana (9)	2 (0.2)	~ ~	51 (1.1)	407 (3.5)	47 (1.2)	376 (2.7)	8.6 (0.05)
Morocco	2 (0.2)	~ ~	43 (0.9)	401 (3.3)	55 (1.0)	386 (2.4)	8.2 (0.05)
International Avg.	13 (0.1)	547 (1.2)	72 (0.2)	486 (0.6)	15 (0.1)	432 (1.1)	

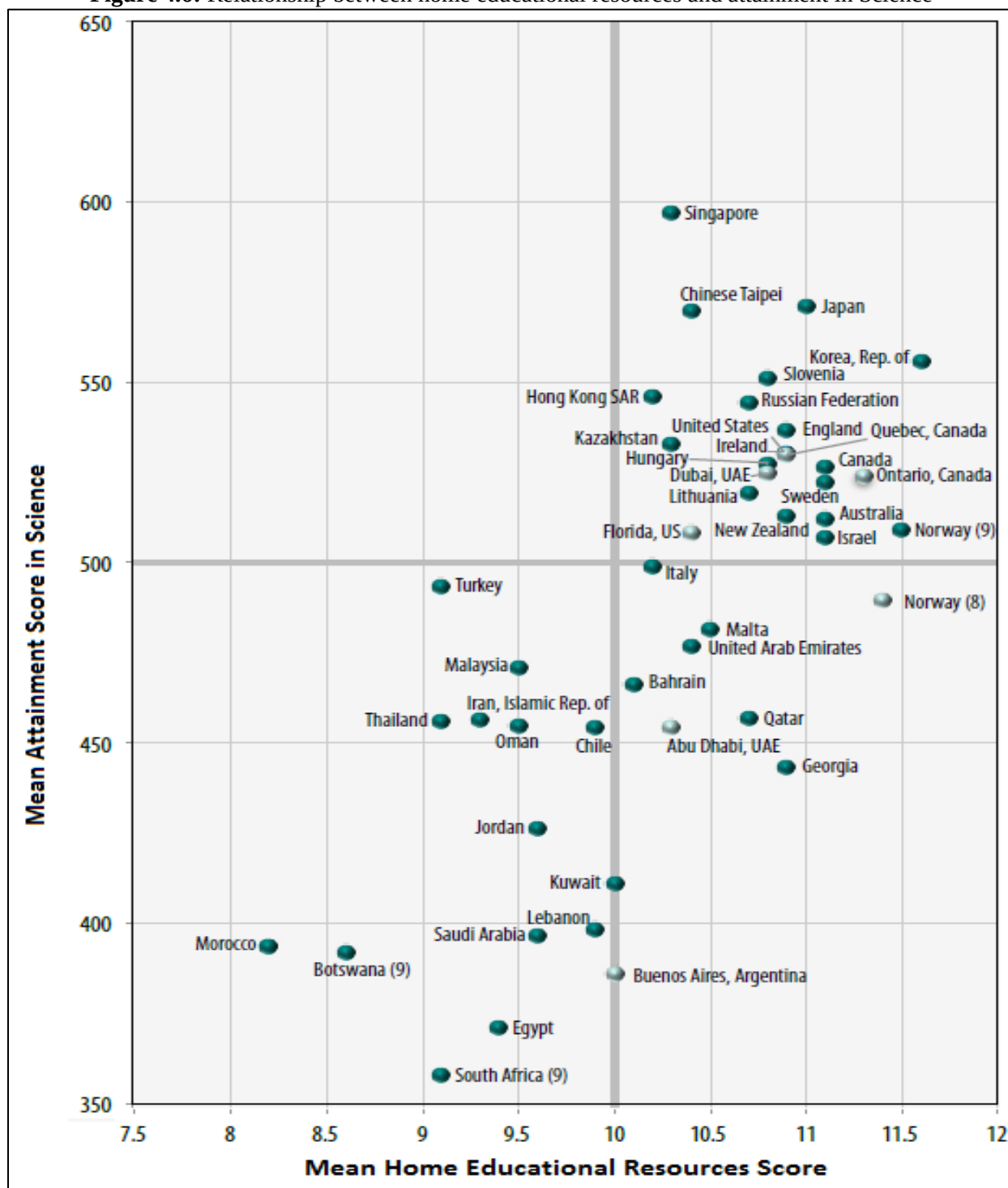
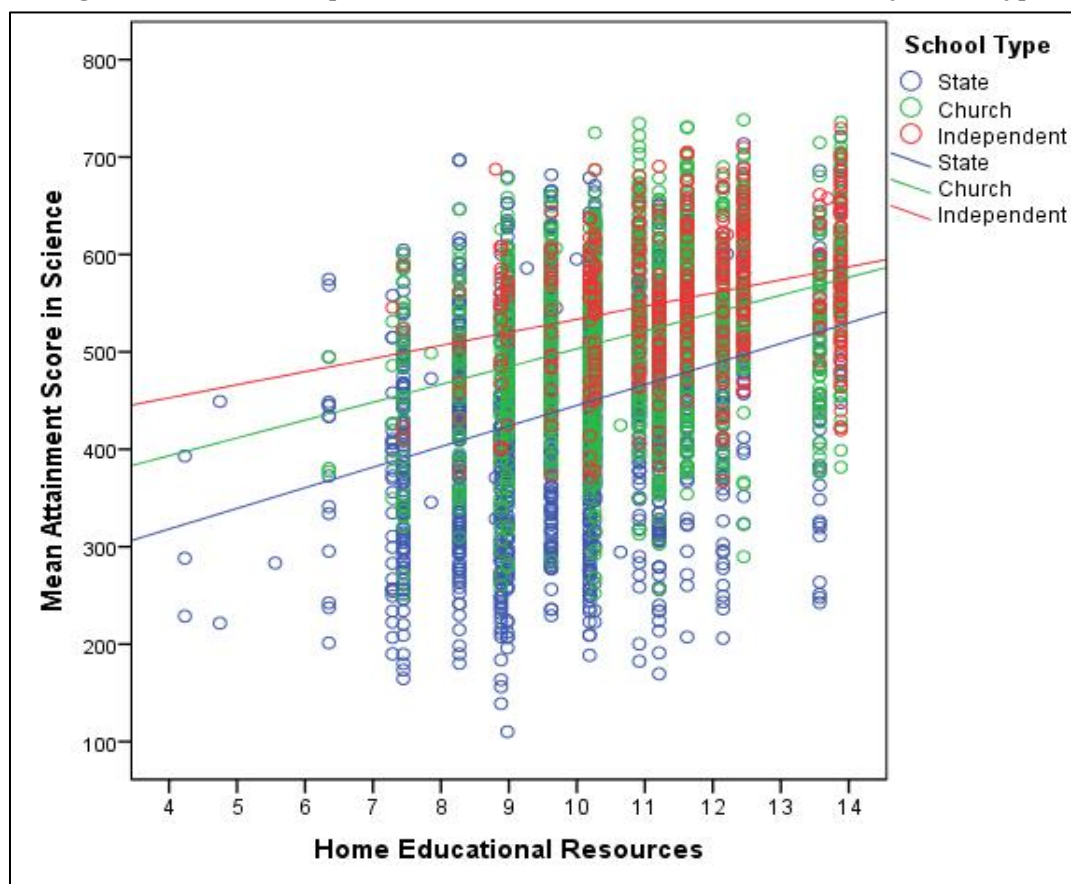
Figure 4.6: Relationship between home educational resources and attainment in Science

Figure 4.6 shows a strong positive relationship between the home resources scale scores for learning and the science attainment score when students are clustered by country. Table 4.5 and Figure 4.7 display the same positive relationship when Maltese students are clustered by school type.

Table 4.5: Mean home educational resources and mean science scores by school type

School Type	Mean Home Resources Score	Mean Science Score
State	10.0	443.7
Church	10.9	518.3
Independent	11.5	553.5

Figure 4.7: Relationship between home resources and Science scores by school type

4.3 Students speaking the language of the test at home

For most participating countries the language used in the TIMSS mathematics and science tests was the same as their native language. For a few countries, including Malta, the language used in the mathematics and science tests was the same as that used at school (English) and not their home language. Table 4.6 shows that 9.8% of Maltese students always speak English at home, 15.5% almost always, 54.6% sometimes and 19.9% never speak English at home. Moreover, there is a significantly larger proportion of students attending independent schools (65.7%) who always or almost always speak English at home compared to students attending church schools (22.0%) and state schools (19.5%). Conversely, there is a larger proportion of students attending state schools who never speak English at home (23.5%) compared to students attending church schools (18.2%) and independent schools (8.9%).

Table 4.6: Percentage of Maltese students speaking English at home by school type

			School Type			Total
			State	Church	Independent	
How often do you speak the language of the test (English) at home?	Always	Count	119	105	148	372
		Percentage	6.1%	7.4%	36.7%	9.8%
	Almost always	Count	263	207	117	587
		Percentage	13.4%	14.6%	29.0%	15.5%
	Sometimes	Count	1121	851	102	2074
		Percentage	57.1%	59.9%	25.3%	54.8%
	Never	Count	461	258	36	755
		Percentage	23.5%	18.2%	8.9%	19.9%

Figure 4.8: Percentage of Maltese students speaking English at home and attainment in Mathematics

Country	Always		Almost Always		Sometimes		Never	
	Percent of Students	Average Achievement	Percent of Students	Average Achievement	Percent of Students	Average Achievement	Percent of Students	Average Achievement
Australia	82 (1.3)	504 (2.6)	11 (0.8)	514 (5.8)	6 (0.7)	516 (9.7)	1 (0.1)	~ ~
Bahrain	55 (0.7)	444 (2.0)	19 (0.7)	479 (4.2)	21 (0.7)	464 (3.1)	5 (0.4)	437 (6.6)
Botswana (9)	5 (0.3)	383 (7.3)	8 (0.5)	424 (6.3)	79 (0.8)	392 (2.0)	9 (0.5)	361 (5.6)
Canada	66 (1.4)	524 (2.2)	21 (0.8)	536 (2.9)	10 (0.6)	534 (3.8)	3 (0.4)	547 (7.5)
Chile	87 (0.7)	430 (3.3)	8 (0.4)	439 (4.8)	3 (0.4)	367 (9.6)	1 (0.3)	~ ~
Chinese Taipei	57 (1.1)	604 (2.8)	34 (0.8)	610 (3.1)	9 (0.6)	530 (5.8)	0 (0.1)	~ ~
Egypt	64 (1.6)	388 (4.8)	13 (0.8)	414 (5.7)	19 (1.0)	398 (4.4)	4 (0.5)	375 (8.4)
England	85 (1.2)	517 (4.3)	9 (0.8)	536 (6.9)	4 (0.5)	514 (8.7)	1 (0.1)	~ ~
Georgia	84 (1.3)	453 (3.5)	11 (0.7)	478 (7.1)	5 (0.8)	414 (9.8)	1 (0.2)	~ ~
Hong Kong SAR	75 (1.7)	590 (4.2)	9 (0.5)	596 (6.9)	13 (1.4)	617 (7.4)	3 (0.4)	598 (16.1)
Hungary	87 (0.7)	512 (3.8)	11 (0.6)	535 (5.8)	1 (0.2)	~ ~	0 (0.1)	~ ~
Iran, Islamic Rep. of	51 (1.8)	445 (5.7)	16 (0.9)	467 (7.1)	20 (1.2)	412 (5.0)	13 (1.0)	401 (7.5)
Ireland	82 (0.8)	525 (2.9)	7 (0.5)	523 (4.5)	7 (0.5)	505 (6.6)	4 (0.3)	506 (9.1)
Israel	78 (1.0)	512 (4.1)	15 (0.6)	519 (6.4)	6 (0.6)	498 (11.2)	1 (0.2)	~ ~
Italy	71 (1.4)	504 (2.7)	18 (0.9)	487 (3.6)	9 (0.8)	448 (7.0)	2 (0.3)	~ ~
Japan	96 (0.3)	588 (2.3)	3 (0.3)	566 (9.8)	1 (0.1)	~ ~	0 (0.1)	~ ~
Jordan	77 (1.3)	385 (3.3)	11 (0.6)	417 (5.0)	8 (0.7)	369 (5.6)	4 (0.6)	363 (16.7)
Kazakhstan	80 (1.1)	526 (5.3)	13 (0.7)	545 (7.8)	6 (0.6)	522 (14.2)	0 (0.1)	~ ~
Korea, Rep. of	89 (0.5)	605 (2.6)	11 (0.5)	618 (4.6)	0 (0.1)	~ ~	0 (0.0)	~ ~
Kuwait	10 (1.0)	378 (8.7)	10 (0.7)	410 (12.8)	47 (1.5)	402 (5.5)	33 (1.3)	378 (5.2)
Lebanon	10 (0.8)	444 (6.8)	17 (0.7)	456 (4.8)	59 (1.2)	442 (4.3)	14 (0.9)	430 (5.7)
Lithuania	79 (0.9)	510 (3.1)	18 (0.7)	520 (4.6)	3 (0.3)	491 (8.5)	0 (0.1)	~ ~
Malaysia	34 (1.5)	491 (4.5)	22 (0.8)	472 (4.0)	38 (1.4)	443 (5.2)	6 (0.7)	437 (8.0)
Malta	10 (0.5)	511 (5.1)	15 (0.6)	507 (3.8)	55 (0.8)	493 (1.7)	20 (0.5)	479 (3.3)
Morocco	25 (1.1)	369 (3.5)	14 (0.6)	387 (3.6)	46 (1.1)	391 (2.7)	15 (0.9)	389 (3.4)
New Zealand	79 (1.4)	495 (2.9)	14 (0.9)	491 (5.6)	6 (0.6)	476 (10.5)	1 (0.1)	~ ~
Norway (9)	81 (1.2)	516 (2.1)	12 (0.7)	497 (4.8)	5 (0.6)	484 (5.8)	1 (0.2)	~ ~
Oman	49 (1.4)	403 (3.0)	18 (0.7)	413 (4.8)	27 (0.9)	403 (3.6)	7 (0.4)	389 (5.4)
Qatar	50 (0.7)	411 (3.3)	19 (0.8)	470 (4.8)	26 (0.6)	465 (5.1)	4 (0.3)	440 (8.0)
Russian Federation	83 (1.6)	539 (4.4)	12 (0.6)	544 (7.0)	5 (1.3)	512 (27.6)	1 (0.1)	~ ~
Saudi Arabia	64 (1.7)	364 (4.7)	10 (0.6)	396 (7.5)	17 (1.2)	368 (7.6)	10 (1.0)	367 (11.3)
Singapore	33 (0.7)	631 (3.2)	32 (0.7)	630 (3.2)	31 (0.6)	603 (4.3)	4 (0.2)	601 (7.7)
Slovenia	70 (1.3)	524 (2.3)	21 (1.0)	512 (3.1)	7 (0.6)	468 (5.5)	3 (0.4)	474 (9.2)
South Africa (9)	16 (1.2)	409 (7.2)	14 (0.8)	424 (6.9)	63 (1.5)	356 (4.1)	6 (0.4)	325 (5.6)
Sweden	75 (1.5)	508 (2.9)	16 (1.0)	491 (4.5)	7 (0.7)	457 (8.2)	1 (0.2)	~ ~
Thailand	64 (1.9)	441 (5.5)	15 (0.8)	436 (6.3)	19 (1.7)	397 (5.2)	2 (0.2)	~ ~
Turkey	82 (1.6)	468 (4.6)	9 (0.5)	471 (8.2)	8 (1.0)	365 (10.4)	2 (0.5)	~ ~
United Arab Emirates	43 (0.9)	443 (2.7)	21 (0.6)	505 (2.9)	31 (0.8)	473 (3.3)	5 (0.3)	449 (6.2)
United States	74 (1.1)	521 (3.0)	17 (0.6)	518 (4.7)	8 (0.5)	504 (5.5)	1 (0.1)	~ ~
International Avg.	62 (0.2)	482 (0.7)	15 (0.1)	494 (0.9)	19 (0.1)	458 (1.4)	5 (0.1)	437 (1.9)

Figure 4.9: Percentage of Maltese students speaking English at home and attainment in Science

Country	Always		Almost Always		Sometimes		Never	
	Percent of Students	Average Achievement	Percent of Students	Average Achievement	Percent of Students	Average Achievement	Percent of Students	Average Achievement
Australia	82 (1.3)	514 (2.5)	11 (0.8)	512 (4.6)	6 (0.7)	495 (9.0)	1 (0.1)	~ ~
Bahrain	55 (0.7)	456 (2.9)	19 (0.7)	506 (5.1)	21 (0.7)	465 (5.2)	5 (0.4)	434 (10.2)
Botswana (9)	5 (0.3)	386 (10.5)	8 (0.5)	433 (8.9)	79 (0.8)	395 (2.5)	9 (0.5)	338 (7.7)
Canada	66 (1.4)	529 (2.3)	21 (0.8)	529 (3.2)	10 (0.6)	516 (4.2)	3 (0.4)	522 (7.5)
Chile	87 (0.7)	457 (3.2)	8 (0.4)	467 (5.3)	3 (0.4)	391 (12.1)	1 (0.3)	~ ~
Chinese Taipei	57 (1.1)	572 (2.4)	34 (0.8)	581 (3.0)	9 (0.6)	511 (5.1)	0 (0.1)	~ ~
Egypt	64 (1.6)	368 (5.2)	13 (0.8)	388 (5.8)	19 (1.0)	375 (4.3)	4 (0.5)	348 (10.6)
England	85 (1.2)	537 (3.8)	9 (0.8)	547 (6.6)	4 (0.5)	521 (8.4)	1 (0.1)	~ ~
Georgia	84 (1.3)	444 (3.1)	11 (0.7)	468 (7.1)	5 (0.8)	395 (9.5)	1 (0.2)	~ ~
Hong Kong SAR	75 (1.7)	543 (3.5)	9 (0.5)	549 (6.3)	13 (1.4)	563 (6.3)	3 (0.4)	542 (15.3)
Hungary	87 (0.7)	526 (3.5)	11 (0.6)	545 (5.6)	1 (0.2)	~ ~	0 (0.1)	~ ~
Iran, Islamic Rep. of	51 (1.8)	467 (4.9)	16 (0.9)	486 (6.2)	20 (1.2)	429 (4.1)	13 (1.0)	421 (7.5)
Ireland	82 (0.8)	532 (3.0)	7 (0.5)	533 (4.4)	7 (0.5)	511 (7.2)	4 (0.3)	514 (9.6)
Israel	78 (1.0)	507 (3.9)	15 (0.6)	520 (6.2)	6 (0.6)	494 (10.6)	1 (0.2)	~ ~
Italy	71 (1.4)	511 (2.6)	18 (0.9)	488 (3.5)	9 (0.8)	446 (6.4)	2 (0.3)	~ ~
Japan	96 (0.3)	572 (1.8)	3 (0.3)	555 (7.2)	1 (0.1)	~ ~	0 (0.1)	~ ~
Jordan	77 (1.3)	424 (3.5)	11 (0.6)	460 (6.0)	8 (0.7)	420 (6.4)	4 (0.6)	410 (17.7)
Kazakhstan	80 (1.1)	530 (4.3)	13 (0.7)	549 (6.4)	6 (0.6)	525 (14.6)	0 (0.1)	~ ~
Korea, Rep. of	89 (0.5)	555 (2.3)	11 (0.5)	563 (4.3)	0 (0.1)	~ ~	0 (0.0)	~ ~
Kuwait	10 (1.0)	381 (11.0)	10 (0.7)	439 (14.0)	47 (1.5)	419 (6.1)	33 (1.3)	399 (5.9)
Lebanon	10 (0.8)	393 (9.1)	17 (0.7)	422 (6.6)	59 (1.2)	400 (6.3)	14 (0.9)	369 (8.9)
Lithuania	79 (0.9)	519 (3.2)	18 (0.7)	523 (4.1)	3 (0.3)	487 (9.2)	0 (0.1)	~ ~
Malaysia	34 (1.5)	510 (4.3)	22 (0.8)	482 (4.2)	38 (1.4)	443 (5.3)	6 (0.7)	385 (10.6)
Malta	10 (0.5)	521 (6.3)	15 (0.6)	512 (3.8)	55 (0.8)	477 (2.3)	20 (0.5)	454 (4.1)
Morocco	25 (1.1)	377 (3.2)	14 (0.6)	395 (3.7)	46 (1.1)	402 (3.1)	15 (0.9)	394 (3.3)
New Zealand	79 (1.4)	517 (2.7)	14 (0.9)	507 (5.8)	6 (0.6)	480 (10.6)	1 (0.1)	~ ~
Norway (9)	81 (1.2)	516 (2.5)	12 (0.7)	492 (5.6)	5 (0.6)	457 (6.7)	1 (0.2)	~ ~
Oman	49 (1.4)	458 (3.2)	18 (0.7)	461 (4.4)	27 (0.9)	451 (4.1)	7 (0.4)	439 (5.7)
Qatar	50 (0.7)	434 (3.7)	19 (0.8)	495 (4.4)	26 (0.6)	476 (4.9)	4 (0.3)	446 (9.4)
Russian Federation	83 (1.6)	546 (3.8)	12 (0.6)	549 (6.8)	5 (1.3)	509 (24.1)	1 (0.1)	~ ~
Saudi Arabia	64 (1.7)	392 (5.0)	10 (0.6)	426 (7.8)	17 (1.2)	403 (7.8)	10 (1.0)	389 (11.4)
Singapore	33 (0.7)	611 (3.0)	32 (0.7)	610 (3.3)	31 (0.6)	573 (4.3)	4 (0.2)	558 (8.6)
Slovenia	70 (1.3)	561 (2.5)	21 (1.0)	544 (3.8)	7 (0.6)	491 (6.3)	3 (0.4)	504 (11.1)
South Africa (9)	16 (1.2)	417 (8.5)	14 (0.8)	421 (8.2)	63 (1.5)	335 (4.9)	6 (0.4)	295 (6.9)
Sweden	75 (1.5)	534 (3.3)	16 (1.0)	510 (5.8)	7 (0.7)	445 (9.9)	1 (0.2)	~ ~
Thailand	64 (1.9)	465 (4.7)	15 (0.8)	462 (5.4)	19 (1.7)	423 (4.9)	2 (0.2)	~ ~
Turkey	82 (1.6)	504 (3.9)	9 (0.5)	503 (7.2)	8 (1.0)	407 (8.8)	2 (0.5)	~ ~
United Arab Emirates	43 (0.9)	454 (2.9)	21 (0.6)	524 (2.7)	31 (0.8)	483 (3.7)	5 (0.3)	453 (7.0)
United States	74 (1.1)	535 (2.8)	17 (0.6)	524 (4.2)	8 (0.5)	503 (5.2)	1 (0.1)	~ ~
International Avg.	62 (0.2)	489 (0.7)	15 (0.1)	499 (1.0)	19 (0.1)	459 (1.3)	5 (0.1)	431 (2.1)

Figures 4.8 and 4.9 clearly show that students who regularly speak the language of tests at home are more likely to attain better results in Mathematics and Science. Maltese students who always, almost always, sometimes and never speak English at home are scoring, on average, 511, 507, 493 and 479 in Mathematics and 521, 512, 477 and 454 in Science respectively.

5

School Conditions and Resources

5.1 Introduction

There are a number of factors that affect the teachers' curriculum delivery at school and the way students respond to what is being taught to them. This chapter will describe the school level contexts in which children learn mathematics and science both locally and internationally using the information provided by heads of school and partly by teachers. This chapter analyzes the school composition by student economic background and the prevalence of English-speaking students in Maltese schools and how these factors affect attainment in mathematics and science. This chapter also investigates how instruction is affected by resource shortages and problems with school conditions and resources. Comparisons are carried between school types for the Maltese sample and between countries for the whole sample.

5.2 School Composition by Student Economic Background

Schools where more than 25% of students come from economically affluent homes and not more than 25% of students come from economically disadvantaged homes are labelled as 'More Affluent'. School where more than 25% of students come from economically disadvantaged homes and not more than 25% of students come from economically affluent homes are labelled as 'More Disadvantaged'. All other possible response combinations are 'Neither more affluent nor more disadvantaged'.

Table 5.1: Maltese School Composition by Student Economic Background

Approximately what percentages of students in your school have the following background?	0-10%	11-25%	26-50%	51-100%
Come from economically disadvantaged homes	72.3%	21.3%	6.4%	0.0%
Come from economically affluent homes	42.6%	21.3%	8.5%	27.7%

Table 5.1 shows that 72.3% of Maltese schools have less than 10% of students coming from economically disadvantaged homes; whereas, 27.7% of Maltese schools have more than 50% of students coming from economically affluent homes. Combining the two variables together, 32% of Maltese students are categorised as coming from economically affluent homes which is marginally

higher than the international average (31%). On the other hand, the proportion of Maltese students categorised as coming from economically disadvantaged homes (5%) is significantly lower than the international average (36%).

Figure 5.1: Relation between Students' Economic Status and Attainment in Mathematics

Country	More Affluent		Neither More Affluent Nor More Disadvantaged		More Disadvantaged	
	Percent of Students	Average Achievement	Percent of Students	Average Achievement	Percent of Students	Average Achievement
Australia	30 (3.6)	545 (4.8)	39 (4.1)	504 (4.2)	30 (3.6)	474 (6.3)
Bahrain	31 (0.3)	480 (3.6)	47 (0.3)	445 (2.1)	22 (0.2)	446 (3.3)
Botswana (9)	10 (2.7)	432 (7.1)	25 (4.6)	401 (5.1)	65 (4.8)	381 (3.2)
Canada	43 (3.9)	541 (3.0)	32 (3.6)	524 (4.3)	25 (3.1)	512 (4.9)
Chile	14 (2.5)	490 (9.4)	18 (4.0)	457 (12.0)	68 (4.0)	409 (5.1)
Chinese Taipei	18 (2.6)	630 (10.0)	69 (3.3)	601 (2.9)	13 (2.3)	549 (5.9)
Egypt	18 (3.3)	409 (11.7)	32 (3.9)	400 (7.9)	49 (4.1)	379 (6.5)
England	33 (3.6)	576 (7.4)	38 (4.4)	515 (7.8)	29 (3.8)	487 (7.8)
Georgia	20 (3.4)	470 (7.7)	29 (4.5)	453 (6.7)	51 (4.5)	445 (5.6)
Hong Kong SAR	19 (3.2)	630 (8.7)	35 (4.1)	604 (8.0)	46 (4.2)	562 (6.6)
Hungary	23 (3.3)	562 (7.2)	36 (4.3)	530 (6.3)	41 (3.9)	470 (6.4)
Iran, Islamic Rep. of	22 (2.7)	483 (10.0)	23 (2.9)	461 (8.9)	55 (2.6)	409 (4.4)
Ireland	27 (4.1)	546 (4.4)	39 (4.6)	533 (3.3)	34 (4.0)	500 (4.6)
Israel	24 (3.3)	560 (8.4)	34 (3.4)	529 (6.5)	43 (3.2)	471 (8.0)
Italy	36 (4.0)	502 (6.2)	46 (4.7)	496 (4.5)	18 (3.9)	475 (7.9)
Japan	44 (3.6)	604 (4.2)	46 (3.9)	577 (3.2)	10 (2.5)	558 (6.0)
Jordan	15 (2.5)	414 (9.8)	21 (3.4)	401 (8.2)	65 (3.8)	370 (4.6)
Kazakhstan	65 (3.8)	536 (7.4)	29 (3.6)	519 (8.3)	5 (1.8)	504 (30.8)
Korea, Rep. of	14 (2.8)	643 (6.7)	56 (4.4)	607 (3.2)	30 (3.7)	587 (3.4)
Kuwait	17 (3.2)	433 (21.8)	38 (3.8)	386 (6.8)	45 (4.6)	383 (6.6)
Lebanon	19 (3.9)	452 (11.9)	29 (4.1)	470 (6.9)	53 (4.5)	426 (6.3)
Lithuania	50 (3.6)	528 (4.2)	34 (3.6)	499 (4.4)	15 (2.9)	484 (6.4)
Malaysia	6 (1.2)	546 (8.4)	26 (3.5)	478 (9.4)	68 (3.4)	451 (4.3)
Malta	32 (0.1)	508 (1.8)	64 (0.1)	489 (1.4)	5 (0.1)	432 (4.1)
Morocco	7 (1.6)	438 (12.2)	12 (2.2)	395 (11.0)	81 (2.4)	377 (2.4)
New Zealand	30 (4.7)	529 (5.0)	42 (4.9)	493 (4.6)	28 (2.3)	449 (5.8)
Norway (9)	57 (4.5)	519 (3.2)	35 (4.1)	504 (3.5)	8 (2.2)	493 (4.1)
Oman	37 (3.3)	421 (4.6)	37 (3.8)	398 (4.0)	26 (3.5)	387 (7.0)
Qatar	76 (0.7)	444 (3.8)	14 (0.3)	402 (4.2)	10 (0.7)	440 (10.8)
Russian Federation	68 (3.7)	541 (5.5)	22 (3.4)	531 (6.3)	10 (2.3)	537 (14.7)
Saudi Arabia	38 (4.4)	380 (6.2)	46 (5.2)	355 (5.9)	16 (3.6)	349 (11.3)
Singapore	33 (0.0)	657 (4.6)	53 (0.0)	617 (4.7)	14 (0.0)	551 (8.7)
Slovenia	38 (3.9)	523 (2.7)	43 (4.2)	518 (3.9)	19 (3.2)	500 (3.7)
South Africa (9)	8 (2.1)	487 (13.1)	13 (3.0)	437 (20.5)	79 (3.3)	353 (4.6)
Sweden	64 (4.6)	512 (3.3)	27 (4.6)	492 (5.8)	9 (2.8)	449 (9.8)
Thailand	16 (2.9)	489 (16.7)	21 (3.2)	436 (11.6)	63 (3.8)	412 (5.6)
Turkey	23 (3.5)	501 (13.9)	24 (3.0)	477 (8.2)	53 (3.9)	433 (4.4)
United Arab Emirates	50 (2.0)	482 (4.3)	19 (1.7)	472 (6.6)	31 (1.5)	437 (4.0)
United States	20 (2.5)	561 (6.2)	24 (3.2)	534 (5.2)	56 (3.4)	497 (4.1)
International Avg.	31 (0.5)	513 (1.4)	34 (0.6)	486 (1.2)	36 (0.5)	457 (1.3)

Figures 5.1 and 5.2 clearly show that attainment in Mathematics and Science is positively related to students' economic status. This implies that students who come from economically affluent backgrounds perform better in Mathematics and Science subjects than those who come from more disadvantaged backgrounds. Maltese students who come from economically affluent, neither more affluent nor more disadvantaged and disadvantaged backgrounds are scoring, on average, 508, 489 and 432 in Mathematics and 498, 477 and 406 in Science respectively.

Figure 5.2: Relation between Students' Economic Status and Attainment in Science

Country	More Affluent		Neither More Affluent Nor More Disadvantaged		More Disadvantaged	
	Percent of Students	Average Achievement	Percent of Students	Average Achievement	Percent of Students	Average Achievement
Australia	30 (3.6)	548 (3.6)	39 (4.1)	512 (4.0)	30 (3.6)	481 (5.4)
Bahrain	31 (0.3)	493 (5.4)	47 (0.3)	454 (2.9)	22 (0.2)	460 (4.5)
Botswana (9)	10 (2.7)	444 (8.7)	25 (4.6)	403 (7.0)	65 (4.8)	380 (4.1)
Canada	43 (3.9)	539 (2.9)	32 (3.6)	528 (3.7)	25 (3.1)	507 (3.8)
Chile	14 (2.5)	514 (10.1)	18 (4.0)	485 (11.0)	68 (4.0)	437 (5.0)
Chinese Taipei	18 (2.6)	595 (8.6)	69 (3.3)	570 (2.4)	13 (2.3)	530 (4.9)
Egypt	18 (3.3)	391 (12.3)	32 (3.9)	379 (8.4)	49 (4.1)	357 (7.3)
England	33 (3.6)	592 (6.5)	38 (4.4)	533 (7.1)	29 (3.8)	506 (7.9)
Georgia	20 (3.4)	457 (7.3)	29 (4.5)	445 (6.3)	51 (4.5)	435 (4.9)
Hong Kong SAR	19 (3.2)	579 (8.1)	35 (4.1)	552 (6.9)	46 (4.2)	520 (5.5)
Hungary	23 (3.3)	569 (6.1)	36 (4.3)	541 (5.2)	41 (3.9)	489 (6.2)
Iran, Islamic Rep. of	22 (2.7)	499 (8.8)	23 (2.9)	479 (7.4)	55 (2.6)	432 (4.0)
Ireland	27 (4.1)	551 (4.4)	39 (4.6)	540 (3.3)	34 (4.0)	507 (5.2)
Israel	24 (3.3)	557 (7.8)	34 (3.4)	523 (6.1)	43 (3.2)	468 (7.7)
Italy	36 (4.0)	505 (6.1)	46 (4.7)	502 (4.5)	18 (3.9)	482 (7.4)
Japan	44 (3.6)	581 (3.0)	46 (3.9)	567 (2.3)	10 (2.5)	549 (6.1)
Jordan	15 (2.5)	459 (9.5)	21 (3.4)	440 (7.8)	65 (3.8)	408 (4.6)
Kazakhstan	65 (3.8)	537 (6.4)	29 (3.6)	529 (8.7)	5 (1.8)	520 (28.7)
Korea, Rep. of	14 (2.8)	584 (6.0)	56 (4.4)	557 (2.9)	30 (3.7)	541 (2.5)
Kuwait	17 (3.2)	454 (25.7)	38 (3.8)	404 (8.9)	45 (4.6)	405 (7.7)
Lebanon	19 (3.9)	405 (16.6)	29 (4.1)	439 (9.6)	53 (4.5)	375 (8.6)
Lithuania	50 (3.6)	535 (4.2)	34 (3.6)	506 (4.7)	15 (2.9)	495 (7.2)
Malaysia	6 (1.2)	552 (6.7)	26 (3.5)	479 (11.3)	68 (3.4)	458 (5.1)
Malta	32 (0.1)	498 (2.6)	64 (0.1)	477 (2.0)	5 (0.1)	406 (4.4)
Morocco	7 (1.6)	445 (12.0)	12 (2.2)	404 (10.2)	81 (2.4)	386 (2.8)
New Zealand	30 (4.7)	550 (3.7)	42 (4.9)	514 (4.8)	28 (2.3)	467 (6.1)
Norway (9)	57 (4.5)	519 (3.7)	35 (4.1)	501 (4.1)	8 (2.2)	479 (6.1)
Oman	37 (3.3)	471 (4.1)	37 (3.8)	452 (4.6)	26 (3.5)	439 (7.9)
Qatar	76 (0.7)	463 (4.2)	14 (0.3)	418 (4.7)	10 (0.7)	466 (9.1)
Russian Federation	68 (3.7)	547 (5.1)	22 (3.4)	541 (6.1)	10 (2.3)	533 (11.7)
Saudi Arabia	38 (4.4)	420 (7.2)	46 (5.2)	380 (6.8)	16 (3.6)	372 (15.9)
Singapore	33 (0.0)	635 (4.7)	53 (0.0)	592 (4.7)	14 (0.0)	524 (8.9)
Slovenia	38 (3.9)	558 (3.3)	43 (4.2)	553 (4.2)	19 (3.2)	535 (4.0)
South Africa (9)	8 (2.1)	500 (14.9)	13 (3.0)	436 (24.7)	79 (3.3)	335 (5.7)
Sweden	64 (4.6)	537 (3.9)	27 (4.6)	512 (6.3)	9 (2.8)	453 (14.1)
Thailand	16 (2.9)	504 (13.5)	21 (3.2)	462 (10.6)	63 (3.8)	438 (5.3)
Turkey	23 (3.5)	528 (12.3)	24 (3.0)	510 (7.1)	53 (3.9)	473 (3.8)
United Arab Emirates	50 (2.0)	496 (4.4)	19 (1.7)	480 (5.8)	31 (1.5)	447 (4.5)
United States	20 (2.5)	570 (5.3)	24 (3.2)	545 (4.5)	56 (3.4)	510 (4.0)
International Avg.	31 (0.5)	517 (1.4)	34 (0.6)	491 (1.2)	36 (0.5)	462 (1.3)

Table 5.2: Student economic background by school type

			School Type			Total
			State	Church	Independent	
School Composition by Student Background	More Affluent	Count	3	5	7	15
		Percentage	15.8%	25.0%	87.5%	31.9%
	Neither More Affluent nor More Disadvantaged	Count	14	15	1	30
		Percentage	73.7%	75.0%	12.5%	63.8%
	More Disadvantaged	Count	2	0	0	2
		Percentage	10.5%	0.0%	0.0%	4.3%

Table 5.2 clearly shows that the proportion of students coming from economically affluent backgrounds and attend independent schools (87.5%) is significantly larger than those attending church (25.0%) and state schools (15.8%). International research has shown that economical affluence is a major predictor of students' success in Mathematics and Science subjects and this may be one of the reasons why students attending independent schools tend to perform better in these subjects than other students.

5.3 Schools with students having test language as native language

Figure 5.3: Relation between test language spoken at school and attainment in Mathematics

Country	More than 90% of Students		51-90% of Students		50% or Less of Students	
	Percent of Students	Average Achievement	Percent of Students	Average Achievement	Percent of Students	Average Achievement
Australia	62 (4.0)	506 (3.8)	27 (3.5)	513 (8.1)	11 (2.1)	497 (12.7)
Bahrain	74 (0.2)	442 (1.7)	8 (0.1)	484 (6.9)	18 (0.2)	491 (3.5)
Botswana (9)	6 (1.9)	379 (12.1)	2 (1.2)	~ ~	93 (2.3)	391 (2.3)
Canada	43 (2.9)	530 (3.2)	40 (3.1)	526 (3.6)	18 (2.6)	529 (6.5)
Chile	100 (0.3)	428 (3.7)	0 (0.3)	~ ~	0 (0.0)	~ ~
Chinese Taipei	66 (3.5)	610 (3.6)	28 (3.5)	583 (5.5)	5 (1.3)	546 (7.6)
Egypt	99 (0.7)	392 (4.2)	1 (0.7)	~ ~	0 (0.0)	~ ~
England	66 (4.4)	523 (6.9)	24 (3.9)	544 (11.2)	10 (2.7)	515 (18.2)
Georgia	89 (2.7)	455 (3.7)	10 (2.8)	442 (12.4)	1 (0.7)	~ ~
Hong Kong SAR	48 (4.7)	579 (6.3)	6 (2.1)	573 (23.8)	46 (5.0)	607 (7.2)
Hungary	100 (0.0)	513 (3.9)	0 (0.0)	~ ~	0 (0.0)	~ ~
Iran, Islamic Rep. of	50 (2.9)	459 (6.9)	11 (2.3)	439 (11.3)	40 (3.1)	408 (5.4)
Ireland	70 (4.1)	528 (3.0)	26 (3.8)	509 (8.4)	4 (1.7)	525 (10.2)
Israel	66 (3.0)	514 (5.6)	28 (3.2)	506 (7.4)	7 (1.9)	509 (20.9)
Italy	63 (3.8)	489 (3.4)	36 (3.8)	502 (4.7)	1 (0.9)	~ ~
Japan	99 (0.9)	587 (2.3)	1 (0.6)	~ ~	1 (0.7)	~ ~
Jordan	99 (0.5)	385 (3.2)	0 (0.4)	~ ~	0 (0.3)	~ ~
Kazakhstan	55 (3.1)	521 (7.4)	26 (3.4)	539 (11.7)	20 (2.9)	534 (12.9)
Korea, Rep. of	100 (0.0)	606 (2.6)	0 (0.0)	~ ~	0 (0.0)	~ ~
Kuwait	84 (2.5)	384 (4.7)	4 (1.5)	345 (13.4)	11 (2.0)	461 (26.6)
Lebanon	4 (1.6)	423 (22.4)	9 (2.6)	465 (14.9)	87 (3.1)	442 (3.9)
Lithuania	88 (2.6)	510 (3.2)	10 (2.4)	519 (8.4)	2 (0.9)	~ ~
Malaysia	48 (3.9)	469 (5.5)	24 (3.8)	460 (6.8)	28 (4.1)	464 (8.6)
Malta	4 (0.0)	527 (6.2)	6 (0.1)	550 (3.2)	90 (0.1)	487 (1.1)
Morocco	74 (2.8)	385 (2.6)	10 (2.0)	387 (7.3)	16 (2.1)	383 (5.6)
New Zealand	68 (4.2)	496 (4.0)	29 (4.1)	485 (8.6)	3 (1.7)	449 (36.6)
Norway (9)	77 (3.4)	515 (2.7)	19 (2.8)	504 (3.7)	4 (1.8)	492 (4.5)
Oman	86 (1.9)	398 (2.6)	3 (1.3)	390 (11.7)	11 (1.2)	446 (9.5)
Qatar	51 (0.7)	393 (3.5)	9 (0.3)	478 (6.2)	40 (0.7)	485 (5.0)
Russian Federation	80 (2.6)	538 (4.6)	15 (2.4)	546 (7.5)	5 (1.7)	522 (34.5)
Saudi Arabia	93 (2.4)	369 (4.9)	3 (1.3)	359 (19.0)	4 (2.0)	353 (8.9)
Singapore	0 (0.0)	~ ~	0 (0.0)	~ ~	100 (0.0)	621 (3.2)
Slovenia	71 (3.6)	519 (2.8)	27 (3.6)	514 (4.5)	2 (1.0)	~ ~
South Africa (9)	12 (2.3)	421 (14.5)	8 (1.7)	448 (17.7)	80 (2.7)	361 (5.5)
Sweden	47 (4.4)	509 (4.3)	43 (4.5)	499 (3.9)	10 (2.4)	469 (11.7)
Thailand	86 (2.8)	436 (5.2)	7 (2.2)	391 (12.7)	7 (1.8)	411 (14.9)
Turkey	80 (2.5)	470 (5.1)	7 (1.6)	447 (17.0)	12 (2.1)	383 (11.1)
United Arab Emirates	48 (1.2)	426 (3.3)	5 (0.9)	522 (8.7)	47 (1.4)	495 (3.7)
United States	58 (2.8)	533 (3.8)	28 (2.8)	503 (5.8)	14 (2.5)	493 (8.9)
International Avg.	64 (0.4)	478 (1.0)	14 (0.4)	483 (1.9)	22 (0.3)	475 (2.6)

Figures 5.3 and 5.4 show that 4% of Maltese schools have more than 90% English-speaking students; 6% of the schools have between 51% and 90%, while 90% of the schools have less than 50% English-speaking students. There exists a relationship between the prevalence of students speaking the language of the test and attainment in Mathematics and Science, both internationally and locally. In Malta, students attending schools having more than 50% English-speaking students scored higher in both the Mathematics (550) and Science (558) tests than their counterparts attending schools with lower proportions of English-speaking students (487 in Mathematics and 473 in Science). An explanation of this fact is that in Malta questions in Mathematics and Science examination papers are provided in English and students who are not fluent in English are less likely to understand the questions and answer them correctly.

Figure 5.4: Relation between test language spoken at school and attainment in Science

Country	More than 90% of Students		51-90% of Students		50% or Less of Students	
	Percent of Students	Average Achievement	Percent of Students	Average Achievement	Percent of Students	Average Achievement
Australia	62 (4.0)	515 (3.5)	27 (3.5)	517 (7.1)	11 (2.1)	493 (10.3)
Bahrain	74 (0.2)	455 (2.7)	8 (0.1)	504 (8.4)	18 (0.2)	496 (5.3)
Botswana (9)	6 (1.9)	382 (15.2)	2 (1.2)	~ ~	93 (2.3)	392 (3.1)
Canada	43 (2.9)	535 (3.1)	40 (3.1)	524 (3.3)	18 (2.6)	517 (5.6)
Chile	100 (0.3)	455 (3.5)	0 (0.3)	~ ~	0 (0.0)	~ ~
Chinese Taipei	66 (3.5)	579 (2.9)	28 (3.5)	555 (4.6)	5 (1.3)	527 (5.2)
Egypt	99 (0.7)	371 (4.4)	1 (0.7)	~ ~	0 (0.0)	~ ~
England	66 (4.4)	543 (6.3)	24 (3.9)	555 (10.2)	10 (2.7)	522 (16.6)
Georgia	89 (2.7)	445 (3.4)	10 (2.8)	433 (12.8)	1 (0.7)	~ ~
Hong Kong SAR	48 (4.7)	532 (5.2)	6 (2.1)	540 (22.2)	46 (5.0)	556 (6.2)
Hungary	100 (0.0)	526 (3.5)	0 (0.0)	~ ~	0 (0.0)	~ ~
Iran, Islamic Rep. of	50 (2.9)	478 (6.0)	11 (2.3)	460 (10.6)	40 (3.1)	428 (4.9)
Ireland	70 (4.1)	534 (3.2)	26 (3.8)	517 (9.1)	4 (1.7)	534 (9.7)
Israel	66 (3.0)	510 (5.3)	28 (3.2)	502 (7.4)	7 (1.9)	504 (19.9)
Italy	63 (3.8)	494 (3.4)	36 (3.8)	506 (4.6)	1 (0.9)	~ ~
Japan	99 (0.9)	571 (1.8)	1 (0.6)	~ ~	1 (0.7)	~ ~
Jordan	99 (0.5)	426 (3.4)	0 (0.4)	~ ~	0 (0.3)	~ ~
Kazakhstan	55 (3.1)	517 (6.0)	26 (3.4)	548 (10.2)	20 (2.9)	555 (13.0)
Korea, Rep. of	100 (0.0)	556 (2.2)	0 (0.0)	~ ~	0 (0.0)	~ ~
Kuwait	84 (2.5)	403 (5.4)	4 (1.5)	343 (21.5)	11 (2.0)	482 (27.4)
Lebanon	4 (1.6)	377 (32.3)	9 (2.6)	425 (19.7)	87 (3.1)	398 (5.9)
Lithuania	88 (2.6)	518 (3.1)	10 (2.4)	526 (10.5)	2 (0.9)	~ ~
Malaysia	48 (3.9)	485 (5.6)	24 (3.8)	466 (7.9)	28 (4.1)	451 (10.4)
Malta	4 (0.0)	522 (8.8)	6 (0.1)	558 (6.2)	90 (0.1)	473 (1.8)
Morocco	74 (2.8)	393 (2.9)	10 (2.0)	395 (7.4)	16 (2.1)	394 (5.1)
New Zealand	68 (4.2)	517 (3.7)	29 (4.1)	504 (8.3)	3 (1.7)	459 (32.2)
Norway (9)	77 (3.4)	514 (3.2)	19 (2.8)	500 (3.9)	4 (1.8)	476 (9.2)
Oman	86 (1.9)	452 (3.0)	3 (1.3)	445 (14.3)	11 (1.2)	476 (8.7)
Qatar	51 (0.7)	412 (4.2)	9 (0.3)	495 (6.3)	40 (0.7)	505 (4.7)
Russian Federation	80 (2.6)	545 (4.0)	15 (2.4)	551 (6.8)	5 (1.7)	516 (32.1)
Saudi Arabia	93 (2.4)	397 (4.8)	3 (1.3)	384 (23.1)	4 (2.0)	394 (11.8)
Singapore	0 (0.0)	~ ~	0 (0.0)	~ ~	100 (0.0)	597 (3.2)
Slovenia	71 (3.6)	555 (3.0)	27 (3.6)	545 (4.9)	2 (1.0)	~ ~
South Africa (9)	12 (2.3)	423 (17.6)	8 (1.7)	462 (20.6)	80 (2.7)	342 (6.7)
Sweden	47 (4.4)	534 (4.9)	43 (4.5)	520 (4.4)	10 (2.4)	481 (16.8)
Thailand	86 (2.8)	460 (4.6)	7 (2.2)	420 (11.2)	7 (1.8)	436 (13.3)
Turkey	80 (2.5)	505 (4.5)	7 (1.6)	487 (13.0)	12 (2.1)	419 (9.9)
United Arab Emirates	48 (1.2)	436 (3.5)	5 (0.9)	531 (9.6)	47 (1.4)	508 (3.9)
United States	58 (2.8)	546 (3.2)	28 (2.8)	514 (5.7)	14 (2.5)	504 (8.7)
International Avg.	64 (0.4)	485 (1.2)	14 (0.4)	491 (2.1)	22 (0.3)	477 (2.5)

5.4 Effect on learning Mathematics caused by resource shortages

A scale score for resource shortage in Mathematics was generated by using the heads of school responses concerning school and classroom resources that are displayed in tables 5.3 and 5.4.

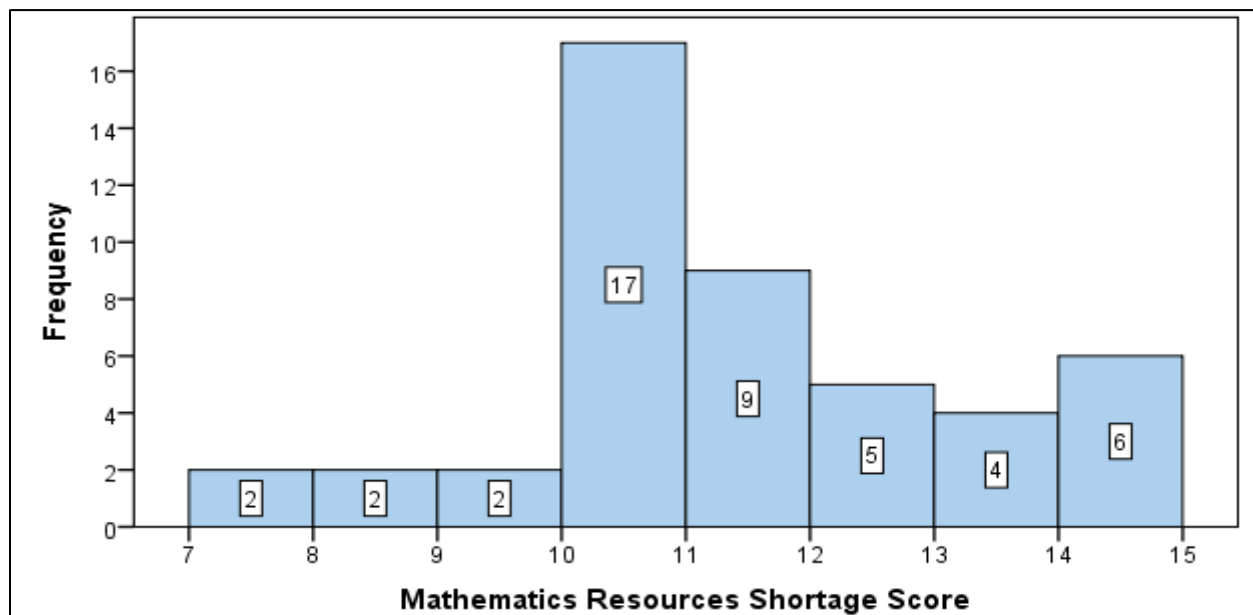
Table 5.3: General Resources in Maltese schools

How much is your school affected by a shortage or inadequacy of general school resources?	Not at all	A little	Some	A lot
Instructional materials (e.g., textbooks)	80.9%	8.5%	4.3%	6.4%
Supplies (e.g., papers, pencils, materials)	87.2%	8.5%	2.1%	2.1%
School buildings and grounds	42.6%	36.2%	8.5%	12.8%
Heating/cooling and lighting systems	51.1%	31.9%	14.9%	2.1%
Instructional space (e.g., classrooms)	42.6%	34.0%	14.9%	8.5%
Technologically competent staff	51.1%	31.9%	10.6%	6.4%
Audio-visual resources for delivery of instruction	78.3%	15.2%	2.2%	4.3%
Computer technology for teaching and learning	55.3%	23.4%	17.0%	4.3%
Resources for students with disabilities	29.8%	44.7%	14.9%	10.6%

Table 5.4: Resource shortages for Mathematics Instruction in Maltese schools

How much is your school affected by a shortage or inadequacy of resources for mathematics instruction?	Not at all	A little	Some	A lot
Teachers with a specialization in mathematics	83.0%	10.6%	4.3%	2.1%
Computer software / applications for mathematics instruction	48.9%	34.0%	17.0%	0.0%
Library resources relevant to mathematics instruction	46.8%	31.9%	19.1%	2.1%
Calculators for mathematics instruction	85.1%	10.6%	2.1%	2.1%
Concrete objects or materials to help students understand quantities or procedures	48.9%	34.0%	14.9%	2.1%

Figure 5.5: Mathematics resource shortages score distribution for Maltese schools



The generated mathematics resources shortage score was categorised into three levels. Scores exceeding 11.1 indicate that resource shortages do not affect instruction of mathematics. Scores between 7.5 and 11.1 indicate that resource shortages affect instruction, while scores below 7.5 indicate that shortages affect instruction considerably. Figure 5.5 display the Mathematics resource shortages score distribution for Maltese schools.

Figure 5.6: Mathematics Instruction affected by Resource Shortages

Country	Not Affected		Affected		Affected A Lot		Average Scale Score
	Percent of Students	Average Achievement	Percent of Students	Average Achievement	Percent of Students	Average Achievement	
Singapore	74 (0.0)	623 (3.9)	20 (0.0)	613 (8.2)	6 (0.0)	622 (12.6)	12.0 (0.00)
Korea, Rep. of	62 (3.8)	605 (3.3)	37 (3.9)	607 (4.0)	1 (0.7)	~ ~	11.6 (0.15)
Slovenia	56 (4.6)	517 (2.9)	44 (4.6)	516 (3.9)	0 (0.0)	~ ~	11.5 (0.12)
Malta	55 (0.2)	501 (1.3)	45 (0.2)	482 (1.5)	0 (0.0)	~ ~	11.4 (0.00)
Australia	51 (3.5)	520 (3.3)	48 (3.4)	493 (5.2)	1 (0.7)	~ ~	11.3 (0.11)
England	48 (4.6)	539 (6.2)	52 (4.6)	515 (6.9)	0 (0.0)	~ ~	11.3 (0.14)
Norway (9)	47 (4.1)	516 (3.8)	53 (4.1)	508 (2.5)	0 (0.0)	~ ~	11.1 (0.11)
Japan	46 (3.3)	593 (4.2)	53 (3.4)	580 (3.1)	1 (0.6)	~ ~	10.9 (0.10)
Hong Kong SAR	46 (4.2)	600 (7.3)	51 (4.3)	586 (6.8)	3 (1.6)	582 (14.1)	10.9 (0.16)
Qatar	45 (0.4)	455 (3.1)	34 (0.4)	421 (4.0)	20 (0.4)	424 (8.5)	10.3 (0.03)
Canada	45 (3.4)	538 (3.0)	54 (3.4)	519 (3.1)	0 (0.3)	~ ~	11.2 (0.11)
Sweden	41 (4.1)	501 (4.3)	58 (4.0)	500 (4.0)	1 (0.9)	~ ~	10.9 (0.10)
New Zealand	39 (5.0)	500 (6.0)	61 (5.0)	486 (4.1)	0 (0.0)	~ ~	10.9 (0.15)
United States	37 (3.1)	532 (5.9)	61 (3.1)	512 (3.7)	3 (0.9)	494 (9.0)	10.8 (0.12)
Kazakhstan	32 (4.0)	524 (9.7)	63 (3.8)	533 (6.8)	5 (1.7)	498 (28.3)	10.2 (0.18)
United Arab Emirates	31 (2.2)	508 (4.8)	53 (2.3)	441 (3.9)	16 (1.7)	456 (7.2)	9.9 (0.12)
Georgia	29 (3.3)	449 (5.9)	70 (3.3)	454 (4.5)	1 (0.8)	~ ~	10.5 (0.10)
Chinese Taipei	29 (3.5)	613 (6.6)	71 (3.5)	594 (3.3)	1 (0.5)	~ ~	10.6 (0.11)
Chile	27 (3.5)	453 (6.7)	70 (3.8)	419 (4.9)	3 (1.6)	413 (19.4)	10.2 (0.13)
Ireland	27 (3.5)	526 (7.3)	71 (3.8)	522 (3.3)	2 (1.5)	~ ~	10.4 (0.12)
Lithuania	23 (3.9)	519 (8.0)	74 (3.8)	509 (3.0)	2 (1.5)	~ ~	10.2 (0.13)
Russian Federation	19 (2.8)	550 (8.9)	80 (2.9)	536 (5.1)	1 (0.5)	~ ~	10.2 (0.09)
Hungary	17 (3.5)	526 (13.9)	80 (3.7)	510 (4.0)	2 (1.3)	~ ~	9.8 (0.11)
Kuwait	16 (3.4)	443 (22.9)	63 (3.2)	380 (4.4)	21 (3.6)	388 (9.4)	9.1 (0.20)
Israel	16 (2.7)	559 (8.9)	76 (3.2)	508 (4.8)	8 (1.9)	431 (18.4)	9.6 (0.11)
Bahrain	16 (0.2)	497 (3.8)	63 (0.3)	444 (1.8)	21 (0.2)	456 (3.3)	9.2 (0.01)
Oman	15 (2.1)	426 (7.3)	77 (2.6)	395 (2.8)	8 (1.5)	422 (10.2)	9.4 (0.10)
Lebanon	14 (2.8)	479 (9.2)	78 (3.0)	436 (4.4)	8 (1.5)	443 (9.3)	9.6 (0.14)
Saudi Arabia	13 (3.6)	365 (17.2)	74 (4.2)	363 (4.7)	13 (2.9)	396 (14.4)	9.1 (0.17)
Jordan	7 (1.5)	431 (10.9)	80 (2.9)	376 (3.4)	13 (2.8)	418 (10.9)	9.0 (0.11)
South Africa (9)	6 (1.4)	463 (19.1)	87 (2.3)	368 (4.8)	7 (2.1)	346 (8.7)	9.3 (0.09)
Italy	6 (1.9)	516 (11.2)	93 (2.0)	493 (2.8)	1 (0.8)	~ ~	9.7 (0.07)
Iran, Islamic Rep. of	6 (1.6)	511 (25.7)	82 (2.7)	432 (4.3)	12 (2.3)	428 (11.9)	9.1 (0.10)
Malaysia	6 (2.4)	431 (9.2)	70 (4.2)	465 (4.6)	24 (3.8)	474 (8.5)	8.4 (0.13)
Thailand	5 (1.7)	461 (21.2)	81 (2.8)	430 (5.0)	14 (2.7)	429 (15.7)	8.9 (0.12)
Morocco	3 (0.9)	413 (16.6)	95 (1.2)	383 (2.3)	1 (0.7)	~ ~	9.6 (0.05)
Turkey	2 (1.0)	~ ~	81 (3.0)	457 (4.7)	17 (3.1)	453 (9.9)	8.4 (0.11)
Egypt	1 (0.6)	~ ~	91 (2.0)	389 (4.4)	8 (2.0)	431 (14.5)	8.8 (0.07)
Botswana (9)	1 (0.0)	~ ~	92 (2.4)	390 (2.4)	7 (2.4)	402 (14.8)	8.7 (0.07)
International Avg.	27 (0.5)	506 (1.8)	66 (0.5)	476 (0.7)	6 (0.3)	448 (2.9)	

Singapore has the largest scale score (12.0) indicating that Mathematics instruction is the least affected by resource shortages. This is followed by Korea (11.6), Slovenia (11.5), Malta (11.4), Australia (11.3), England (11.3) and Canada (11.2). Turkey (8.4), Malaysia (8.4), Botswana (8.7) Egypt (8.8) and Thailand (8.9) have the lowest scale scores indicating that Mathematics instruction is affected more by resource shortages in these countries. Figure 5.6 shows that in 55% of Maltese schools Mathematics instruction is not affected by resource shortages and in 45% of the schools instruction is somewhat affected. These proportions are considerably different from international averages (27%, 66% and 6%). The mean Mathematics scores of students attending schools where shortages in resources ‘Did not affect instruction’, ‘Somewhat affected’ and ‘Affected instruction a lot’ are 506, 476, and 448 respectively. This pattern is also visible for Maltese schools, where the mean scores in Mathematics for the first two resource shortage categories are 501 and 482 respectively. Figure 5.7 and Table 5.5 show no discrepancies in resource shortages for mathematics instruction between school types.

Figure 5.7: Mean mathematics resource shortage scores by school type

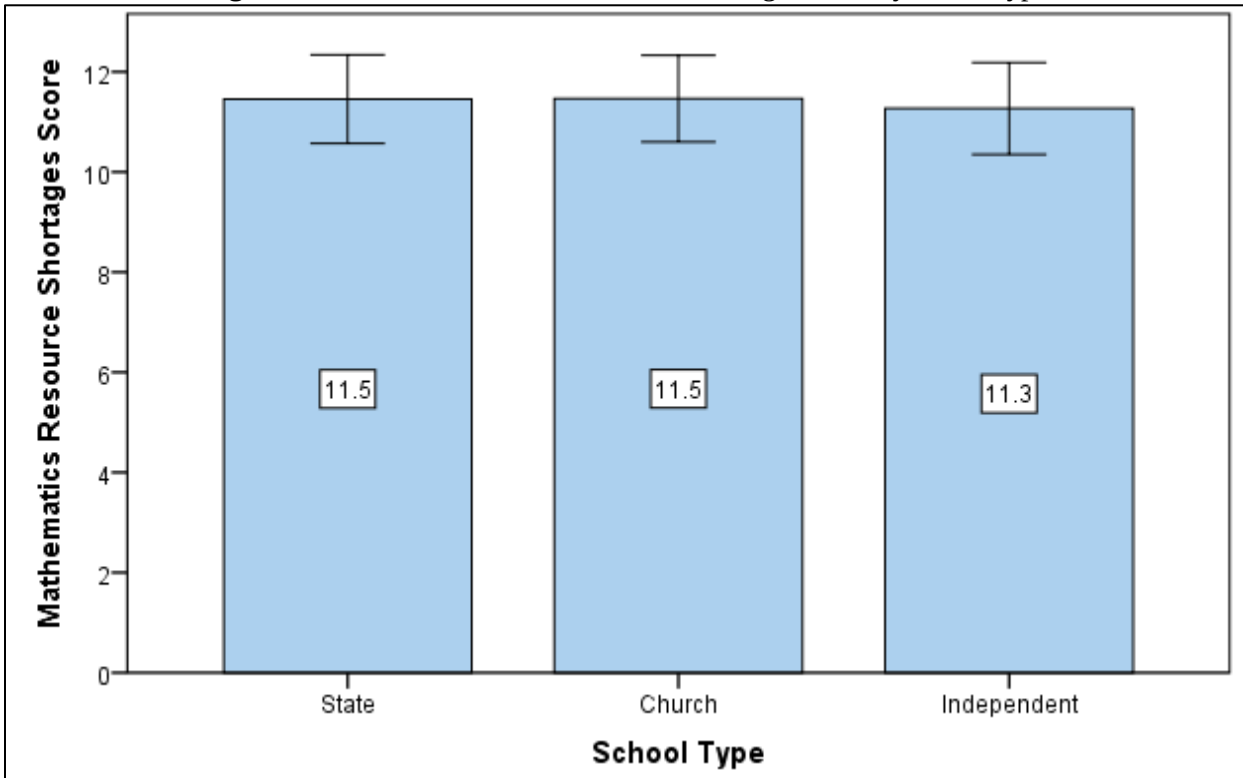


Table 5.5: Resource shortages for Mathematics Instruction by school type

			School Type			Total
			State	Church	Independent	
Instruction affected by mathematics resource shortage	Not Affected	Count	9	10	4	23
		Percentage	47.4%	50.0%	50.0%	48.9%
	Affected	Count	10	10	4	24
		Percentage	52.6%	50.0%	50.0%	51.1%
	Affected Considerably	Count	0	0	0	0
		Percentage	0.0%	0.0%	0.0%	0.0%

5.5 Effect on learning Science caused by resource shortages

A similar scale score was generated for Science resource shortage by using the heads of school responses concerning school and classroom resources that are displayed in tables 5.6 and 5.7.

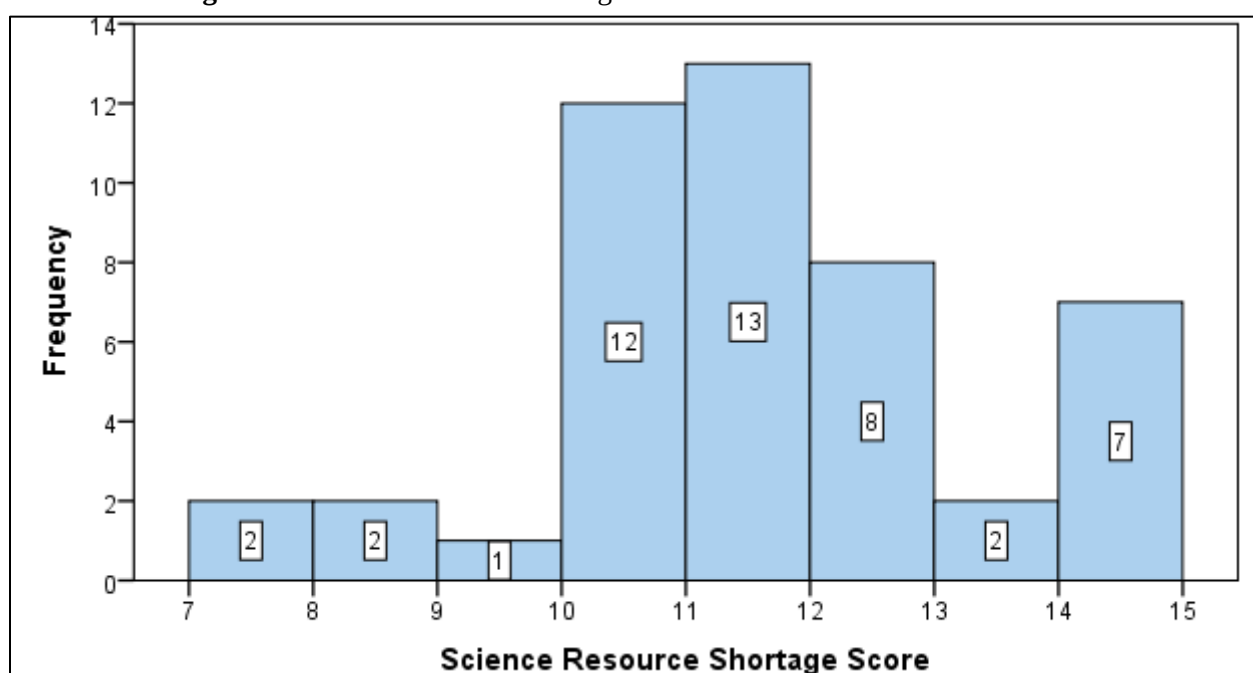
Table 5.6: General Resources in Maltese schools

How much is your school affected by a shortage or inadequacy of general school resources?	Not at all	A little	Some	A lot
Instructional materials (e.g., textbooks)	80.9%	8.5%	4.3%	6.4%
Supplies (e.g., papers, pencils, materials)	87.2%	8.5%	2.1%	2.1%
School buildings and grounds	42.6%	36.2%	8.5%	12.8%
Heating/cooling and lighting systems	51.1%	31.9%	14.9%	2.1%
Instructional space (e.g., classrooms)	42.6%	34.0%	14.9%	8.5%
Technologically competent staff	51.1%	31.9%	10.6%	6.4%
Audio-visual resources for delivery of instruction	78.3%	15.2%	2.2%	4.3%
Computer technology for teaching and learning	55.3%	23.4%	17.0%	4.3%
Resources for students with disabilities	29.8%	44.7%	14.9%	10.6%

Table 5.7: Resource shortages for Science Instruction in Maltese schools

How much is your school affected by a shortage or inadequacy of resources for science instruction?	Not at all	A little	Some	A lot
Teachers with a specialization in science	83.0%	8.5%	6.4%	2.1%
Computer software / applications for science instruction	48.9%	31.9%	14.9%	4.3%
Library resources relevant to science instruction	53.2%	25.5%	19.1%	2.1%
Calculators for science instruction	87.2%	8.5%	4.3%	0.0%
Science equipment and materials for experiments	66.0%	23.4%	4.3%	6.4%

Figure 5.8: Science resource shortages score distribution for Maltese schools



The generated science resources shortage score was categorised into three levels. Scores exceeding 11.2 indicate that resource shortages do not affect instruction of science. Scores between 7.4 and 11.2 indicate that resource shortages affect instruction, while scores below 7.4 indicate that shortages affect instruction considerably. Figure 5.8 displays the Science resource shortages score distribution for Maltese schools.

Figure 5.9: Science Instruction affected by Resource Shortages

Country	Not Affected		Affected		Affected A Lot		Average Scale Score
	Percent of Students	Average Achievement	Percent of Students	Average Achievement	Percent of Students	Average Achievement	
Singapore	74 (0.0)	599 (4.0)	18 (0.0)	585 (8.6)	8 (0.0)	601 (11.3)	12.2 (0.00)
Malta	66 (0.1)	486 (1.8)	34 (0.1)	469 (2.6)	0 (0.0)	~ ~	11.6 (0.00)
Korea, Rep. of	61 (3.9)	555 (2.7)	37 (3.8)	558 (3.5)	3 (1.3)	537 (5.8)	11.8 (0.17)
Australia	53 (3.6)	524 (3.1)	46 (3.5)	501 (4.8)	1 (0.8)	~ ~	11.5 (0.12)
Slovenia	50 (4.7)	551 (3.3)	50 (4.7)	552 (3.9)	0 (0.0)	~ ~	11.5 (0.12)
England	48 (4.3)	552 (6.0)	52 (4.3)	536 (6.6)	0 (0.0)	~ ~	11.4 (0.15)
Japan	47 (3.5)	574 (2.8)	53 (3.6)	568 (2.4)	1 (0.6)	~ ~	10.9 (0.11)
Canada	47 (3.4)	533 (3.1)	53 (3.3)	522 (3.0)	0 (0.3)	~ ~	11.3 (0.14)
Hong Kong SAR	45 (4.8)	546 (6.6)	52 (4.8)	544 (5.6)	3 (1.6)	529 (7.2)	11.0 (0.18)
Qatar	45 (0.4)	478 (2.9)	34 (0.4)	433 (4.2)	20 (0.4)	448 (9.1)	10.5 (0.03)
New Zealand	45 (5.2)	521 (5.7)	55 (5.2)	504 (4.1)	0 (0.0)	~ ~	11.1 (0.16)
Sweden	45 (4.2)	521 (5.1)	54 (4.1)	523 (4.8)	1 (0.9)	~ ~	11.0 (0.11)
Norway (9)	44 (4.1)	516 (5.3)	56 (4.1)	504 (3.0)	0 (0.0)	~ ~	11.2 (0.10)
United Arab Emirates	32 (2.3)	516 (4.6)	50 (2.4)	452 (4.6)	17 (1.8)	469 (7.4)	10.0 (0.13)
United States	32 (3.4)	542 (5.7)	65 (3.4)	526 (3.6)	3 (0.9)	501 (12.3)	10.8 (0.13)
Kazakhstan	31 (3.9)	525 (9.0)	63 (4.0)	537 (6.5)	5 (1.8)	522 (23.6)	10.3 (0.20)
Ireland	29 (3.5)	532 (7.2)	69 (3.8)	528 (3.4)	2 (1.5)	~ ~	10.7 (0.13)
Chile	28 (3.2)	483 (6.2)	68 (3.6)	443 (5.1)	4 (1.8)	442 (14.7)	10.2 (0.14)
Chinese Taipei	28 (3.7)	583 (5.4)	72 (3.6)	564 (2.8)	1 (0.5)	~ ~	10.7 (0.12)
Georgia	25 (3.3)	449 (6.6)	74 (3.3)	441 (3.9)	1 (0.8)	~ ~	10.6 (0.12)
Russian Federation	20 (2.8)	552 (8.3)	78 (2.9)	542 (4.7)	1 (0.7)	~ ~	10.3 (0.10)
Lithuania	17 (3.3)	517 (9.0)	80 (3.7)	519 (3.1)	2 (1.5)	~ ~	10.2 (0.14)
Israel	17 (2.7)	547 (9.2)	75 (2.9)	505 (4.5)	9 (1.8)	433 (15.6)	9.6 (0.11)
Bahrain	17 (0.2)	513 (5.7)	58 (0.3)	455 (2.8)	25 (0.2)	466 (4.8)	9.2 (0.01)
Kuwait	16 (3.3)	467 (26.6)	63 (3.0)	396 (5.1)	21 (3.3)	411 (12.4)	9.1 (0.21)
Oman	15 (2.2)	471 (6.8)	79 (2.5)	448 (3.1)	5 (1.4)	476 (10.5)	9.5 (0.10)
Hungary	15 (3.2)	538 (13.9)	82 (3.4)	523 (3.6)	3 (1.6)	546 (13.0)	9.9 (0.11)
Lebanon	15 (2.7)	456 (12.8)	73 (3.0)	384 (6.7)	12 (2.5)	411 (15.1)	9.7 (0.15)
Saudi Arabia	12 (3.5)	407 (20.9)	73 (4.3)	387 (5.0)	15 (3.2)	431 (12.9)	9.1 (0.19)
Iran, Islamic Rep. of	10 (2.2)	507 (19.4)	78 (2.9)	451 (3.9)	13 (2.4)	450 (10.8)	9.1 (0.11)
Italy	9 (2.4)	509 (10.8)	90 (2.6)	497 (2.7)	1 (0.8)	~ ~	9.8 (0.08)
South Africa (9)	7 (1.4)	461 (22.7)	83 (2.6)	354 (6.1)	10 (2.4)	316 (14.6)	9.3 (0.11)
Thailand	7 (2.1)	485 (15.4)	78 (2.9)	454 (4.6)	15 (2.8)	453 (12.3)	8.9 (0.13)
Jordan	7 (1.5)	476 (12.8)	79 (3.1)	416 (3.7)	14 (2.9)	461 (11.6)	9.0 (0.13)
Malaysia	5 (2.2)	420 (11.7)	70 (4.1)	470 (4.6)	25 (3.8)	482 (10.8)	8.4 (0.15)
Morocco	3 (0.9)	426 (20.0)	95 (1.2)	391 (2.5)	2 (0.7)	~ ~	9.6 (0.05)
Turkey	2 (1.0)	~ ~	79 (3.2)	493 (4.0)	19 (3.2)	490 (8.7)	8.4 (0.11)
Egypt	1 (0.7)	~ ~	89 (2.3)	366 (4.8)	10 (2.2)	417 (13.5)	8.7 (0.08)
Botswana (9)	1 (0.0)	~ ~	89 (2.8)	390 (3.2)	10 (2.8)	402 (14.5)	8.6 (0.08)
International Avg.	27 (0.5)	509 (1.8)	65 (0.5)	480 (0.7)	7 (0.3)	465 (2.6)	

Singapore has the largest scale score (12.2) indicating that Science instruction is the least affected by resource shortages. This is followed by Korea (11.8), Malta (11.6), Slovenia (11.5), Australia (11.5), England (11.4) and Canada (11.3). Turkey (8.4), Malaysia (8.4), Botswana (8.6) Egypt (8.7) and Thailand (8.9) have the lowest scale scores indicating that Science instruction is affected more by resource shortages in these countries. Figure 5.9 shows that in 66% of Maltese schools, Science instruction is not affected by resource shortages and in 34% of the schools instruction is somewhat affected. These proportions are considerably different from international averages (27%, 65% and 7%). The mean science scores of students attending schools where shortages in resources ‘Did not affect instruction’, ‘Somewhat affected’ and ‘Affected instruction a lot’ are 509, 480, and 448 respectively. This pattern is also visible for Maltese schools, where the mean scores in Science for the first two resource shortage categories are 486 and 469 respectively. Figure 5.10 and Table 5.8 show no bias in resource shortages for science instruction between school types.

Figure 5.10: Mean science resource shortage scores by school type

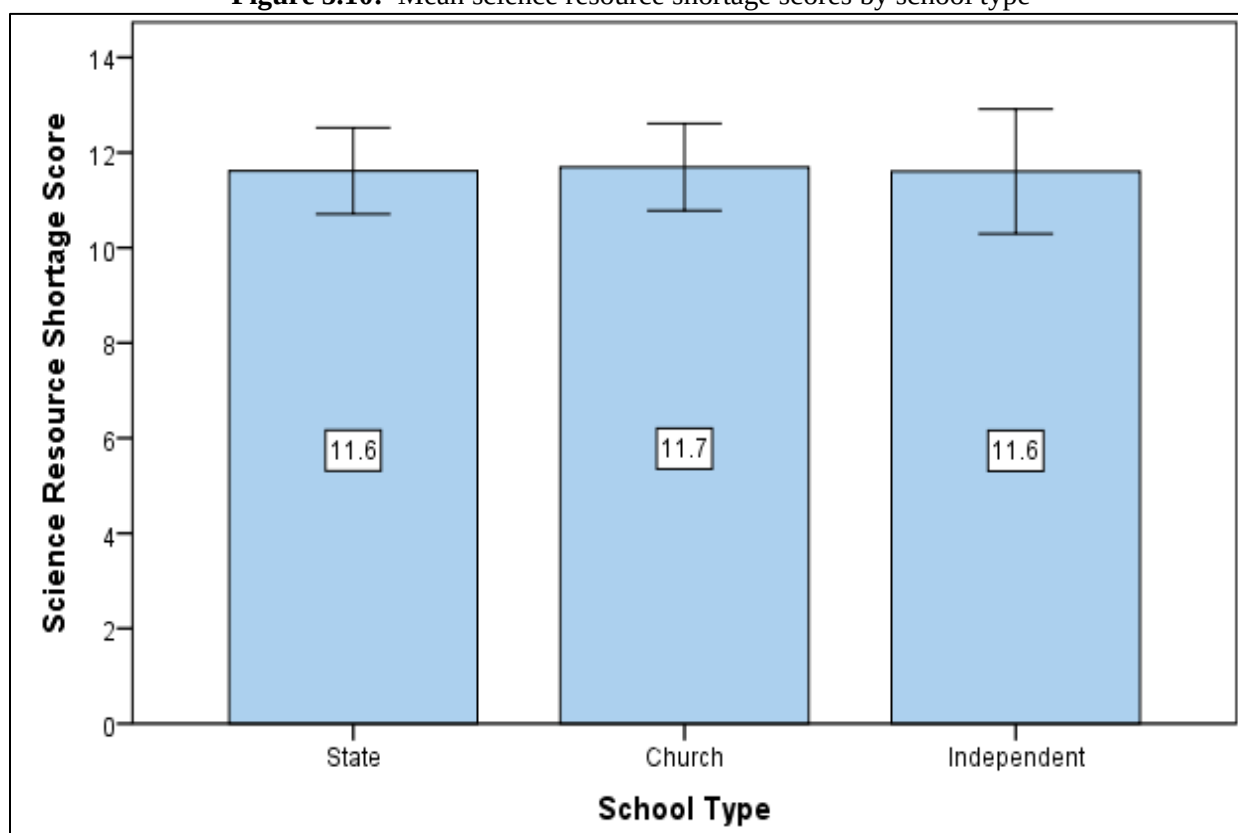


Table 5.8: Resource shortages for Science Instruction by school type

			School Type			Total
			State	Church	Independent	
Instruction affected by science resource shortage	Not Affected	Count	12	11	5	28
		Percentage	63.2%	55.0%	62.5%	59.6%
	Affected	Count	7	9	3	19
		Percentage	36.8%	45.0%	37.5%	40.4%
	Affected Considerably	Count	0	0	0	0
		Percentage	0.0%	0.0%	0.0%	0.0%

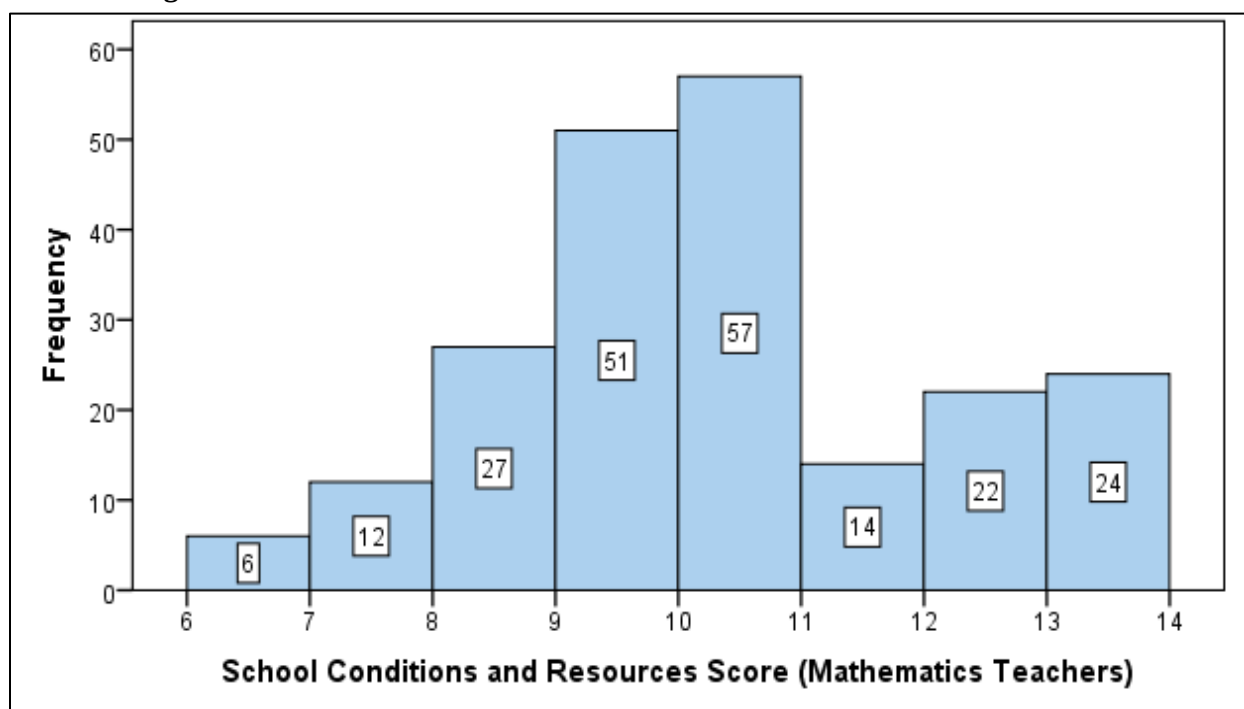
5.6 School conditions and resources reported by mathematics teachers

A scale score for problems with school conditions and resource shortage was generated by using the mathematics teachers' responses concerning school and classroom facilities that are shown in Table 5.9.

Table 5.9: Problems with school conditions and resources (Maltese mathematics teachers)

In your current school, how severe is each problem?	Not a problem	Minor problem	Moderate problem	Serious problem
The school building needs significant repair	47.4%	33.3%	12.7%	6.6%
Teachers do not have adequate workspace	32.4%	35.7%	22.1%	9.9%
Teachers do not have adequate instructional materials and supplies	45.1%	32.9%	19.2%	2.8%
The school classrooms are not cleaned often enough	54.5%	32.9%	8.9%	3.8%
The school classrooms need maintenance work	48.4%	32.9%	13.1%	5.6%
Teachers do not have adequate technological resources	50.7%	26.8%	14.6%	8.0%
Teachers do not have adequate support for using technology	46.9%	33.8%	15.0%	4.2%

Figure 5.11: School conditions and resources score distribution for Maltese schools



The generated school conditions and resources score was categorised into three levels. Scores exceeding 10.9 indicate that there are hardly any problems with school and classroom facilities. Scores between 8.5 and 10.9 indicate minor problems, while scores less than 8.5 indicate moderate to severe problems. Figure 5.11 displays the school conditions and resources score distribution for Maltese schools according to Mathematics teachers.

Figure 5.12: Problems with school conditions and resources (Mathematics Teachers)

Country	Hardly Any Problems		Minor Problems		Moderate to Severe Problems		Average Scale Score
	Percent of Students	Average Achievement	Percent of Students	Average Achievement	Percent of Students	Average Achievement	
Qatar	69 (3.5)	429 (4.1)	23 (2.5)	457 (9.2)	8 (2.8)	438 (8.1)	11.7 (0.16)
United Arab Emirates	56 (2.6)	478 (3.6)	37 (2.4)	452 (5.1)	7 (1.3)	441 (8.7)	11.2 (0.10)
Bahrain	52 (3.1)	460 (2.9)	40 (3.2)	451 (3.0)	7 (1.8)	431 (8.5)	11.0 (0.10)
Singapore	50 (2.9)	621 (5.1)	44 (2.9)	621 (5.1)	5 (1.1)	598 (16.1)	10.9 (0.10)
Australia	50 (3.3)	519 (3.8)	44 (3.5)	496 (4.9)	6 (1.4)	500 (13.9)	10.9 (0.10)
England	49 (4.6)	523 (8.3)	44 (4.3)	514 (8.3)	7 (2.0)	498 (21.8)	10.8 (0.15)
United States	49 (2.8)	522 (4.5)	41 (2.3)	514 (4.7)	10 (2.1)	517 (9.4)	10.7 (0.12)
Chile	48 (3.8)	442 (5.5)	38 (3.5)	424 (8.1)	14 (2.8)	402 (7.2)	10.6 (0.17)
Ireland	45 (3.6)	527 (4.4)	42 (3.4)	519 (5.0)	12 (2.3)	521 (6.8)	10.6 (0.14)
Canada	45 (3.2)	535 (3.3)	46 (3.2)	525 (3.8)	9 (1.7)	534 (5.8)	10.6 (0.11)
Lebanon	45 (4.6)	451 (5.8)	37 (4.1)	438 (6.1)	19 (3.2)	426 (11.9)	10.4 (0.18)
Slovenia	45 (3.2)	518 (2.8)	43 (3.2)	515 (3.9)	13 (2.2)	514 (5.4)	10.7 (0.14)
New Zealand	41 (3.7)	497 (7.3)	49 (3.8)	495 (4.7)	10 (1.5)	470 (13.8)	10.5 (0.10)
Kuwait	40 (3.9)	394 (8.8)	37 (3.7)	393 (9.4)	23 (3.2)	386 (6.6)	10.2 (0.16)
Kazakhstan	40 (4.0)	533 (7.5)	37 (3.9)	534 (8.5)	23 (3.1)	507 (12.9)	10.3 (0.17)
Malta	39 (0.1)	502 (1.7)	48 (0.1)	493 (1.5)	13 (0.1)	475 (3.2)	10.5 (0.00)
Hong Kong SAR	39 (4.6)	597 (9.5)	52 (4.8)	595 (6.7)	9 (2.4)	569 (16.6)	10.7 (0.15)
Chinese Taipei	38 (3.7)	615 (5.1)	51 (4.1)	591 (4.1)	11 (2.5)	585 (9.2)	10.4 (0.12)
Oman	37 (3.3)	407 (5.5)	47 (3.5)	404 (3.6)	16 (2.4)	393 (6.8)	10.5 (0.15)
Russian Federation	34 (3.7)	544 (6.3)	50 (3.5)	537 (5.7)	16 (2.5)	530 (11.5)	10.1 (0.11)
Korea, Rep. of	33 (3.4)	612 (4.4)	51 (3.4)	603 (4.1)	16 (2.6)	603 (7.8)	10.3 (0.14)
Lithuania	30 (4.0)	515 (6.8)	59 (4.6)	511 (3.9)	10 (2.4)	495 (9.4)	10.2 (0.14)
Israel	29 (2.7)	509 (8.3)	46 (2.5)	519 (6.9)	25 (2.2)	497 (7.8)	9.8 (0.12)
Norway (9)	29 (3.2)	518 (5.0)	53 (3.9)	512 (2.7)	18 (3.2)	506 (3.2)	10.1 (0.12)
Iran, Islamic Rep. of	28 (3.4)	466 (10.1)	41 (3.5)	437 (7.3)	30 (2.9)	408 (5.8)	9.6 (0.13)
Thailand	27 (3.4)	438 (9.6)	59 (4.0)	433 (6.6)	14 (2.6)	414 (11.7)	10.0 (0.13)
Sweden	26 (3.8)	498 (6.2)	53 (4.4)	505 (4.1)	22 (3.3)	493 (6.0)	9.8 (0.14)
Jordan	25 (2.9)	412 (7.4)	37 (3.5)	385 (3.8)	38 (3.3)	369 (5.4)	9.4 (0.13)
Hungary	22 (3.2)	517 (12.1)	49 (3.7)	508 (6.1)	28 (3.4)	523 (6.9)	9.7 (0.13)
Georgia	22 (3.6)	463 (6.3)	44 (4.3)	452 (5.0)	34 (3.6)	448 (7.5)	9.5 (0.14)
Saudi Arabia	20 (3.6)	386 (8.5)	41 (4.3)	367 (6.9)	39 (4.6)	357 (6.6)	9.3 (0.19)
South Africa (9)	18 (3.1)	444 (11.4)	29 (3.4)	384 (9.0)	53 (3.9)	342 (3.3)	8.6 (0.18)
Italy	17 (3.0)	486 (8.3)	51 (4.1)	501 (4.1)	32 (3.5)	485 (5.5)	9.4 (0.12)
Japan	17 (2.6)	587 (6.0)	60 (3.5)	586 (3.4)	22 (2.9)	588 (5.1)	9.5 (0.10)
Turkey	16 (2.6)	481 (12.9)	36 (3.4)	461 (7.1)	48 (3.7)	447 (6.6)	8.8 (0.15)
Egypt	15 (2.3)	417 (6.5)	39 (3.5)	392 (7.5)	46 (3.4)	383 (5.8)	8.8 (0.11)
Malaysia	13 (2.9)	477 (13.9)	52 (4.4)	466 (5.6)	34 (4.3)	461 (6.7)	9.1 (0.14)
Morocco	12 (2.0)	405 (6.0)	41 (3.1)	387 (3.8)	47 (3.0)	377 (3.4)	8.9 (0.09)
Botswana (9)	2 (1.1)	~ ~	20 (3.2)	402 (5.9)	77 (3.4)	387 (2.5)	7.6 (0.11)
International Avg.	34 (0.5)	493 (1.2)	44 (0.6)	481 (0.9)	22 (0.5)	470 (1.5)	

Figure 5.12 shows that Qatar has the largest scale score (11.7) indicating least problems with school conditions and resources according to mathematics teachers. This is followed by United Arab Emirates (11.2), Bahrain (11.0), Singapore (10.9), Australia (10.9) and England (10.8). The lowest scale scores indicating more problems with school conditions and resources than other

countries are those of Botswana (7.6), South Africa (8.6), Turkey (8.8), Egypt (8.8) and Morocco (8.9). Malta's scale score (10.5) is significantly higher than the international average (10.0), where 39% of Mathematics teachers stated that there are hardly any problems with school conditions and resources, 48% indicated minor problems and 13% indicated moderate to severe problems. These proportions differ from international averages (34%, 44% and 22%). The mean mathematics scores of students attending schools having hardly any problems with facilities and resources, have minor problems and have moderate to severe problems are 493, 481, and 470 respectively. This trend applies to Maltese schools, where the mean scores in mathematics for the three problem categories are 502, 493 and 475 respectively. Figure 5.13 and Table 5.10 show that church schools have fewer problems with school conditions and resources than state and independent schools.

Figure 5.13: Mean scores for school conditions and resources by school type (Mathematics teachers)

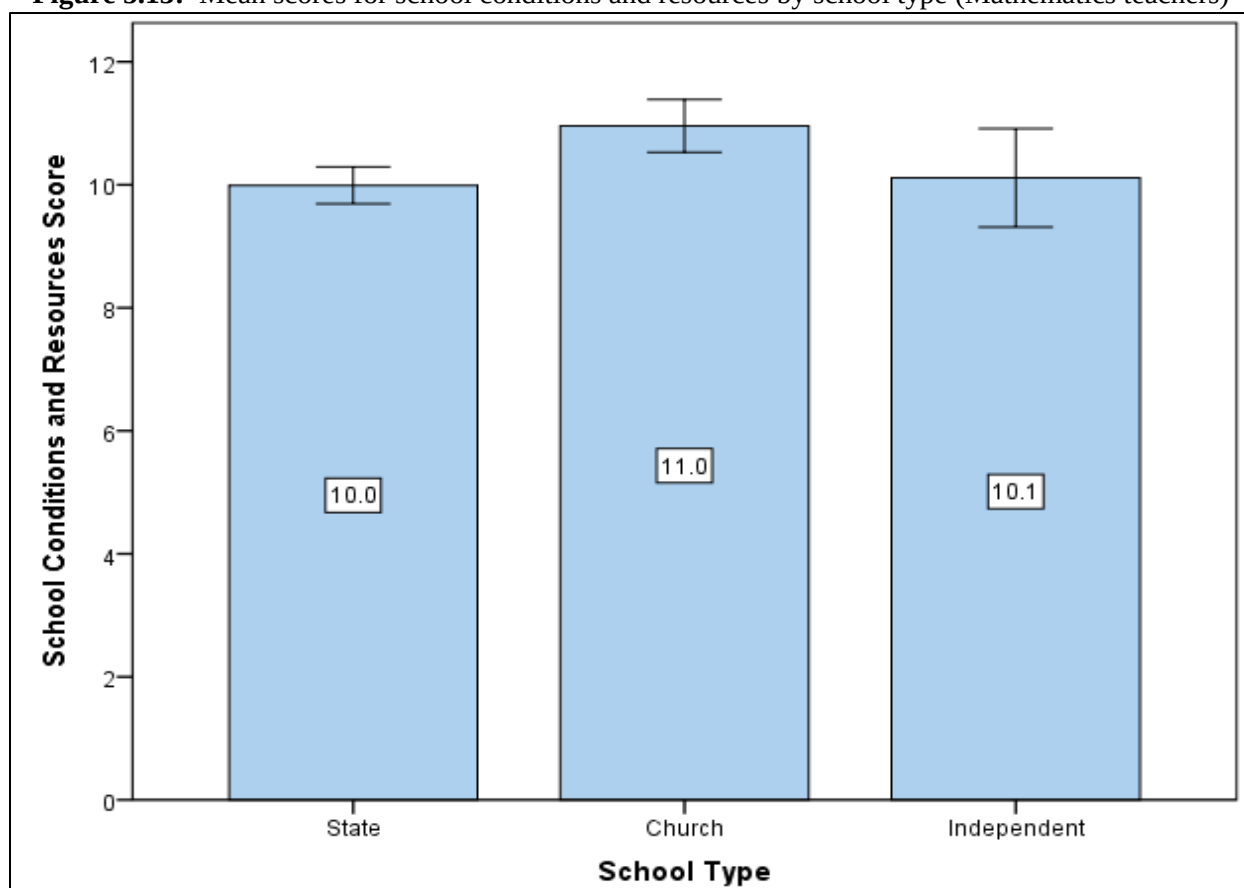


Table 5.10: Problems with school conditions and resources by school type (Mathematics teachers)

			School Type			Total
			State	Church	Independent	
Problems with school conditions and resources	Hardly any problems	Count	37	35	4	76
		Percentage	30.3%	50.7%	18.2%	35.7%
	Minor problems	Count	63	28	16	107
		Percentage	51.6%	40.6%	72.7%	50.2%
	Moderate to severe problems	Count	22	6	2	30
		Percentage	18.0%	8.7%	9.1%	14.1%

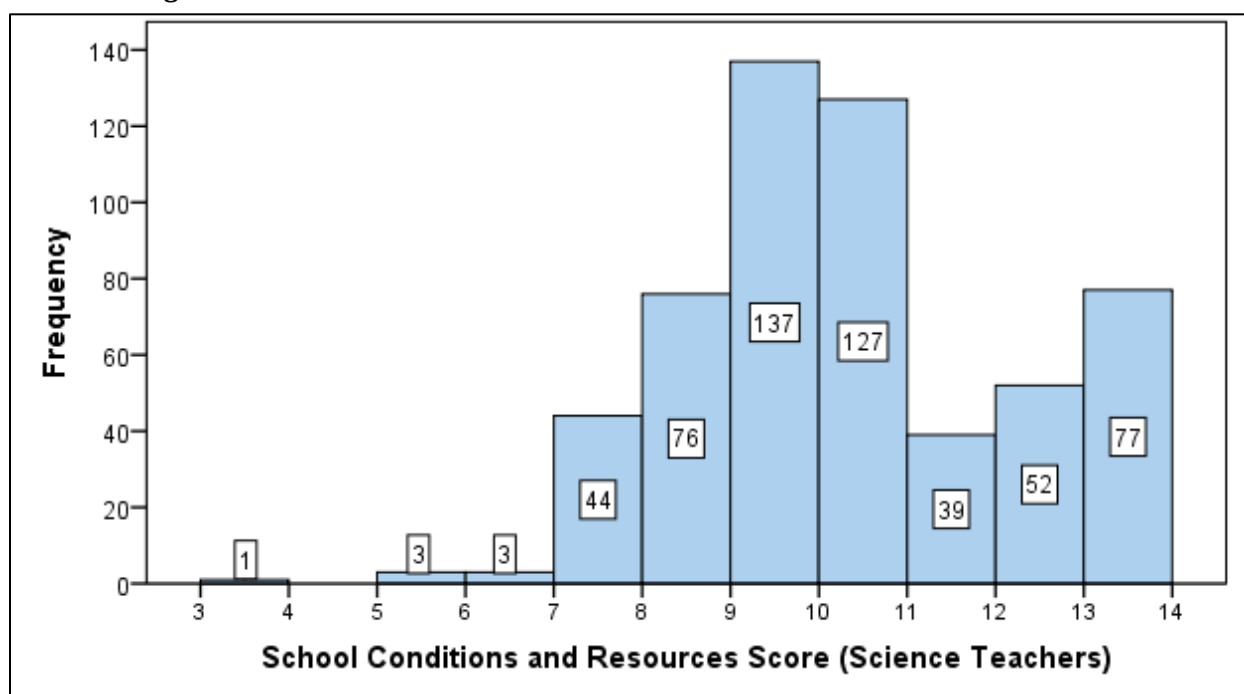
5.7 School conditions and resources reported by science teachers

A similar scale score for problems with school conditions and resources was generated by using the science teachers' responses concerning school and classroom facilities that are shown in Table 5.11.

Table 5.11: Problems with school conditions and resources (Maltese science teachers)

In your current school, how severe is each problem?	Not a problem	Minor problem	Moderate problem	Serious problem
The school building needs significant repair	41.9%	36.5%	18.8%	2.9%
Teachers do not have adequate workspace	32.4%	37.6%	21.0%	9.0%
Teachers do not have adequate instructional materials and supplies	42.6%	38.1%	17.0%	2.3%
The school classrooms are not cleaned often enough	58.8%	22.6%	10.4%	8.2%
The school classrooms need maintenance work	46.8%	30.6%	18.8%	3.8%
Teachers do not have adequate technological resources	49.6%	31.1%	15.9%	3.4%
Teachers do not have adequate support for using technology	49.2%	31.1%	17.2%	2.5%

Figure 5.14: School conditions and resources score distribution for Maltese schools



The generated school conditions and resources score was categorised into three levels. Scores exceeding 10.9 indicate that there are hardly any problems with school and classroom facilities. Scores between 8.5 and 10.9 indicate minor problems, while scores less than 8.5 indicate moderate to severe problems. Figure 5.14 displays the school conditions and resources score distribution for Maltese schools according to Science teachers.

Figure 5.15: Problems with school conditions and resources (Science Teachers)

Country	Hardly Any Problems		Minor Problems		Moderate to Severe Problems		Average Scale Score
	Percent of Students	Average Achievement	Percent of Students	Average Achievement	Percent of Students	Average Achievement	
Qatar	67 (3.0)	449 (4.8)	25 (3.0)	473 (8.0)	8 (0.5)	463 (9.7)	11.6 (0.13)
United Arab Emirates	57 (2.4)	489 (3.8)	33 (2.3)	458 (7.5)	10 (1.9)	463 (9.6)	11.1 (0.10)
Singapore	53 (2.6)	607 (4.7)	41 (2.8)	587 (6.5)	5 (1.2)	569 (15.2)	11.0 (0.09)
Australia	50 (2.5)	524 (3.2)	40 (3.0)	508 (5.7)	10 (2.0)	503 (8.0)	10.8 (0.10)
Lebanon	50 (4.6)	412 (10.7)	36 (3.9)	394 (7.8)	14 (3.1)	358 (13.3)	10.6 (0.17)
England	47 (3.4)	545 (5.1)	40 (2.9)	531 (6.7)	13 (2.6)	534 (15.8)	10.6 (0.14)
Chile	45 (3.9)	470 (5.7)	41 (3.9)	446 (6.2)	15 (3.1)	442 (10.1)	10.4 (0.16)
Slovenia	44 (2.9)	554 (2.7)	44 (2.4)	550 (2.8)	11 (1.5)	545 (6.6)	10.7 (0.12)
Kuwait	43 (4.1)	424 (9.1)	33 (4.0)	394 (9.7)	24 (3.7)	403 (12.2)	10.3 (0.20)
Canada	42 (3.2)	535 (3.0)	48 (3.3)	523 (3.6)	10 (1.9)	518 (10.9)	10.6 (0.11)
Bahrain	42 (3.0)	477 (4.3)	44 (3.2)	459 (4.3)	14 (2.3)	451 (7.8)	10.5 (0.11)
Oman	42 (3.8)	460 (3.9)	43 (3.4)	455 (5.6)	15 (2.3)	442 (9.6)	10.5 (0.15)
Korea, Rep. of	41 (3.8)	557 (2.5)	47 (3.9)	554 (3.5)	11 (2.6)	555 (8.1)	10.5 (0.15)
Kazakhstan	40 (2.9)	540 (5.7)	40 (2.9)	534 (6.4)	20 (2.6)	519 (12.5)	10.3 (0.13)
United States	40 (2.7)	543 (4.0)	46 (2.9)	528 (4.6)	14 (2.0)	514 (7.9)	10.4 (0.11)
Malta	39 (0.5)	493 (2.1)	46 (0.5)	477 (1.9)	15 (0.3)	459 (3.1)	10.4 (0.02)
Chinese Taipei	39 (3.5)	579 (3.9)	49 (4.0)	562 (3.4)	12 (2.6)	566 (5.5)	10.3 (0.12)
Hong Kong SAR	38 (4.8)	552 (6.5)	49 (5.3)	537 (6.3)	13 (3.1)	549 (9.7)	10.3 (0.13)
Ireland	38 (3.2)	537 (4.5)	47 (3.5)	527 (4.5)	16 (2.4)	530 (6.3)	10.3 (0.13)
New Zealand	37 (3.4)	529 (4.5)	47 (3.1)	507 (6.0)	16 (3.2)	507 (8.2)	10.1 (0.14)
Norway (9)	36 (3.1)	510 (4.5)	50 (3.7)	511 (3.9)	14 (2.7)	507 (6.1)	10.2 (0.11)
Russian Federation	35 (2.6)	551 (4.6)	48 (2.3)	543 (5.2)	16 (2.0)	533 (7.6)	10.1 (0.11)
Lithuania	33 (3.1)	519 (4.5)	52 (2.7)	517 (3.1)	15 (1.8)	524 (6.3)	10.2 (0.13)
Israel	28 (3.2)	498 (9.6)	46 (3.4)	521 (6.1)	26 (2.8)	496 (8.0)	9.8 (0.14)
Hungary	26 (2.1)	518 (5.9)	47 (2.5)	527 (4.4)	26 (2.6)	530 (5.6)	9.7 (0.10)
Jordan	25 (3.0)	455 (8.4)	39 (3.9)	423 (5.3)	36 (4.0)	407 (5.3)	9.3 (0.15)
Thailand	25 (3.4)	472 (9.8)	50 (3.9)	458 (6.1)	26 (3.2)	437 (8.4)	9.7 (0.13)
Japan	24 (3.7)	573 (4.4)	62 (3.9)	572 (2.2)	14 (2.6)	564 (6.0)	9.9 (0.13)
Sweden	23 (3.7)	521 (8.7)	50 (3.9)	528 (4.2)	26 (3.4)	514 (6.7)	9.6 (0.15)
Egypt	22 (2.7)	398 (8.7)	40 (3.7)	374 (7.3)	38 (3.6)	351 (7.3)	9.1 (0.15)
Saudi Arabia	22 (4.1)	424 (8.8)	48 (4.8)	394 (7.6)	31 (4.4)	380 (7.6)	9.3 (0.21)
Georgia	21 (2.5)	454 (5.0)	45 (2.5)	442 (3.7)	34 (2.9)	439 (5.3)	9.4 (0.12)
Iran, Islamic Rep. of	21 (2.6)	481 (12.1)	52 (3.2)	461 (4.7)	27 (3.1)	428 (5.2)	9.5 (0.11)
Italy	16 (3.0)	490 (8.3)	52 (4.2)	506 (3.6)	32 (3.5)	489 (5.8)	9.4 (0.12)
Turkey	16 (2.6)	522 (11.2)	39 (3.5)	497 (6.7)	45 (3.7)	480 (5.1)	8.9 (0.14)
South Africa (9)	15 (2.6)	452 (13.9)	29 (3.5)	364 (10.8)	56 (3.6)	329 (6.0)	8.5 (0.17)
Malaysia	13 (2.7)	465 (13.4)	42 (4.1)	483 (7.2)	45 (4.0)	455 (8.2)	8.9 (0.12)
Morocco	12 (1.4)	420 (8.0)	43 (2.5)	394 (3.6)	44 (2.6)	386 (2.8)	8.9 (0.08)
Botswana (9)	2 (0.7)	~ ~	15 (3.4)	421 (6.9)	82 (3.3)	387 (3.4)	7.4 (0.11)
International Avg.	34 (0.5)	500 (1.2)	43 (0.5)	486 (0.9)	23 (0.5)	475 (1.3)	

Perceptions of science teachers regarding problems with school conditions and resources are similar to mathematics teachers. Figure 5.15 shows that Qatar has the largest scale score (11.6) indicating least problems with school conditions and resources according to science teachers. This is followed by United Arab Emirates (11.1), Singapore (11.0), Australia (10.8), Slovenia (10.7) and

England (10.6). Botswana (7.4), South Africa (8.5), Turkey (8.9), Malaysia (8.9) and Morocco (8.9) have the lowest scale scores indicating more problems with school conditions and resources than other countries. Malta's scale score (10.4) is significantly higher than the international average (10.0), where 39% of Science teacher stated that there are hardly any problems with school conditions and resources, 46% indicated minor problems and 15% indicated moderate to severe problems. These proportions differ from international averages (34%, 43% and 23%). The mean science scores of students attending schools having hardly any problems with facilities and resources, have minor problems and have moderate to severe problems are 500, 486, and 475 respectively. This trend applies to Maltese schools, where the mean scores in science for the three problem categories are 493, 477 and 459 respectively. Figure 5.16 and Table 5.12 show that state schools have more problems with school conditions and resources than independent and church schools.

Figure 5.16: Mean scores for school conditions and resources by school type (Science teachers)

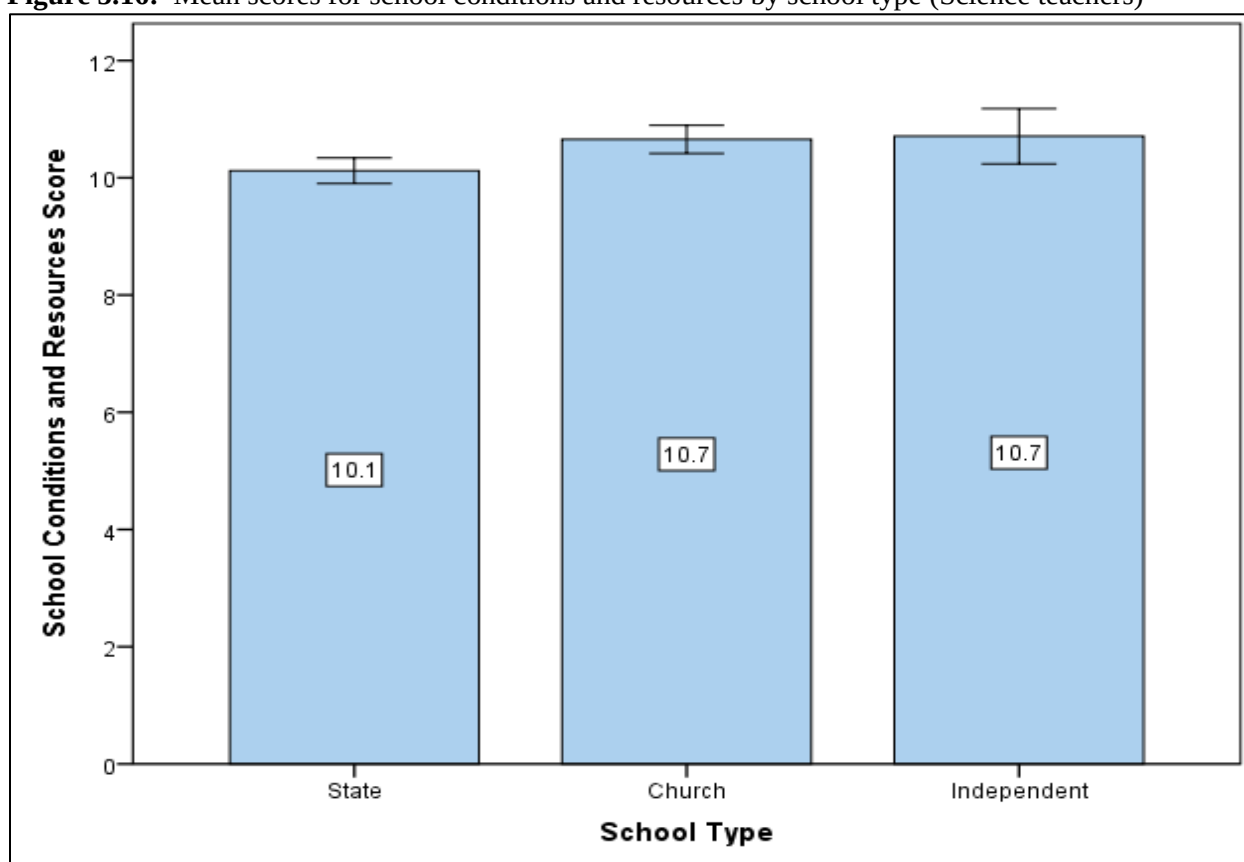


Table 5.12: Problems with school conditions and resources by school type (Science teachers)

			School Type			Total
			State	Church	Independent	
Problems with school conditions and resources	Hardly any problems	Count	105	80	29	214
		Percentage	33.4%	41.9%	53.7%	38.3%
	Minor problems	Count	142	96	16	254
		Percentage	45.2%	50.3%	29.6%	45.4%
	Moderate to severe problems	Count	67	15	9	91
		Percentage	21.3%	7.9%	16.7%	16.3%

6

Job Satisfaction, Challenges, School Sense of Belonging

6.1 Introduction

This chapter describes the views of heads of school and teachers regarding a number of school-related issues. It highlights the heads' and teachers' perspectives regarding the school emphasis on academic success in Mathematics and Science. Moreover, this chapter addresses other issues related to teachers' job satisfaction, challenges faced by teachers at school and students' sense of belonging. A scale score is generated for each of these issues which will be used to identify differences between participating countries and between different school types in Malta.

6.2 Emphasis on academic success and attainment (Head of School report)

A scale score for School Emphasis on Academic Success was generated by considering these thirteen aspects. Table 6.1 displays the responses of Maltese heads of school regarding the emphasis the school provides to academic success.

Table 6.1: Responses of Maltese heads of school regarding school emphasis on academic success

How would you characterize each of the following within your school?	Very high	High	Medium	Low	Very low
Teachers' understanding of the school's curricular goals	34.0%	51.1%	14.9%	0.0%	0.0%
Teachers' degree of success in implementing the school's curriculum	21.3%	63.8%	14.9%	0.0%	0.0%
Teachers' expectations for student achievement	23.4%	61.7%	12.8%	2.1%	0.0%
Teachers working together to improve student achievement	14.9%	57.4%	21.3%	6.4%	0.0%
Teachers' ability to inspire students	8.5%	70.2%	21.3%	0.0%	0.0%
Parental involvement in school activities	8.5%	27.7%	38.3%	14.9%	10.6%
Parental commitment to ensure that students are ready to learn	13.0%	41.3%	34.8%	8.7%	2.2%
Parental expectations for student achievement	39.1%	43.5%	17.4%	0.0%	0.0%
Parental support for student achievement	13.0%	39.1%	43.5%	4.3%	0.0%
Parental pressure for the school to maintain high academic standards	23.9%	45.7%	28.3%	2.2%	0.0%
Students' desire to do well in school	19.6%	41.3%	37.0%	2.2%	0.0%
Students' ability to reach school's academic goals	8.7%	50.0%	41.3%	0.0%	0.0%
Students' respect for classmates who excel in school	10.9%	52.2%	34.8%	2.2%	0.0%

Pupils in schools where their head reported a very high emphasis on academic success had a score on the scale of at least 13.1 which corresponds to their head of school characterizing seven of the thirteen aspects as ‘Very high’ and the other six as ‘High’, on average. Students in schools with a medium emphasis on academic success had a score no higher than 9.6, which corresponds to their heads of school characterizing seven of the thirteen aspects as ‘medium’ and the other six as ‘high’, on average. All other pupils attended schools with a High Emphasis on academic success.

Figure 6.1: Emphasis on academic success and attainment in Mathematics (Heads of School)

Country	Very High Emphasis		High Emphasis		Medium Emphasis		Average Scale Score
	Percent of Students	Average Achievement	Percent of Students	Average Achievement	Percent of Students	Average Achievement	
England	26 (3.7)	574 (10.5)	53 (4.8)	521 (6.5)	22 (3.5)	485 (10.3)	11.6 (0.17)
Qatar	25 (0.4)	473 (5.3)	57 (0.5)	433 (3.6)	19 (0.4)	403 (5.4)	11.7 (0.02)
United Arab Emirates	19 (1.7)	520 (5.6)	59 (2.2)	466 (2.9)	22 (1.5)	406 (4.7)	11.2 (0.07)
Korea, Rep. of	17 (3.5)	622 (7.0)	65 (4.3)	607 (3.2)	18 (3.4)	585 (4.2)	11.2 (0.17)
Ireland	15 (2.9)	549 (6.8)	65 (4.0)	526 (2.9)	21 (3.1)	495 (8.1)	11.2 (0.15)
Australia	14 (2.3)	557 (7.4)	42 (3.5)	512 (5.1)	44 (3.0)	486 (4.6)	10.5 (0.11)
Canada	13 (2.1)	556 (6.1)	46 (3.2)	533 (2.9)	41 (3.3)	513 (3.5)	10.6 (0.15)
Bahrain	12 (0.2)	504 (6.0)	52 (0.2)	456 (2.0)	36 (0.2)	435 (2.3)	10.3 (0.01)
Malaysia	10 (2.1)	518 (12.7)	65 (3.6)	465 (4.9)	25 (3.9)	446 (6.9)	11.0 (0.12)
Singapore	10 (0.0)	684 (7.7)	64 (0.0)	626 (4.5)	26 (0.0)	587 (6.0)	10.7 (0.00)
New Zealand	9 (2.8)	523 (14.3)	69 (4.4)	496 (4.5)	22 (3.6)	460 (6.5)	11.0 (0.14)
Kazakhstan	9 (2.6)	538 (20.3)	72 (3.8)	528 (6.7)	19 (3.4)	521 (9.5)	11.0 (0.16)
Malta	8 (0.1)	525 (4.7)	57 (0.1)	506 (1.2)	35 (0.1)	463 (2.0)	10.4 (0.01)
United States	8 (2.0)	564 (10.7)	46 (3.5)	532 (4.3)	46 (3.2)	499 (5.0)	10.0 (0.13)
Chinese Taipei	7 (1.9)	661 (10.0)	46 (3.8)	610 (3.7)	47 (3.5)	579 (4.1)	10.0 (0.13)
Hong Kong SAR	6 (1.2)	629 (12.2)	39 (3.8)	624 (6.3)	56 (3.8)	567 (6.2)	9.7 (0.14)
Sweden	5 (1.9)	531 (9.2)	45 (4.4)	511 (4.1)	50 (4.2)	488 (4.2)	9.9 (0.13)
Saudi Arabia	5 (1.7)	397 (18.5)	43 (4.1)	385 (6.9)	52 (4.2)	352 (4.9)	9.8 (0.15)
Oman	5 (1.3)	425 (17.1)	57 (2.9)	409 (4.0)	38 (2.6)	390 (3.4)	10.2 (0.09)
Kuwait	5 (1.7)	442 (36.4)	53 (4.1)	407 (7.2)	42 (3.9)	369 (5.2)	10.0 (0.13)
Iran, Islamic Rep. of	5 (1.0)	533 (27.1)	43 (3.0)	455 (6.5)	53 (3.2)	412 (4.2)	9.6 (0.12)
Thailand	5 (1.5)	466 (34.6)	61 (4.0)	443 (6.3)	34 (3.8)	406 (5.6)	10.3 (0.14)
Israel	4 (1.6)	586 (17.4)	56 (3.6)	522 (6.0)	39 (3.3)	486 (8.2)	10.2 (0.11)
Turkey	4 (1.3)	600 (13.8)	29 (3.1)	486 (7.9)	67 (3.3)	437 (4.4)	8.9 (0.14)
Lebanon	4 (1.7)	496 (18.7)	53 (4.4)	456 (5.7)	43 (4.0)	422 (5.3)	10.0 (0.13)
Jordan	3 (1.0)	424 (17.4)	40 (3.7)	406 (4.9)	57 (3.7)	369 (4.2)	9.4 (0.12)
Egypt	3 (0.9)	431 (30.8)	33 (3.5)	401 (7.6)	64 (3.6)	385 (4.9)	9.5 (0.11)
Chile	2 (1.1)	~ ~	29 (3.4)	462 (7.6)	69 (3.6)	411 (4.3)	8.7 (0.16)
Japan	2 (1.2)	~ ~	53 (4.0)	600 (3.3)	45 (4.0)	568 (3.2)	9.8 (0.12)
Lithuania	2 (1.1)	~ ~	58 (3.7)	520 (4.0)	40 (3.8)	498 (3.9)	9.9 (0.10)
South Africa (9)	1 (0.5)	~ ~	27 (3.5)	397 (12.5)	72 (3.5)	361 (4.2)	8.7 (0.13)
Georgia	1 (0.6)	~ ~	57 (4.3)	456 (4.8)	42 (4.3)	450 (5.0)	9.9 (0.11)
Slovenia	1 (0.9)	~ ~	38 (4.6)	525 (4.1)	61 (4.5)	511 (2.7)	9.5 (0.11)
Hungary	1 (0.9)	~ ~	64 (3.9)	534 (4.4)	35 (3.9)	472 (7.4)	10.1 (0.10)
Norway (9)	1 (0.8)	~ ~	52 (4.1)	521 (3.3)	47 (4.0)	500 (2.6)	9.9 (0.12)
Botswana (9)	1 (0.0)	~ ~	12 (2.7)	429 (7.7)	88 (2.7)	385 (2.2)	7.7 (0.13)
Italy	1 (0.7)	~ ~	29 (3.6)	500 (5.4)	71 (3.7)	491 (3.3)	9.0 (0.12)
Morocco	0 (0.2)	~ ~	12 (1.8)	426 (10.2)	88 (1.8)	379 (2.3)	7.8 (0.10)
Russian Federation	0 (0.0)	~ ~	27 (3.1)	554 (6.0)	73 (3.1)	532 (5.8)	9.1 (0.08)
International Avg.	7 (0.3)	531 (3.2)	48 (0.6)	494 (0.9)	45 (0.5)	462 (0.8)	

Figure 6.2: Emphasis on academic success and attainment in Science (Heads of School)

Country	Very High Emphasis		High Emphasis		Medium Emphasis		Average Scale Score
	Percent of Students	Average Achievement	Percent of Students	Average Achievement	Percent of Students	Average Achievement	
England	26 (3.7)	587 (9.7)	53 (4.8)	540 (6.0)	22 (3.5)	502 (9.9)	11.6 (0.17)
Qatar	25 (0.4)	499 (4.2)	57 (0.5)	452 (4.0)	19 (0.4)	415 (6.1)	11.7 (0.02)
United Arab Emirates	19 (1.7)	533 (5.8)	59 (2.2)	478 (3.3)	22 (1.5)	416 (5.8)	11.2 (0.07)
Korea, Rep. of	17 (3.5)	567 (6.2)	65 (4.3)	557 (2.7)	18 (3.4)	539 (3.4)	11.2 (0.17)
Ireland	15 (2.9)	556 (6.7)	65 (4.0)	534 (2.9)	21 (3.1)	498 (8.7)	11.2 (0.15)
Australia	14 (2.3)	556 (5.8)	42 (3.5)	519 (4.6)	44 (3.0)	495 (4.1)	10.5 (0.11)
Canada	13 (2.1)	548 (4.6)	46 (3.2)	530 (2.7)	41 (3.3)	517 (3.0)	10.6 (0.15)
Bahrain	12 (0.2)	514 (8.7)	52 (0.2)	472 (2.9)	36 (0.2)	441 (3.0)	10.3 (0.01)
Malaysia	10 (2.1)	524 (12.1)	65 (3.6)	471 (5.6)	25 (3.9)	448 (7.6)	11.0 (0.12)
Singapore	10 (0.0)	661 (8.7)	64 (0.0)	601 (4.4)	26 (0.0)	562 (6.1)	10.7 (0.00)
New Zealand	9 (2.8)	539 (12.9)	69 (4.4)	517 (4.5)	22 (3.6)	480 (7.1)	11.0 (0.14)
Kazakhstan	9 (2.6)	533 (16.8)	72 (3.8)	534 (5.7)	19 (3.4)	527 (10.1)	11.0 (0.16)
Malta	8 (0.1)	520 (5.0)	57 (0.1)	497 (2.0)	35 (0.1)	444 (2.7)	10.4 (0.01)
United States	8 (2.0)	570 (9.3)	46 (3.5)	543 (3.9)	46 (3.2)	512 (4.9)	10.0 (0.13)
Chinese Taipei	7 (1.9)	621 (7.7)	46 (3.8)	579 (3.0)	47 (3.5)	552 (3.4)	10.0 (0.13)
Hong Kong SAR	6 (1.2)	586 (11.6)	39 (3.8)	568 (5.6)	56 (3.8)	524 (5.3)	9.7 (0.14)
Sweden	5 (1.9)	560 (11.7)	45 (4.4)	536 (4.9)	50 (4.2)	506 (5.0)	9.9 (0.13)
Saudi Arabia	5 (1.7)	433 (22.2)	43 (4.1)	418 (7.1)	52 (4.2)	377 (5.6)	9.8 (0.15)
Oman	5 (1.3)	469 (12.5)	57 (2.9)	462 (4.2)	38 (2.6)	440 (4.1)	10.2 (0.09)
Kuwait	5 (1.7)	462 (28.8)	53 (4.1)	430 (8.3)	42 (3.9)	379 (6.1)	10.0 (0.13)
Iran, Islamic Rep. of	5 (1.0)	542 (22.8)	43 (3.0)	473 (5.8)	53 (3.2)	435 (3.7)	9.6 (0.12)
Thailand	5 (1.5)	479 (27.0)	61 (4.0)	467 (5.4)	34 (3.8)	432 (5.5)	10.3 (0.14)
Israel	4 (1.6)	578 (15.5)	56 (3.6)	519 (5.5)	39 (3.3)	482 (7.9)	10.2 (0.11)
Turkey	4 (1.3)	614 (11.8)	29 (3.1)	518 (6.8)	67 (3.3)	476 (3.8)	8.9 (0.14)
Lebanon	4 (1.7)	476 (18.5)	53 (4.4)	418 (8.7)	43 (4.0)	368 (7.5)	10.0 (0.13)
Jordan	3 (1.0)	467 (19.8)	40 (3.7)	449 (5.5)	57 (3.7)	408 (4.5)	9.4 (0.12)
Egypt	3 (0.9)	410 (35.9)	33 (3.5)	384 (8.5)	64 (3.6)	362 (5.0)	9.5 (0.11)
Chile	2 (1.1)	~ ~	29 (3.4)	488 (7.7)	69 (3.6)	438 (4.2)	8.7 (0.16)
Japan	2 (1.2)	~ ~	53 (4.0)	581 (2.3)	45 (4.0)	558 (2.6)	9.8 (0.12)
Lithuania	2 (1.1)	~ ~	58 (3.7)	527 (3.9)	40 (3.8)	506 (3.9)	9.9 (0.10)
South Africa (9)	1 (0.5)	~ ~	27 (3.5)	386 (15.5)	72 (3.5)	344 (5.5)	8.7 (0.13)
Georgia	1 (0.6)	~ ~	57 (4.3)	446 (4.0)	42 (4.3)	440 (4.8)	9.9 (0.11)
Slovenia	1 (0.9)	~ ~	38 (4.6)	560 (4.4)	61 (4.5)	546 (3.1)	9.5 (0.11)
Hungary	1 (0.9)	~ ~	64 (3.9)	545 (3.8)	35 (3.9)	489 (7.0)	10.1 (0.10)
Norway (9)	1 (0.8)	~ ~	52 (4.1)	520 (4.2)	47 (4.0)	497 (3.2)	9.9 (0.12)
Botswana (9)	1 (0.0)	~ ~	12 (2.7)	440 (9.6)	88 (2.7)	385 (3.0)	7.7 (0.13)
Italy	1 (0.7)	~ ~	29 (3.6)	505 (5.1)	71 (3.7)	496 (3.4)	9.0 (0.12)
Morocco	0 (0.2)	~ ~	12 (1.8)	432 (10.1)	88 (1.8)	388 (2.6)	7.8 (0.10)
Russian Federation	0 (0.0)	~ ~	27 (3.1)	560 (5.7)	73 (3.1)	538 (5.4)	9.1 (0.08)
International Avg.	7 (0.3)	533 (3.0)	48 (0.6)	499 (1.0)	45 (0.5)	466 (0.9)	

Around 8% of heads of school in Malta reported that academic success is very highly emphasized. This is slightly above the international average (7%) and is comparable to United State (8%). The percentage of Maltese pupils attending schools which assign high emphasis on academic success (57%) is considerably higher than the international average (48%). 35% of heads of school claim medium emphasis on academic success and is well below the international average

(45%). The scale score that measures the school emphasis on academic success according to heads of school ranges from 11.6 (England) to 7.7 (Botswana). Malta's mean scale score (10.4) is well above the international average. Figures 6.1 and 6.2 show that the larger the emphasis the school makes on academic success the higher is the attainment in Mathematics and Science. The mean Mathematics scores of pupils attending schools that allocate 'Very high emphasis', 'High emphasis' and 'Medium emphasis' are 525, 506 and 463 respectively. The corresponding mean Science scores of Maltese pupils are 520, 497 and 444 respectively.

Figure 6.3: Score distribution for school emphasis on academic success (Heads of School)

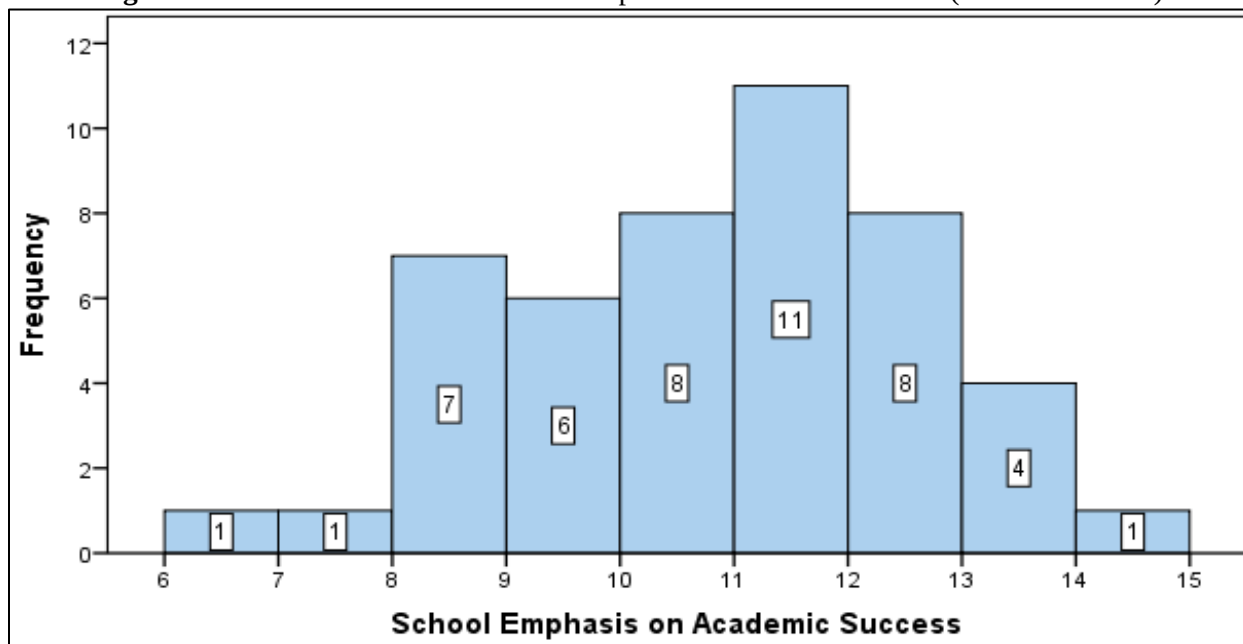


Figure 6.4: School emphasis on academic success by school type (Heads of School)

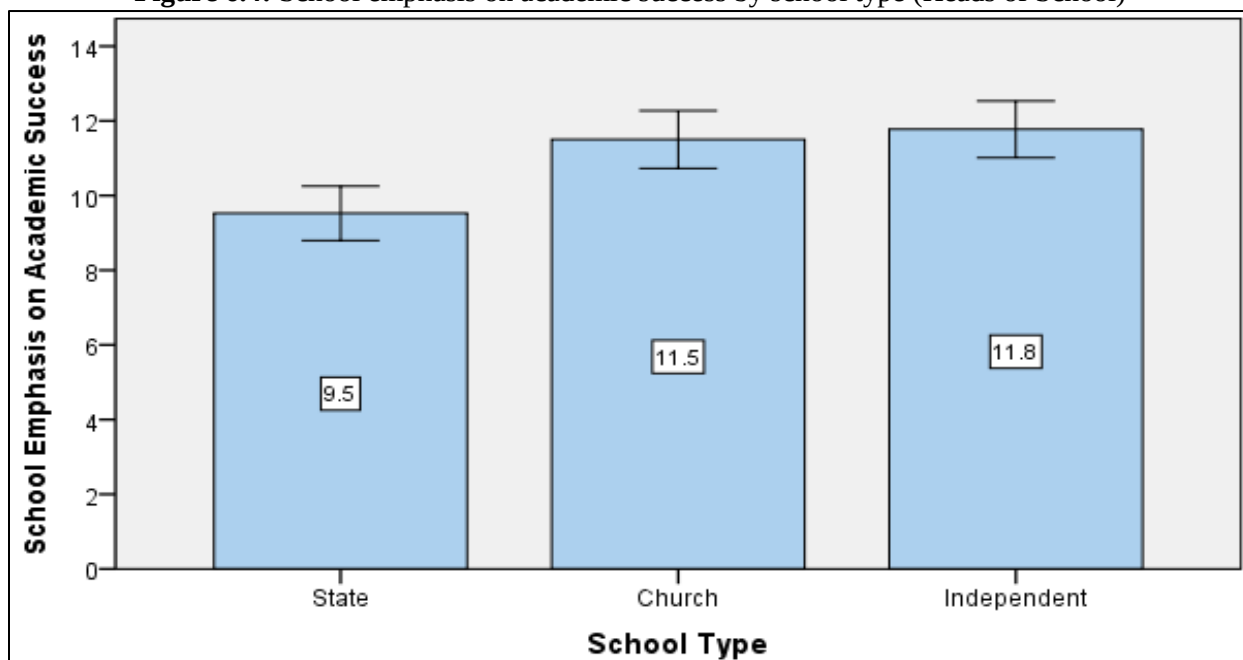


Figure 6.3 displays the score distribution of school emphasis on academic success and Figure 6.4 shows that according to heads of school the emphasis exerted by church and independent schools on academic success is significantly higher than state schools.

6.3 Emphasis on academic success and attainment (Teacher report)

A similar scale score was generated for School Emphasis on Academic Success by using Maltese Mathematics and Science teachers' responses to fourteen aspects shown in Tables 6.2 and 6.3.

Table 6.2: Responses of Mathematics teachers regarding the school emphasis on academic success

As a Mathematics teacher how would you characterize each of the following within your school?	Very high	High	Medium	Low	Very low
Teachers' understanding of the school's curricular goals	35.7%	48.8%	13.6%	1.9%	0.0%
Teachers' degree of success in implementing the school's curriculum	24.4%	54.5%	18.3%	2.3%	0.5%
Teachers' expectations for student achievement	23.0%	51.6%	21.1%	3.8%	0.5%
Teachers working together to improve student achievement	19.2%	45.1%	31.5%	2.8%	1.4%
Teachers' ability to inspire students	17.4%	55.9%	25.8%	0.5%	0.5%
Parental involvement in school activities	3.3%	28.2%	39.0%	23.0%	6.6%
Parental commitment to ensure students are ready to learn	2.8%	32.4%	43.2%	16.9%	4.7%
Parental expectations for student achievement	16.4%	45.1%	30.5%	5.6%	2.3%
Parental support for student achievement	4.7%	33.3%	44.6%	14.6%	2.8%
Parental pressure for the school to maintain high standards	15.0%	37.6%	33.8%	10.3%	3.3%
Students' desire to do well in school	8.9%	42.7%	38.0%	8.9%	1.4%
Students' ability to reach school's academic goals	6.1%	37.1%	49.3%	6.1%	1.4%
Students' respect for classmates who excel in school	8.9%	44.6%	39.0%	5.6%	1.9%
Collaboration between school leadership and teachers to plan instruction	13.6%	45.5%	33.8%	6.1%	0.9%

Table 6.3: Responses of Science teachers regarding school emphasis on academic success

As a Science teacher how would you characterize each of the following within your school?	Very high	High	Medium	Low	Very low
Teachers' understanding of the school's curricular goals	37.6%	48.4%	13.1%	0.5%	0.4%
Teachers' degree of success in implementing the school's curriculum	22.9%	54.7%	20.6%	1.3%	0.5%
Teachers' expectations for student achievement	24.0%	49.1%	24.7%	2.0%	0.2%
Teachers working together to improve student achievement	20.1%	48.0%	27.2%	4.3%	0.4%
Teachers' ability to inspire students	18.6%	55.4%	25.1%	0.9%	0.0%
Parental involvement in school activities	5.4%	19.7%	48.1%	20.8%	5.9%
Parental commitment to ensure students are ready to learn	6.1%	24.8%	46.4%	18.3%	4.3%
Parental expectations for student achievement	14.7%	36.3%	40.8%	6.5%	1.8%
Parental support for student achievement	5.6%	24.9%	53.2%	13.4%	2.9%
Parental pressure for the school to maintain high standards	14.0%	35.1%	38.4%	9.9%	2.7%
Students' desire to do well in school	9.0%	38.0%	45.7%	5.9%	1.4%
Students' ability to reach school's academic goals	4.5%	34.9%	51.3%	8.1%	1.3%
Students' respect for classmates who excel in school	6.3%	37.3%	44.3%	9.3%	2.7%
Collaboration between school leadership and teachers to plan instruction	16.3%	42.7%	31.5%	5.7%	3.8%

Schools where teachers reported a very high emphasis on academic success, had a score on the scale of at least 13.4 which corresponds to their teachers characterizing seven of the fourteen aspects as 'Very high' and the other seven as 'High', on average. Schools with a medium emphasis on academic success had a score no higher than 9.8 which corresponds to their teachers characterizing seven of the fourteen aspects as 'Medium' and the other seven as 'High,' on average. All other pupils attended schools with a high emphasis on academic success.

Figure 6.5: Emphasis on academic success and attainment in Mathematics (Mathematics teachers)

Country	Very High Emphasis		High Emphasis		Medium Emphasis		Average Scale Score
	Percent of Students	Average Achievement	Percent of Students	Average Achievement	Percent of Students	Average Achievement	
Qatar	18 (3.2)	472 (10.0)	58 (3.7)	444 (4.1)	25 (2.2)	395 (6.1)	11.4 (0.12)
Korea, Rep. of	16 (2.8)	620 (5.7)	57 (3.8)	611 (3.6)	27 (3.2)	587 (4.7)	11.2 (0.16)
United Arab Emirates	15 (1.4)	513 (7.4)	61 (2.4)	468 (3.7)	25 (2.2)	431 (7.3)	11.2 (0.09)
Ireland	12 (1.9)	538 (8.1)	61 (3.0)	535 (3.2)	27 (2.5)	490 (6.4)	11.0 (0.12)
Canada	11 (2.1)	551 (5.3)	55 (3.1)	535 (2.8)	34 (2.6)	516 (4.5)	10.7 (0.12)
Kazakhstan	10 (2.4)	566 (12.4)	71 (3.3)	528 (6.4)	18 (2.9)	507 (10.2)	11.3 (0.15)
Malaysia	10 (2.0)	504 (16.5)	69 (3.6)	467 (5.2)	21 (3.2)	448 (9.7)	11.1 (0.10)
England	9 (2.4)	568 (15.2)	54 (4.0)	528 (6.6)	37 (3.5)	487 (7.7)	10.5 (0.15)
Lebanon	9 (2.5)	463 (12.7)	33 (3.5)	460 (5.7)	58 (3.8)	429 (5.3)	9.8 (0.16)
Oman	9 (1.9)	423 (10.7)	46 (3.0)	413 (3.7)	45 (2.7)	389 (3.7)	10.3 (0.12)
Australia	8 (1.7)	543 (10.5)	48 (3.1)	523 (4.2)	44 (2.9)	484 (4.0)	10.2 (0.15)
South Africa (9)	7 (1.7)	407 (16.2)	37 (3.1)	389 (9.5)	56 (3.3)	358 (4.9)	9.7 (0.15)
Kuwait	6 (2.7)	488 (30.1)	45 (4.7)	394 (5.5)	49 (3.9)	377 (6.0)	10.0 (0.14)
United States	6 (1.2)	558 (11.2)	39 (2.9)	537 (4.8)	55 (3.0)	501 (4.0)	9.8 (0.13)
Thailand	6 (1.1)	455 (34.8)	52 (3.3)	445 (6.8)	43 (3.3)	411 (5.9)	10.2 (0.13)
Iran, Islamic Rep. of	6 (1.6)	513 (19.3)	42 (3.3)	454 (6.9)	53 (3.2)	415 (4.8)	9.7 (0.14)
Malta	5 (0.1)	531 (3.9)	55 (0.1)	503 (1.5)	40 (0.1)	477 (1.7)	10.3 (0.01)
Bahrain	5 (0.7)	495 (19.4)	54 (3.3)	466 (2.8)	41 (3.3)	434 (2.9)	10.3 (0.11)
New Zealand	4 (1.2)	531 (15.0)	59 (2.7)	500 (5.5)	37 (2.6)	478 (5.3)	10.5 (0.10)
Israel	4 (0.9)	533 (10.5)	58 (2.8)	533 (5.6)	38 (2.8)	473 (7.8)	10.4 (0.10)
Singapore	4 (1.1)	643 (22.9)	49 (2.8)	639 (4.9)	47 (2.6)	598 (5.4)	10.1 (0.08)
Turkey	4 (1.3)	547 (24.7)	28 (3.3)	481 (8.1)	68 (3.4)	443 (5.2)	9.2 (0.12)
Lithuania	3 (1.9)	548 (12.8)	58 (4.3)	520 (4.3)	39 (4.0)	493 (4.3)	10.3 (0.11)
Georgia	3 (1.3)	446 (33.5)	57 (4.3)	463 (4.5)	40 (4.3)	440 (5.6)	10.3 (0.12)
Chile	3 (1.3)	495 (14.1)	35 (4.2)	450 (7.4)	62 (4.3)	415 (4.8)	9.2 (0.18)
Egypt	3 (1.2)	443 (32.8)	39 (3.5)	404 (6.6)	59 (3.6)	381 (5.5)	9.6 (0.14)
Chinese Taipei	2 (1.2)	~ ~	45 (3.7)	620 (4.2)	53 (3.5)	579 (3.8)	9.9 (0.13)
Saudi Arabia	2 (0.7)	~ ~	38 (4.4)	372 (7.7)	60 (4.5)	359 (4.7)	9.6 (0.17)
Morocco	2 (0.8)	~ ~	8 (1.5)	411 (8.7)	90 (1.7)	381 (2.3)	7.7 (0.12)
Botswana (9)	1 (0.7)	~ ~	17 (3.5)	419 (6.5)	82 (3.5)	384 (2.4)	8.6 (0.14)
Italy	1 (0.7)	~ ~	32 (3.5)	500 (5.5)	67 (3.6)	492 (2.9)	9.1 (0.11)
Hong Kong SAR	1 (0.8)	~ ~	40 (3.9)	626 (5.6)	59 (3.9)	572 (5.8)	9.5 (0.13)
Jordan	1 (0.9)	~ ~	36 (3.5)	402 (6.4)	63 (3.6)	376 (4.3)	9.4 (0.13)
Norway (9)	1 (0.9)	~ ~	50 (3.4)	520 (3.3)	49 (3.5)	505 (2.8)	9.9 (0.09)
Hungary	1 (0.8)	~ ~	36 (3.4)	550 (5.4)	63 (3.3)	492 (4.4)	9.4 (0.12)
Japan	1 (0.7)	~ ~	46 (3.5)	601 (2.9)	53 (3.5)	574 (3.4)	9.6 (0.11)
Slovenia	1 (0.2)	~ ~	42 (3.4)	519 (4.1)	58 (3.4)	514 (2.5)	9.7 (0.08)
Russian Federation	0 (0.4)	~ ~	35 (3.7)	552 (6.9)	64 (3.8)	529 (5.0)	9.5 (0.09)
Sweden	0 (0.3)	~ ~	42 (3.8)	513 (4.5)	58 (3.8)	491 (3.9)	9.6 (0.10)
International Avg.	5 (0.2)	515 (3.6)	46 (0.5)	495 (0.9)	49 (0.5)	464 (0.8)	

Figure 6.6: Emphasis on academic success and attainment in Science (Science teachers)

Country	Very High Emphasis		High Emphasis		Medium Emphasis		Average Scale Score
	Percent of Students	Average Achievement	Percent of Students	Average Achievement	Percent of Students	Average Achievement	
United Arab Emirates	14 (1.7)	520 (7.4)	61 (2.5)	487 (3.9)	25 (1.8)	425 (5.6)	11.3 (0.08)
Korea, Rep. of	13 (2.7)	566 (6.1)	61 (3.8)	558 (2.8)	26 (3.5)	545 (3.2)	11.2 (0.17)
Qatar	12 (2.4)	490 (20.1)	62 (3.5)	461 (5.2)	26 (2.5)	428 (6.9)	11.0 (0.09)
Ireland	11 (1.8)	546 (6.7)	63 (2.9)	541 (2.6)	26 (2.6)	504 (6.4)	11.1 (0.13)
Kazakhstan	10 (1.8)	536 (12.3)	74 (2.5)	533 (5.1)	17 (2.2)	528 (9.7)	11.3 (0.11)
Canada	10 (1.9)	544 (7.9)	52 (3.4)	533 (3.0)	39 (3.3)	515 (4.0)	10.7 (0.13)
South Africa (9)	9 (2.8)	439 (22.5)	39 (3.4)	363 (8.4)	52 (3.5)	339 (6.9)	10.0 (0.19)
Malaysia	9 (1.9)	481 (16.9)	68 (3.3)	474 (5.0)	24 (3.2)	447 (11.2)	11.1 (0.12)
Oman	9 (2.3)	472 (6.9)	47 (3.9)	456 (4.6)	45 (3.6)	449 (4.7)	10.2 (0.15)
Bahrain	8 (1.5)	521 (8.3)	50 (3.2)	475 (4.0)	42 (3.3)	447 (5.0)	10.3 (0.09)
England	8 (1.3)	575 (12.0)	52 (2.7)	549 (5.9)	40 (2.7)	516 (6.8)	10.5 (0.13)
Chinese Taipei	6 (1.8)	599 (9.6)	38 (3.9)	588 (4.1)	56 (3.9)	554 (3.0)	9.9 (0.14)
Australia	6 (1.4)	548 (10.9)	45 (3.1)	526 (4.5)	49 (3.2)	501 (3.3)	9.9 (0.14)
Malta	6 (0.2)	501 (5.3)	50 (0.4)	498 (2.0)	45 (0.4)	459 (2.0)	10.2 (0.01)
United States	5 (1.2)	582 (7.9)	45 (3.1)	543 (4.9)	50 (3.2)	517 (4.3)	10.0 (0.13)
Kuwait	5 (1.5)	476 (37.6)	45 (4.1)	424 (8.0)	51 (4.0)	389 (6.9)	10.0 (0.14)
Israel	4 (1.4)	529 (15.8)	53 (3.2)	523 (5.9)	43 (3.4)	487 (6.1)	10.3 (0.12)
Thailand	4 (1.5)	498 (29.1)	53 (3.7)	463 (5.8)	44 (3.7)	443 (6.0)	10.3 (0.12)
New Zealand	4 (1.5)	541 (24.7)	53 (3.4)	533 (3.7)	43 (3.5)	491 (5.1)	10.3 (0.14)
Singapore	4 (1.1)	629 (18.1)	53 (2.7)	621 (4.7)	43 (2.7)	564 (5.7)	10.3 (0.08)
Japan	4 (1.3)	579 (14.3)	36 (3.9)	584 (3.2)	60 (3.9)	563 (2.2)	9.6 (0.12)
Norway (9)	4 (1.9)	550 (14.2)	48 (4.3)	514 (4.2)	48 (4.0)	503 (3.3)	10.0 (0.11)
Saudi Arabia	4 (1.7)	431 (29.8)	42 (4.4)	410 (7.9)	55 (4.4)	384 (6.0)	9.5 (0.17)
Iran, Islamic Rep. of	3 (1.2)	526 (16.7)	44 (3.3)	479 (6.2)	52 (3.4)	433 (3.8)	9.8 (0.13)
Egypt	3 (1.2)	441 (20.2)	37 (3.6)	391 (6.8)	60 (3.9)	354 (5.7)	9.5 (0.14)
Chile	3 (1.5)	527 (34.7)	38 (4.2)	472 (6.9)	59 (4.4)	443 (5.0)	9.6 (0.16)
Georgia	3 (0.8)	466 (10.6)	52 (2.6)	452 (3.6)	45 (2.7)	432 (4.2)	10.2 (0.08)
Lebanon	3 (1.1)	402 (28.3)	48 (4.3)	414 (10.2)	49 (4.2)	380 (7.7)	9.9 (0.16)
Turkey	3 (1.1)	565 (27.8)	32 (3.7)	525 (6.8)	66 (3.8)	475 (4.1)	9.1 (0.14)
Jordan	2 (0.9)	~ ~	36 (3.4)	450 (5.5)	62 (3.3)	411 (4.2)	9.5 (0.12)
Sweden	2 (1.0)	~ ~	39 (3.6)	535 (4.8)	58 (3.7)	512 (4.3)	9.6 (0.15)
Lithuania	2 (0.6)	~ ~	57 (2.5)	522 (2.9)	40 (2.5)	514 (3.9)	10.2 (0.08)
Botswana (9)	2 (1.1)	~ ~	18 (3.3)	429 (8.2)	80 (3.4)	386 (3.1)	8.7 (0.14)
Hong Kong SAR	2 (1.4)	~ ~	42 (4.1)	562 (5.6)	56 (4.3)	531 (4.6)	9.6 (0.15)
Italy	1 (0.7)	~ ~	34 (3.7)	501 (5.6)	65 (3.8)	498 (3.1)	9.2 (0.12)
Morocco	1 (0.4)	~ ~	11 (1.7)	423 (6.2)	88 (1.8)	389 (2.5)	7.8 (0.10)
Slovenia	1 (0.3)	~ ~	41 (2.4)	556 (3.4)	58 (2.4)	548 (2.5)	9.7 (0.07)
Hungary	1 (0.3)	~ ~	38 (2.7)	550 (4.5)	62 (2.8)	511 (3.9)	9.5 (0.09)
Russian Federation	1 (0.3)	~ ~	35 (2.5)	559 (4.0)	64 (2.5)	536 (4.9)	9.5 (0.06)
International Avg.	5 (0.2)	520 (3.5)	46 (0.5)	499 (0.9)	49 (0.5)	471 (0.8)	

The proportions of Mathematics and Science teachers reporting that their schools exert ‘Very high emphasis’, ‘High’ and ‘Medium emphasis’ to academic success are around 5%, 46% and 49% respectively. These proportions are similar to those provided by Maltese Mathematics teachers (5%, 55% and 40%) and Maltese Science teachers (6%, 50% and 44%). In Mathematics, the scale score that measures school emphasis on academic success according to teachers ranges from

11.4 (Qatar) to about 9.1 (Italy), where Malta's mean scale score (10.3) is above the international average. In Science, the scale score ranges from 11.4 (United Arab Emirates) to about 9.1 (Turkey), where Malta's mean scale score (10.2) is above the international average. Figures 6.5 and 6.6 show that the emphasis placed on academic success is positively related to the attainment in Mathematics and Science. The mean scores of students attending schools that allocate 'Very high emphasis', 'High emphasis' and 'Medium emphasis' are respectively 515, 495 and 464 in Mathematics and 520, 499 and 471 in Science. The corresponding mean scores of Maltese students are respectively 531, 503 and 477 in Mathematics and 501, 498 and 459 in Science.

Figure 6.7: School emphasis on academic success by school type (Mathematics teachers)

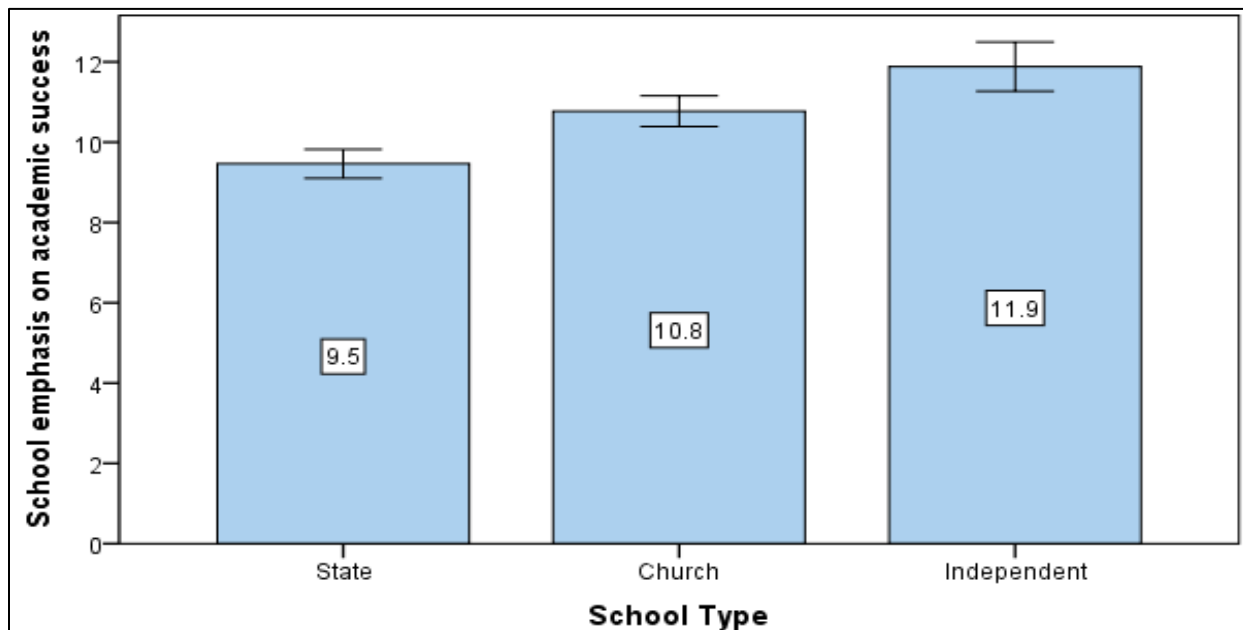
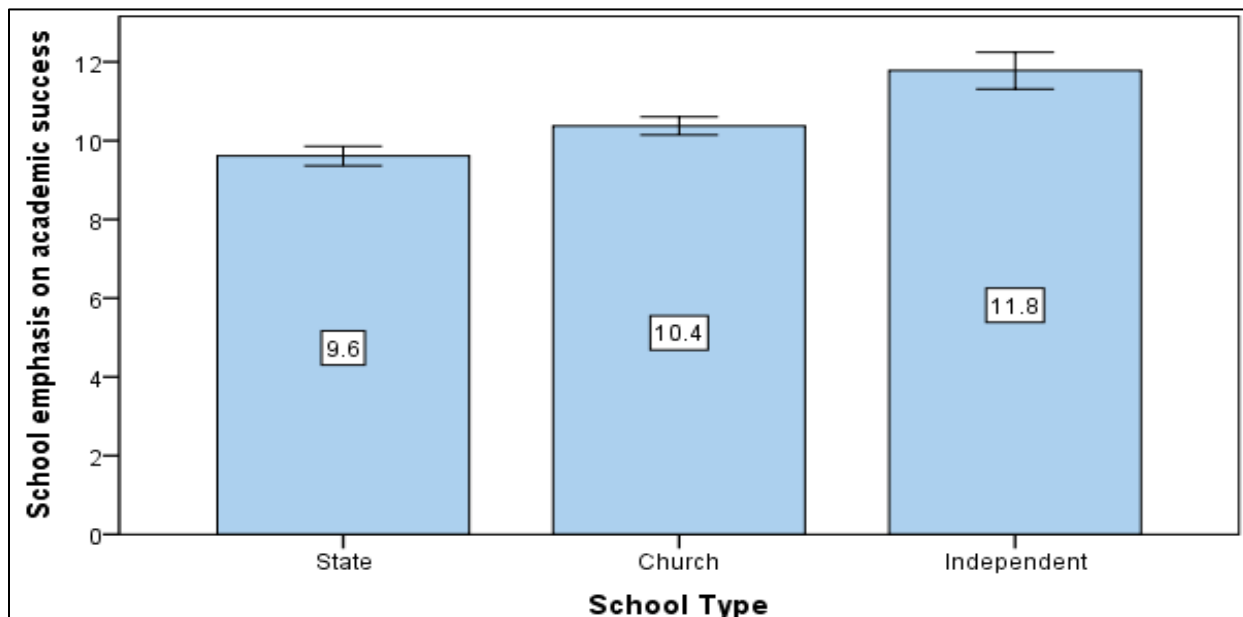


Figure 6.8: School emphasis on academic success by school type (Science teachers)



Figures 6.7 and 6.8 show that according to Maltese mathematics and science teachers the emphasis exerted by independent schools on academic success is significantly higher than church schools, which in turn is significantly higher than state schools.

6.4 Teacher Job Satisfaction

A scale score was generated for teacher job satisfaction by using Mathematics and Science teachers' responses to the seven aspects displayed in Tables 6.4 and 6.5.

Table 6.4: Responses of Maltese Mathematics teachers to job satisfaction

How often do you feel the following way about being a Mathematics teacher?	Very often	Often	Sometimes	Almost never
I am content with my profession as a teacher	54.5%	33.3%	12.2%	0.0%
I am satisfied with being a teacher at this school	50.2%	31.5%	16.0%	2.3%
I find my work full of meaning and purpose	41.3%	39.0%	19.2%	0.5%
I am enthusiastic about my job	46.7%	39.2%	13.7%	0.5%
My work inspires me	45.8%	36.3%	17.5%	0.5%
I am proud of the work I do	60.1%	27.7%	11.7%	0.5%
I am going to continue teaching for as long as I can	45.3%	31.6%	19.3%	3.8%

Table 6.5: Responses of Maltese Science teachers to job satisfaction

How often do you feel the following way about being a Science teacher?	Very often	Often	Sometimes	Almost never
I am content with my profession as a teacher	49.4%	37.2%	12.0%	1.4%
I am satisfied with being a teacher at this school	48.0%	35.5%	14.5%	2.0%
I find my work full of meaning and purpose	41.5%	42.6%	14.0%	2.0%
I am enthusiastic about my job	47.4%	36.9%	14.1%	1.6%
My work inspires me	39.9%	43.6%	14.5%	2.0%
I am proud of the work I do	49.9%	42.0%	6.4%	1.6%
I am going to continue teaching for as long as I can	39.8%	36.2%	18.6%	5.4%

Students were scored according to how often their teachers responded positively to the seven statements on the teacher job. Students with very satisfied teachers had a score on the scale of at least 10.3, which corresponds to their teachers responding 'Very Often' to four of the seven statements and responding 'Often' to the other three, on average. Students with less than satisfied teachers had a score no higher than 7, which corresponds to their teachers responding 'Sometimes' to four of the seven statements and 'Often' to the other three, on average. All other students had satisfied teachers.

The proportions of teachers reporting that they are 'Very Satisfied', 'Satisfied' and 'Less than satisfied' are respectively 50%, 43% and 7% for mathematics and 49%, 42% and 9% for science. The corresponding proportions of Maltese teachers are 45%, 44% and 11% for mathematics and 44%, 43% and 13% for science. For mathematics teachers, the scale score that measures job satisfaction ranges from 11.2 (Egypt and Qatar) to 9.0 (Japan), where Malta's mean scale score (9.9) is below the international average (10.0). For science teachers, the scale score that measures job

satisfaction ranges from 11.0 (Egypt, Lebanon and Chile) to 8.7 (Japan), where Malta's mean scale score (9.6) is below the international average (10.0). Figures 6.9 and 6.10 clearly show that students tend to attain better results in Mathematics and Science when their teachers are satisfied with their job. The mean scores of students taught by teachers who are 'Very satisfied', 'Satisfied' and 'Less than satisfied' with their job are respectively 486, 478 and 480 in Mathematics and 492, 483 and 478 in Science. The corresponding mean scores of Maltese students are respectively 500, 499 and 452 in Mathematics and 498, 475 and 443 in Science.

Figure 6.9: Teacher job satisfaction and attainment in Mathematics (Mathematics teachers)

Country	Very Satisfied		Satisfied		Less than Satisfied		Average Scale Score
	Percent of Students	Average Achievement	Percent of Students	Average Achievement	Percent of Students	Average Achievement	
Egypt	80 (3.4)	396 (4.5)	16 (3.0)	377 (10.4)	4 (1.4)	381 (24.1)	11.2 (0.13)
Qatar	74 (3.3)	437 (4.1)	23 (3.5)	428 (8.3)	3 (1.1)	518 (37.6)	11.2 (0.12)
Kuwait	69 (4.0)	393 (6.1)	29 (4.0)	392 (10.4)	1 (0.8)	~ ~	10.8 (0.13)
Chile	66 (4.1)	435 (4.8)	33 (4.0)	422 (6.3)	1 (0.8)	~ ~	10.7 (0.15)
Israel	66 (2.6)	514 (6.0)	31 (2.5)	505 (8.3)	3 (0.7)	493 (14.2)	10.8 (0.10)
Thailand	66 (3.5)	435 (5.9)	33 (3.4)	425 (7.2)	1 (0.9)	~ ~	10.7 (0.12)
United Arab Emirates	64 (2.6)	463 (3.6)	31 (2.5)	473 (6.0)	5 (1.0)	458 (13.2)	10.7 (0.10)
Lebanon	63 (4.2)	447 (4.8)	33 (4.2)	430 (7.2)	4 (1.6)	472 (19.2)	10.6 (0.13)
Georgia	62 (4.4)	458 (4.3)	37 (4.3)	447 (6.1)	2 (1.1)	~ ~	10.5 (0.15)
Bahrain	61 (3.3)	457 (2.8)	34 (3.5)	448 (4.8)	5 (1.7)	466 (15.7)	10.5 (0.12)
Oman	61 (3.3)	407 (3.7)	33 (3.2)	397 (4.9)	6 (1.7)	395 (8.1)	10.4 (0.12)
Kazakhstan	59 (4.1)	532 (6.7)	40 (4.1)	523 (8.4)	1 (0.4)	~ ~	10.6 (0.11)
Iran, Islamic Rep. of	58 (3.5)	437 (5.7)	36 (3.7)	440 (8.1)	6 (1.6)	409 (10.4)	10.4 (0.11)
Ireland	58 (2.9)	532 (4.1)	36 (2.5)	514 (5.0)	6 (1.4)	498 (12.8)	10.4 (0.12)
Canada	57 (2.8)	527 (2.5)	38 (2.7)	539 (3.3)	5 (1.1)	500 (13.2)	10.4 (0.10)
Saudi Arabia	56 (4.6)	370 (6.3)	41 (4.5)	363 (6.5)	3 (1.3)	365 (13.5)	10.4 (0.15)
Malaysia	56 (3.8)	465 (5.6)	43 (3.7)	468 (6.8)	1 (0.8)	~ ~	10.4 (0.13)
Jordan	50 (3.8)	389 (5.4)	42 (3.5)	386 (5.5)	8 (2.0)	364 (9.3)	10.0 (0.16)
Australia	50 (3.6)	514 (4.2)	39 (3.4)	504 (5.6)	11 (2.1)	496 (8.1)	9.9 (0.15)
South Africa (9)	48 (3.4)	380 (7.3)	43 (3.4)	363 (6.4)	9 (2.0)	373 (18.0)	9.9 (0.14)
Chinese Taipei	48 (4.0)	608 (4.4)	43 (4.0)	592 (4.7)	9 (2.3)	588 (12.3)	9.8 (0.16)
Norway (9)	47 (3.7)	512 (3.0)	47 (3.8)	512 (3.9)	6 (1.7)	514 (6.9)	10.1 (0.15)
Turkey	46 (3.7)	470 (6.4)	45 (3.9)	449 (7.2)	10 (1.6)	439 (10.8)	9.7 (0.12)
Malta	45 (0.1)	500 (1.5)	44 (0.1)	499 (1.7)	11 (0.1)	452 (3.1)	9.9 (0.01)
United States	44 (2.9)	520 (4.7)	42 (2.9)	516 (4.9)	14 (1.9)	518 (7.1)	9.8 (0.13)
New Zealand	43 (3.4)	494 (5.3)	47 (3.8)	497 (6.2)	10 (1.6)	472 (15.7)	9.7 (0.11)
Morocco	42 (3.4)	393 (3.3)	51 (3.3)	378 (3.0)	7 (1.6)	378 (7.6)	9.7 (0.13)
Slovenia	40 (2.9)	517 (3.2)	55 (2.8)	516 (3.1)	5 (1.3)	521 (8.3)	9.8 (0.10)
Russian Federation	39 (3.6)	548 (5.6)	55 (3.5)	535 (5.9)	6 (1.6)	502 (12.6)	9.7 (0.15)
Korea, Rep. of	38 (3.1)	604 (4.2)	53 (3.7)	606 (4.2)	10 (2.0)	609 (8.0)	9.5 (0.15)
Botswana (9)	36 (4.1)	395 (4.4)	51 (4.5)	388 (3.2)	13 (2.9)	394 (5.9)	9.3 (0.15)
Italy	34 (4.0)	501 (4.4)	56 (4.1)	487 (3.7)	10 (2.5)	502 (6.4)	9.4 (0.16)
Lithuania	33 (4.0)	522 (6.7)	53 (4.1)	503 (3.7)	13 (3.2)	511 (8.6)	9.3 (0.17)
Sweden	32 (4.1)	497 (5.2)	56 (4.1)	502 (4.0)	11 (3.5)	501 (6.4)	9.3 (0.19)
Hungary	31 (3.4)	528 (6.1)	59 (3.6)	510 (5.5)	10 (2.2)	497 (11.2)	9.3 (0.14)
Hong Kong SAR	31 (4.0)	612 (8.6)	60 (3.8)	587 (6.7)	10 (2.1)	562 (17.2)	9.4 (0.16)
Singapore	31 (2.4)	631 (7.6)	56 (2.8)	616 (4.7)	14 (1.9)	612 (11.1)	9.2 (0.11)
England	29 (4.0)	523 (9.2)	57 (4.5)	517 (7.4)	14 (2.7)	505 (14.2)	9.1 (0.15)
Japan	26 (3.4)	583 (4.6)	58 (3.7)	588 (3.3)	16 (2.9)	585 (6.2)	9.0 (0.16)
International Avg.	50 (0.6)	486 (0.8)	43 (0.6)	478 (1.0)	7 (0.3)	480 (2.4)	

Figure 6.10: Teacher job satisfaction and attainment in Science (Science teachers)

Country	Very Satisfied		Satisfied		Less than Satisfied		Average Scale Score
	Percent of Students	Average Achievement	Percent of Students	Average Achievement	Percent of Students	Average Achievement	
Egypt	78 (3.2)	377 (4.8)	21 (3.2)	349 (11.2)	2 (0.9)	~ ~	11.0 (0.12)
Lebanon	75 (3.1)	402 (6.4)	23 (3.0)	383 (10.4)	2 (0.7)	~ ~	11.0 (0.12)
Chile	74 (3.6)	455 (4.8)	22 (3.4)	466 (7.2)	4 (1.7)	425 (17.8)	11.0 (0.14)
Qatar	73 (2.9)	450 (4.4)	27 (2.9)	472 (7.2)	0 (0.0)	~ ~	10.9 (0.10)
United Arab Emirates	65 (2.2)	483 (4.1)	32 (2.2)	464 (6.4)	3 (0.7)	441 (14.7)	10.7 (0.08)
Thailand	65 (4.1)	461 (5.2)	32 (3.8)	447 (6.8)	3 (1.4)	443 (21.9)	10.7 (0.15)
Iran, Islamic Rep. of	64 (3.1)	465 (4.5)	28 (3.1)	443 (6.5)	8 (2.1)	435 (8.6)	10.5 (0.13)
Oman	64 (3.3)	454 (3.7)	27 (2.7)	458 (5.5)	9 (2.4)	455 (11.3)	10.5 (0.15)
Israel	63 (3.0)	505 (5.6)	33 (2.9)	520 (7.1)	4 (1.1)	459 (18.3)	10.6 (0.11)
Kuwait	62 (4.4)	414 (7.1)	30 (4.3)	414 (12.6)	7 (2.5)	361 (24.9)	10.5 (0.19)
Malaysia	61 (4.0)	465 (5.9)	37 (4.0)	473 (7.6)	3 (1.1)	449 (39.1)	10.5 (0.15)
Saudi Arabia	61 (4.2)	410 (5.8)	33 (4.1)	378 (8.0)	7 (2.2)	366 (18.5)	10.4 (0.16)
Kazakhstan	57 (3.1)	529 (5.3)	42 (3.1)	537 (6.1)	1 (0.3)	~ ~	10.5 (0.10)
South Africa (9)	56 (3.5)	368 (8.1)	32 (2.9)	352 (9.8)	12 (2.2)	324 (11.2)	10.1 (0.14)
Ireland	55 (3.2)	539 (3.1)	37 (2.6)	521 (4.8)	8 (1.8)	532 (11.2)	10.2 (0.14)
Canada	55 (3.2)	528 (3.6)	41 (3.0)	528 (3.3)	4 (1.0)	518 (9.3)	10.4 (0.12)
Georgia	54 (2.5)	446 (3.3)	42 (2.4)	443 (4.0)	4 (0.8)	426 (8.1)	10.3 (0.08)
Morocco	53 (2.7)	399 (3.6)	41 (2.4)	387 (3.1)	6 (1.1)	392 (5.5)	10.1 (0.10)
Norway (9)	49 (3.9)	508 (3.8)	46 (3.9)	512 (4.3)	6 (2.0)	512 (8.5)	10.1 (0.16)
Bahrain	47 (3.5)	473 (4.3)	44 (3.7)	462 (3.6)	9 (2.2)	464 (10.9)	10.1 (0.12)
United States	46 (3.0)	537 (5.5)	43 (2.7)	529 (4.1)	11 (1.7)	532 (8.8)	9.9 (0.13)
Jordan	45 (3.5)	440 (4.7)	42 (3.3)	418 (5.4)	13 (2.4)	403 (7.8)	9.7 (0.15)
Turkey	44 (3.5)	509 (5.6)	45 (3.0)	482 (6.0)	12 (2.5)	480 (12.3)	9.7 (0.14)
Australia	44 (3.0)	524 (4.3)	41 (2.8)	508 (3.9)	15 (2.4)	513 (5.9)	9.6 (0.14)
Malta	44 (0.4)	498 (2.4)	43 (0.4)	475 (1.8)	13 (0.2)	443 (3.5)	9.6 (0.02)
Chinese Taipei	42 (3.5)	575 (3.6)	43 (3.4)	565 (3.6)	15 (2.5)	564 (7.1)	9.6 (0.17)
Slovenia	42 (2.2)	551 (3.4)	51 (2.1)	551 (2.6)	8 (1.3)	553 (5.5)	9.8 (0.09)
New Zealand	40 (3.8)	520 (4.9)	47 (3.8)	511 (4.9)	13 (2.3)	514 (8.2)	9.6 (0.16)
Korea, Rep. of	39 (3.6)	557 (3.0)	49 (3.9)	555 (3.0)	12 (2.4)	555 (7.3)	9.5 (0.14)
Italy	36 (4.1)	505 (4.7)	54 (4.3)	491 (4.2)	10 (2.6)	507 (6.1)	9.5 (0.17)
Hong Kong SAR	34 (4.1)	562 (7.1)	48 (5.0)	541 (5.4)	19 (3.7)	523 (10.0)	9.1 (0.18)
Singapore	33 (2.9)	604 (6.6)	54 (3.0)	594 (5.7)	13 (1.8)	590 (11.6)	9.3 (0.13)
Russian Federation	33 (2.3)	544 (5.1)	62 (2.3)	545 (4.6)	6 (1.0)	534 (7.2)	9.5 (0.09)
Botswana (9)	32 (4.0)	402 (6.1)	46 (4.6)	387 (4.7)	22 (3.4)	395 (6.2)	8.9 (0.18)
Hungary	31 (2.4)	540 (5.0)	59 (2.5)	523 (3.9)	10 (1.5)	503 (12.7)	9.3 (0.10)
Sweden	30 (4.0)	523 (7.0)	58 (3.8)	524 (3.9)	12 (3.5)	517 (10.0)	9.2 (0.20)
Lithuania	28 (1.9)	519 (3.7)	57 (2.3)	519 (3.2)	16 (1.8)	520 (4.9)	9.1 (0.09)
England	27 (2.3)	550 (7.3)	52 (2.5)	539 (5.8)	21 (2.5)	521 (7.7)	8.8 (0.12)
Japan	19 (3.0)	580 (3.8)	61 (3.8)	570 (2.3)	20 (3.0)	563 (3.7)	8.7 (0.14)
International Avg.	49 (0.5)	492 (0.8)	42 (0.5)	483 (1.0)	9 (0.3)	478 (2.2)	

Figures 6.11 and 6.12 show that job satisfaction of mathematics and science teachers in church schools is higher than independent schools, which in turn is higher than state schools. Table 6.6 shows that female mathematics and science teachers have higher job satisfaction scores than their male counterparts and the difference is significant in Mathematics.

Figure 6.11: Teacher Job Satisfaction by school type (Mathematics teachers)

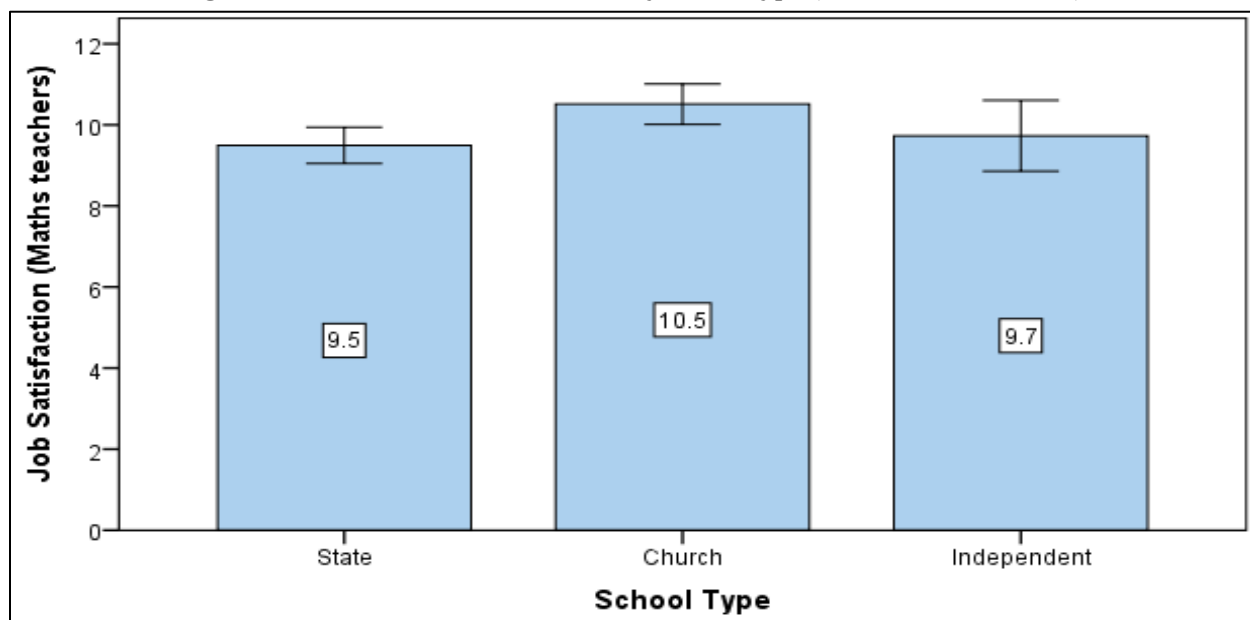


Figure 6.12: Teacher Job Satisfaction by school type (Science teachers)

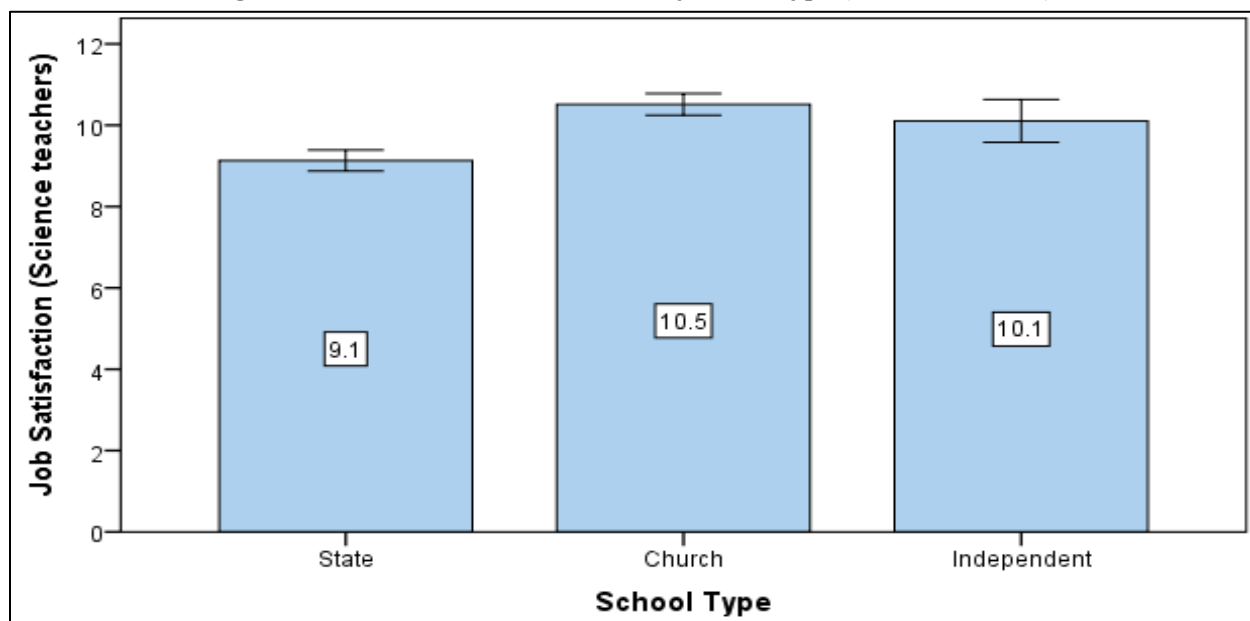


Table 6.6: Mean job satisfaction scores for mathematics and science teachers by gender

		Sample size	Mean Score	Std. Deviation	P-value
Gender of Mathematics teacher	Female	137	10.10	2.283	0.038
	Male	76	9.40	2.433	
Gender of Science teacher	Female	389	9.81	2.205	0.082
	Male	170	9.45	2.287	

6.5 Challenges Facing Teachers at School

A scale score was generated for challenges faced by teachers by using Mathematics and Science teachers' responses to the eight aspects displayed in Tables 6.7 and 6.8.

Table 6.7: Responses of Maltese Mathematics teachers to challenges faced by them at school

Indicate the extent to which you agree or disagree with each of the following statements	Agree a lot	Agree a little	Disagree a little	Disagree a lot
There are too many students in the classes	23.5%	44.6%	19.2%	12.7%
I have too much material to cover in class	50.2%	35.2%	10.8%	3.8%
I have too many teaching hours	16.4%	39.0%	30.5%	14.1%
I need more time to prepare for class	31.9%	43.2%	21.6%	3.3%
I need more time to assist individual students	60.4%	32.1%	6.6%	0.9%
I feel too much pressure from parents	6.2%	32.7%	42.2%	19.0%
I have difficulty keeping up with all of the changes to the curriculum	9.9%	35.8%	36.3%	17.9%
I have too many administrative tasks	16.9%	36.2%	31.5%	15.5%

Table 6.8: Responses of Maltese Science teachers to challenges faced by them at school

Indicate the extent to which you agree or disagree with each of the following statements	Agree a lot	Agree a little	Disagree a little	Disagree a lot
There are too many students in the classes	12.4%	35.8%	26.2%	25.6%
I have too much material to cover in class	51.2%	37.9%	9.3%	1.6%
I have too many teaching hours	14.5%	38.8%	34.3%	12.4%
I need more time to prepare for class	33.0%	47.0%	16.3%	3.8%
I need more time to assist individual students	53.9%	40.4%	4.7%	1.1%
I feel too much pressure from parents	4.8%	25.7%	43.6%	25.9%
I have difficulty keeping up with all of the changes to the curriculum	15.3%	27.8%	40.0%	16.9%
I have too many administrative tasks	16.1%	41.7%	26.3%	15.9%

Students were scored according to their teachers' responses concerning eight challenging conditions on the challenges faced by teachers at school. Students whose teachers faced few challenges had a score on the scale of at least 10.3, which corresponds to their teachers 'Disagreeing a little' with four of eight statements and 'Agreeing a little' with the other four, on average. Students whose teachers faced many challenges had a score no higher than 6.7, which corresponds to their teachers reporting 'Agreeing a lot' with four of eight statements and 'Agreeing a little' with the other four, on average. All other students had teachers that reported facing some challenges.

The proportions of teachers reporting that they face 'Few challenges', 'Some challenges' and 'Many challenges' are respectively 45%, 50% and 5% for mathematics and 45%, 49% and 6% for science. The corresponding proportions of Maltese teachers are 28%, 59% and 13% for mathematics and 37%, 52% and 11% for science. Figures 6.13 shows that, for mathematics teachers, the scale score that measures challenges faced at school ranges from 9.0 (Korea) to 11.6 (Georgia and Lebanon). Malta's mean scale score (9.1) is significantly below the international average (10) indicating that the challenges faced by Mathematics teachers are considerable compared to other countries. Figures 6.14 shows similar results for science teachers, where the scale score measuring challenges faced at school ranges from 8.5 (England and Korea) to 11.7 (Georgia). Malta's mean

scale score (9.4) is below the international average. These two figures show that there is a weak relationship between the challenges faced by teachers at school and students' attainment in mathematics and science. The mean scores of students taught by teachers who face 'Few challenges', 'Some challenges' and 'Many challenges' at school are respectively 486, 476 and 481 in Mathematics and 487, 481 and 473 in Science. The corresponding mean scores of Maltese students are respectively 478, 499 and 509 in Mathematics and 489, 479 and 459 in Science.

Figure 6.13: Challenges faced at school and attainment in Mathematics (Mathematics teachers)

Country	Few Challenges		Some Challenges		Many Challenges		Average Scale Score
	Percent of Students	Average Achievement	Percent of Students	Average Achievement	Percent of Students	Average Achievement	
Georgia	84 (3.4)	454 (3.9)	16 (3.4)	452 (8.0)	1 (0.6)	~ ~	11.6 (0.15)
Russian Federation	73 (3.4)	541 (4.6)	27 (3.4)	530 (8.4)	0 (0.0)	~ ~	11.0 (0.11)
Lithuania	72 (4.0)	509 (3.9)	27 (4.0)	515 (5.8)	1 (0.6)	~ ~	11.0 (0.12)
Turkey	72 (3.5)	456 (5.8)	27 (3.4)	462 (9.0)	1 (0.6)	~ ~	11.4 (0.15)
Lebanon	67 (4.1)	445 (5.4)	32 (4.1)	435 (6.9)	1 (0.5)	~ ~	11.6 (0.22)
Kazakhstan	67 (3.7)	533 (5.5)	33 (3.7)	518 (9.8)	0 (0.4)	~ ~	10.7 (0.10)
Qatar	65 (3.9)	440 (5.3)	33 (3.7)	430 (7.0)	2 (0.8)	~ ~	10.8 (0.15)
Italy	60 (3.4)	490 (3.8)	40 (3.4)	499 (4.6)	0 (0.4)	~ ~	10.5 (0.12)
Chinese Taipei	59 (3.8)	599 (3.9)	39 (3.9)	599 (5.1)	2 (0.9)	~ ~	10.5 (0.13)
Kuwait	58 (4.0)	395 (7.6)	40 (3.9)	390 (7.7)	2 (1.2)	~ ~	10.4 (0.16)
Japan	56 (3.5)	587 (3.5)	40 (3.4)	584 (4.4)	4 (1.4)	602 (5.8)	10.2 (0.11)
United Arab Emirates	52 (2.7)	475 (4.3)	45 (2.7)	454 (4.7)	3 (0.8)	469 (13.4)	10.5 (0.13)
Morocco	48 (3.1)	388 (3.5)	50 (3.1)	381 (2.9)	1 (0.6)	~ ~	10.2 (0.10)
Jordan	48 (3.1)	389 (4.9)	46 (3.2)	381 (4.0)	7 (1.9)	391 (21.3)	10.0 (0.12)
Israel	47 (2.6)	507 (6.0)	48 (2.6)	516 (7.7)	5 (1.2)	490 (19.1)	10.1 (0.12)
Oman	46 (3.7)	401 (5.4)	50 (3.6)	406 (4.3)	4 (1.2)	400 (6.9)	10.2 (0.14)
Bahrain	46 (4.3)	459 (3.3)	52 (4.3)	449 (3.0)	3 (1.2)	489 (29.0)	10.2 (0.14)
United States	44 (3.0)	516 (4.8)	48 (2.8)	518 (5.0)	7 (1.4)	539 (10.9)	9.9 (0.15)
Saudi Arabia	44 (4.4)	372 (7.1)	52 (4.3)	365 (6.2)	4 (1.5)	340 (23.5)	10.0 (0.15)
Canada	44 (3.3)	533 (3.1)	49 (3.3)	527 (3.8)	7 (1.6)	535 (5.9)	9.8 (0.13)
New Zealand	42 (3.0)	484 (5.3)	50 (3.2)	504 (5.8)	8 (2.1)	471 (12.3)	9.7 (0.12)
Egypt	40 (3.7)	401 (5.9)	57 (3.7)	386 (5.8)	4 (1.2)	397 (16.1)	10.0 (0.12)
Sweden	38 (4.1)	495 (5.2)	59 (4.2)	504 (3.5)	3 (1.4)	507 (19.9)	9.7 (0.13)
Thailand	37 (3.8)	442 (8.6)	54 (4.0)	422 (6.3)	9 (2.5)	446 (17.2)	9.6 (0.14)
Ireland	36 (2.8)	522 (5.1)	53 (2.9)	521 (4.3)	11 (2.1)	537 (6.7)	9.4 (0.12)
Malaysia	35 (3.8)	465 (6.0)	64 (3.8)	468 (5.0)	2 (0.9)	~ ~	9.7 (0.09)
Iran, Islamic Rep. of	34 (2.8)	426 (5.7)	60 (3.2)	442 (6.5)	6 (1.8)	436 (19.0)	9.7 (0.12)
Slovenia	33 (2.8)	518 (4.4)	61 (2.8)	517 (2.4)	5 (1.2)	508 (7.8)	9.6 (0.09)
Hong Kong SAR	33 (3.7)	602 (8.1)	63 (3.7)	589 (6.1)	3 (1.5)	612 (8.7)	9.7 (0.12)
England	32 (4.1)	530 (10.5)	57 (4.3)	511 (7.4)	12 (2.7)	510 (14.4)	9.2 (0.17)
Norway (9)	31 (4.1)	511 (4.6)	60 (4.4)	513 (2.7)	9 (2.3)	516 (7.4)	9.4 (0.16)
Australia	29 (2.9)	514 (6.1)	58 (3.3)	505 (3.7)	13 (2.1)	508 (8.0)	9.2 (0.13)
Korea, Rep. of	29 (3.4)	602 (5.2)	57 (3.5)	608 (3.5)	15 (2.6)	606 (6.8)	9.0 (0.14)
Malta	28 (0.1)	478 (2.3)	59 (0.2)	499 (1.5)	13 (0.1)	509 (2.1)	9.1 (0.01)
South Africa (9)	28 (3.1)	419 (10.8)	60 (3.5)	358 (4.4)	12 (2.5)	338 (7.1)	9.1 (0.14)
Hungary	27 (3.3)	521 (10.5)	64 (3.5)	507 (5.0)	9 (2.1)	543 (13.8)	9.3 (0.15)
Chile	20 (3.6)	435 (9.2)	68 (4.4)	430 (4.7)	12 (2.8)	418 (13.3)	9.1 (0.16)
Botswana (9)	17 (3.5)	398 (6.0)	77 (3.3)	390 (2.7)	6 (2.3)	386 (14.1)	9.1 (0.13)
Singapore	--	--	--	--	--	--	--
International Avg.	45 (0.6)	480 (1.0)	49 (0.6)	476 (0.9)	5 (0.3)	481 (2.8)	--

Figure 6.14: Challenges faced at school and attainment in Science (Science teachers)

Country	Few Challenges		Some Challenges		Many Challenges		Average Scale Score
	Percent of Students	Average Achievement	Percent of Students	Average Achievement	Percent of Students	Average Achievement	
Georgia	84 (1.9)	443 (3.3)	16 (1.9)	444 (4.4)	0 (0.2)	~ ~	11.7 (0.09)
Russian Federation	77 (1.8)	545 (4.5)	22 (1.7)	541 (5.5)	1 (0.3)	~ ~	11.2 (0.07)
Turkey	77 (2.9)	491 (4.4)	22 (2.9)	499 (9.2)	1 (0.8)	~ ~	11.5 (0.14)
Kazakhstan	76 (2.0)	535 (4.7)	24 (2.0)	526 (7.5)	0 (0.1)	~ ~	10.9 (0.06)
Lithuania	70 (2.0)	517 (3.0)	28 (1.8)	523 (3.7)	1 (0.6)	~ ~	11.1 (0.09)
Lebanon	63 (4.1)	401 (8.0)	33 (4.2)	395 (9.3)	4 (1.5)	371 (28.9)	11.1 (0.19)
Chinese Taipei	61 (3.8)	564 (3.4)	38 (3.8)	577 (4.5)	1 (0.7)	~ ~	10.6 (0.15)
Kuwait	61 (4.2)	410 (6.5)	35 (4.2)	410 (13.1)	4 (1.5)	381 (29.7)	10.6 (0.18)
Qatar	60 (2.9)	463 (5.0)	38 (3.0)	445 (5.9)	2 (0.7)	~ ~	10.8 (0.09)
Italy	59 (3.5)	495 (3.8)	41 (3.5)	504 (4.2)	0 (0.4)	~ ~	10.5 (0.12)
United Arab Emirates	52 (2.5)	485 (4.1)	43 (2.6)	469 (4.9)	5 (0.9)	441 (10.0)	10.4 (0.08)
Morocco	51 (2.3)	400 (3.5)	46 (2.3)	387 (2.9)	3 (0.8)	393 (6.9)	10.3 (0.09)
Japan	48 (3.8)	574 (2.5)	47 (4.0)	566 (2.8)	5 (1.9)	584 (15.4)	9.9 (0.12)
Egypt	48 (3.3)	385 (6.3)	46 (3.5)	360 (6.4)	6 (2.0)	336 (17.4)	10.0 (0.12)
United States	45 (2.5)	536 (4.4)	47 (2.6)	529 (4.9)	8 (1.5)	536 (12.0)	9.9 (0.13)
Saudi Arabia	45 (4.0)	391 (6.3)	50 (4.2)	393 (6.7)	5 (2.0)	383 (16.3)	10.0 (0.17)
Oman	42 (3.4)	460 (4.2)	54 (3.5)	452 (4.3)	3 (0.8)	456 (10.3)	10.0 (0.11)
Bahrain	42 (3.2)	470 (5.2)	54 (3.0)	463 (3.7)	3 (1.7)	452 (19.3)	10.1 (0.13)
Ireland	42 (3.5)	533 (5.1)	50 (3.6)	531 (4.0)	8 (1.4)	526 (7.5)	9.8 (0.14)
New Zealand	41 (3.4)	517 (4.9)	53 (3.9)	517 (5.5)	7 (2.3)	502 (15.9)	9.8 (0.13)
Jordan	41 (3.7)	433 (5.4)	55 (3.8)	422 (4.9)	4 (1.2)	411 (12.2)	9.9 (0.13)
Israel	39 (3.4)	510 (6.8)	51 (3.6)	509 (5.9)	10 (2.3)	496 (15.8)	9.6 (0.15)
Iran, Islamic Rep. of	39 (3.3)	449 (6.7)	57 (3.2)	459 (4.6)	3 (1.3)	494 (23.6)	9.9 (0.11)
Malta	37 (0.4)	489 (2.4)	52 (0.4)	479 (1.8)	11 (0.3)	459 (2.9)	9.4 (0.02)
Hong Kong SAR	36 (3.9)	535 (9.2)	59 (4.2)	551 (4.5)	5 (2.0)	546 (12.3)	9.5 (0.13)
Hungary	35 (2.1)	520 (5.1)	55 (2.3)	525 (4.3)	10 (1.6)	550 (6.7)	9.4 (0.11)
Thailand	35 (3.7)	463 (7.9)	60 (4.0)	450 (5.3)	5 (1.7)	469 (17.8)	9.7 (0.16)
Canada	35 (3.6)	531 (3.7)	61 (3.5)	526 (3.5)	4 (1.3)	515 (11.5)	9.7 (0.16)
Norway (9)	33 (4.2)	506 (5.5)	58 (4.4)	511 (3.3)	9 (2.4)	515 (8.6)	9.6 (0.18)
Malaysia	32 (3.6)	470 (8.7)	66 (3.8)	466 (5.4)	2 (1.0)	~ ~	9.6 (0.10)
South Africa (9)	32 (3.4)	386 (9.9)	55 (3.2)	348 (6.8)	13 (2.7)	331 (20.9)	9.5 (0.19)
Sweden	32 (4.0)	521 (6.0)	63 (4.3)	522 (4.3)	5 (1.7)	537 (12.1)	9.5 (0.13)
Australia	31 (2.5)	519 (5.3)	57 (3.2)	512 (3.7)	12 (2.4)	521 (8.0)	9.4 (0.11)
Slovenia	30 (2.0)	551 (3.4)	65 (1.8)	552 (2.6)	5 (1.1)	548 (7.0)	9.4 (0.08)
Chile	19 (3.2)	475 (9.0)	65 (4.1)	449 (4.6)	16 (3.2)	463 (10.4)	8.7 (0.15)
England	18 (2.5)	559 (9.5)	61 (2.4)	534 (5.2)	22 (2.1)	534 (6.4)	8.5 (0.14)
Korea, Rep. of	17 (2.4)	549 (5.1)	60 (3.4)	556 (2.5)	23 (3.4)	560 (5.4)	8.5 (0.13)
Botswana (9)	12 (2.4)	416 (10.5)	80 (3.3)	390 (3.0)	8 (2.3)	395 (11.0)	8.9 (0.10)
Singapore	--	--	--	--	--	--	--
International Avg.	45 (0.5)	487 (1.0)	49 (0.5)	481 (0.9)	6 (0.3)	473 (2.7)	--

Figures 6.15 and 6.16 show that mathematics and science teachers teaching in independent schools face fewer challenges at school than teachers in church and state schools. Table 6.9 shows that female mathematics and science teachers face more challenges than their male counterparts, however the difference is not significant

Figure 6.15: Challenges faced by Mathematics teachers grouped by school type

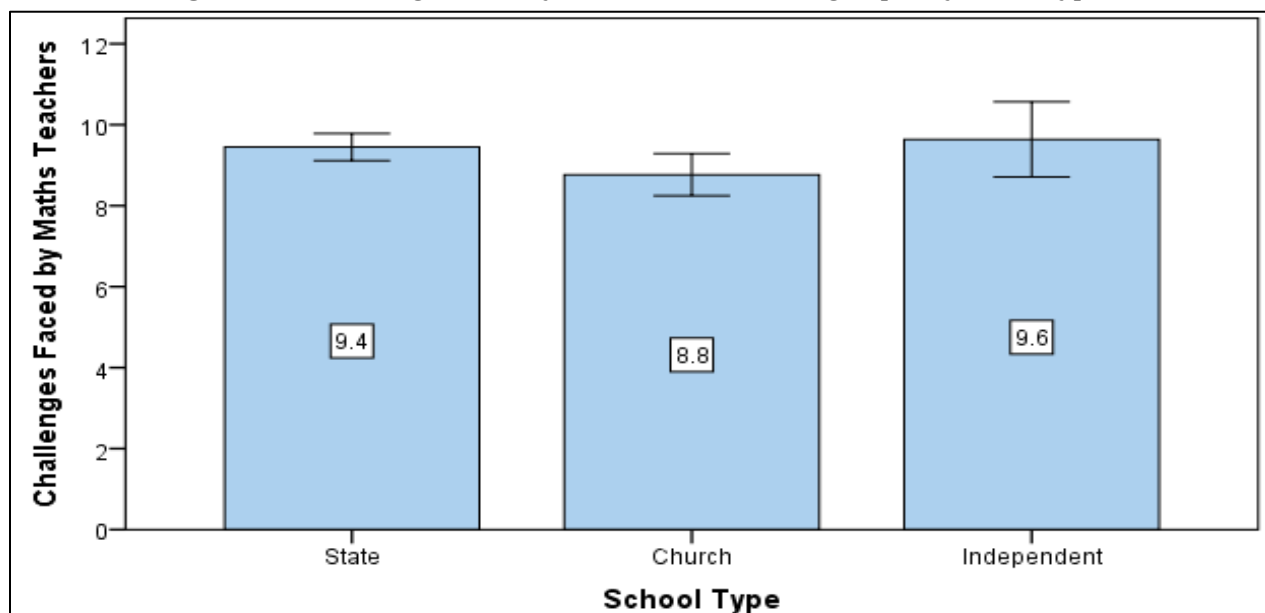


Figure 6.16: Challenges faced by Science teachers grouped by school type

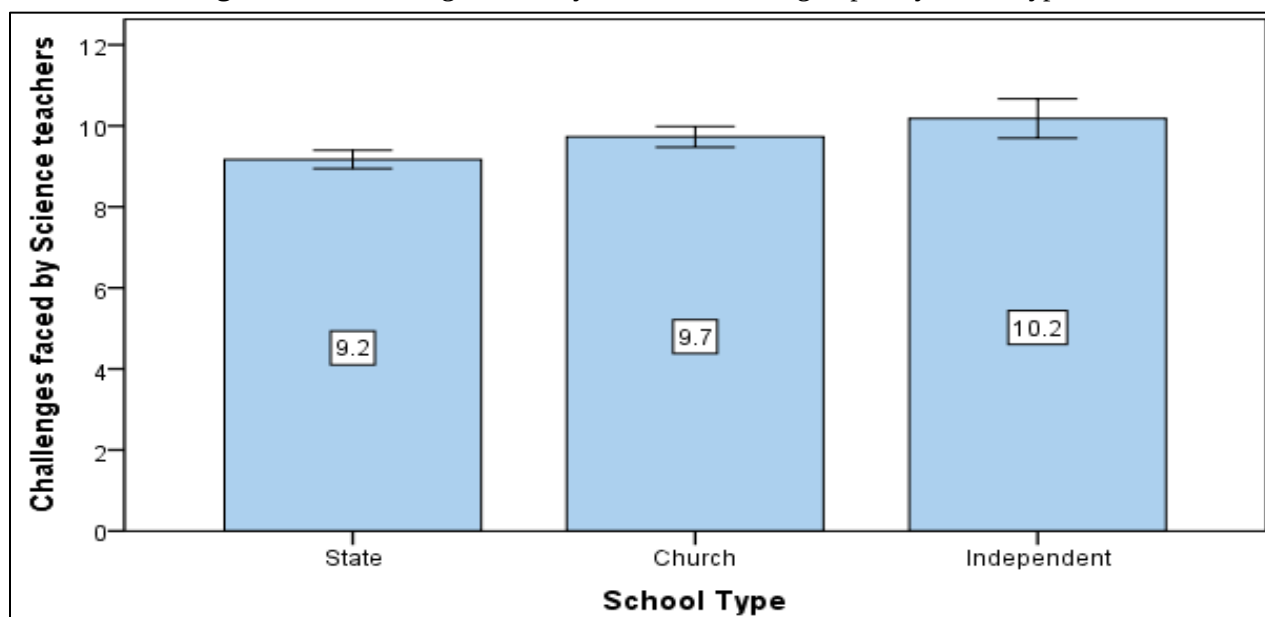


Table 6.9: Mean scores for challenges faced by mathematics and science teachers grouped by gender

		Sample size	Mean Score	Std. Deviation	P-value
Gender of Mathematics teacher	Female	137	9.24	1.928	0.964
	Male	76	9.26	2.166	
Gender of Science teacher	Female	389	9.38	2.015	0.128
	Male	170	9.65	1.805	

6.6 Students' Sense of School Belonging

A scale score was generated for students' sense of school belonging by using students' responses to the seven aspects displayed in Tables 6.10.

Table 6.10: Responses of Maltese students to their sense of school belonging

What do you think about your school?	Agree a lot	Agree a little	Disagree a little	Disagree a lot
I like being in school	22.7%	48.1%	18.8%	10.4%
I feel safe when I am at school	36.9%	41.0%	15.1%	7.0%
I feel like I belong at this school	34.7%	36.7%	17.2%	11.3%
I like to see my classmates at school	73.5%	19.7%	4.3%	2.5%
Teachers at my school are fair to me	33.9%	41.5%	18.0%	6.6%
I am proud to go to this school	46.0%	32.4%	13.1%	8.4%
I learn a lot in school	54.0%	34.6%	8.0%	3.5%

Students were scored according to their agreement to seven statements about their sense of school belonging. Students with a high sense of school belonging had a score on the scale of at least 10.3, which corresponds to their 'Agreeing a lot' to four of the seven statements and 'Agreeing a little' to each of the other three statements, on average. Students with little sense of school belonging had a score no higher than 7.5, which corresponds to their 'Disagreeing a little' to four of the seven statements and 'Agreeing a little' to each of the other three statements, on average. All other students had a sense of school belonging. Figure 6.17 displays the students' sense of school belonging score distribution.

Figure 6.17: Score distribution for students' sense of school belonging

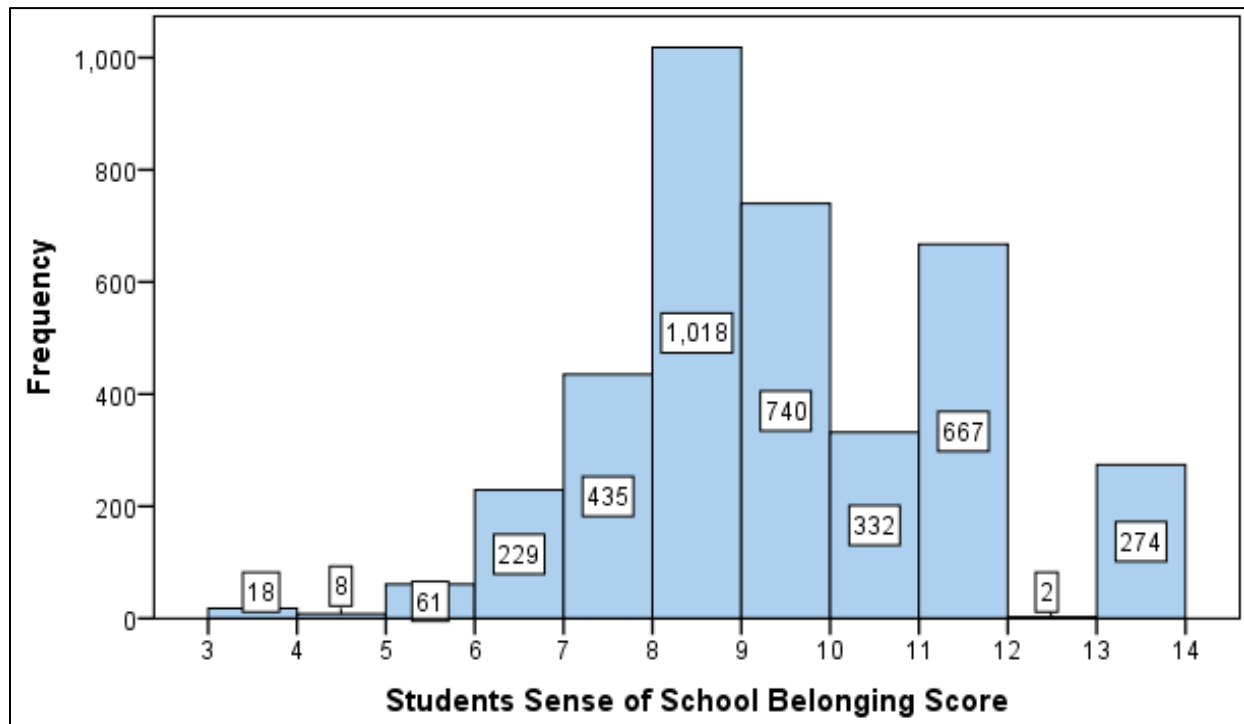


Figure 6.18: Students' sense of school belonging and attainment in Mathematics

Country	High Sense of School Belonging		Sense of School Belonging		Little Sense of School Belonging		Average Scale Score
	Percent of Students	Average Achievement	Percent of Students	Average Achievement	Percent of Students	Average Achievement	
Morocco	73 (0.9)	385 (2.1)	24 (0.8)	386 (3.5)	3 (0.3)	383 (6.6)	11.3 (0.05)
Jordan	66 (1.1)	388 (3.2)	28 (0.8)	389 (4.5)	6 (0.5)	381 (8.6)	11.0 (0.06)
Kazakhstan	66 (1.4)	533 (5.5)	33 (1.3)	519 (6.1)	1 (0.2)	~ ~	11.1 (0.06)
Egypt	63 (1.3)	400 (4.2)	30 (1.1)	386 (5.4)	7 (0.5)	388 (7.8)	10.9 (0.07)
Oman	62 (0.9)	412 (2.7)	33 (0.8)	395 (2.8)	5 (0.5)	381 (7.7)	10.8 (0.04)
South Africa (9)	60 (1.1)	376 (4.6)	36 (0.9)	371 (5.8)	4 (0.3)	378 (9.7)	10.7 (0.05)
Turkey	59 (1.1)	457 (4.9)	35 (0.9)	458 (5.4)	6 (0.4)	467 (8.8)	10.6 (0.05)
Thailand	58 (1.2)	433 (4.7)	40 (1.2)	432 (5.6)	2 (0.2)	~ ~	10.6 (0.05)
Kuwait	53 (1.5)	400 (5.4)	39 (1.2)	389 (6.0)	8 (0.6)	369 (8.2)	10.3 (0.07)
Botswana (9)	53 (0.8)	406 (2.3)	42 (0.8)	383 (2.9)	5 (0.4)	374 (7.3)	10.4 (0.03)
Lebanon	53 (1.3)	445 (3.8)	40 (1.2)	444 (3.8)	8 (0.5)	433 (5.8)	10.4 (0.06)
Norway (9)	52 (1.5)	521 (2.3)	41 (1.2)	506 (2.9)	7 (0.5)	475 (5.5)	10.4 (0.06)
Chile	50 (1.6)	435 (3.9)	39 (1.1)	425 (3.6)	11 (0.7)	406 (4.8)	10.2 (0.08)
Saudi Arabia	49 (1.5)	370 (5.2)	41 (1.2)	373 (5.2)	10 (0.8)	344 (7.4)	10.2 (0.06)
Israel	49 (1.4)	514 (4.6)	41 (1.0)	515 (4.3)	10 (0.7)	490 (6.5)	10.2 (0.07)
Malaysia	46 (1.3)	466 (4.2)	50 (1.1)	468 (3.8)	4 (0.5)	427 (7.6)	10.1 (0.05)
Iran, Islamic Rep. of	45 (1.3)	436 (5.8)	47 (1.1)	439 (4.4)	7 (0.5)	424 (6.7)	10.0 (0.05)
Canada	45 (1.1)	538 (2.0)	48 (0.9)	525 (2.3)	7 (0.5)	495 (4.3)	10.1 (0.05)
Georgia	44 (1.0)	463 (3.7)	51 (1.0)	448 (4.2)	5 (0.5)	443 (8.6)	10.1 (0.05)
New Zealand	43 (1.2)	509 (3.8)	49 (1.0)	488 (3.5)	8 (0.5)	449 (5.8)	10.0 (0.04)
Ireland	42 (1.3)	537 (2.7)	48 (1.0)	519 (3.1)	10 (0.7)	491 (5.9)	9.9 (0.06)
Bahrain	41 (0.8)	466 (2.7)	46 (0.9)	453 (2.1)	13 (1.0)	431 (4.4)	9.8 (0.05)
Australia	41 (1.1)	528 (3.4)	48 (0.9)	499 (2.8)	11 (0.5)	460 (5.0)	9.8 (0.05)
Qatar	39 (1.3)	458 (3.7)	46 (1.2)	436 (3.6)	15 (0.6)	398 (4.8)	9.7 (0.05)
Lithuania	38 (1.4)	512 (4.3)	54 (1.2)	513 (2.6)	8 (0.7)	498 (6.1)	9.8 (0.05)
United States	37 (0.9)	538 (3.9)	49 (0.7)	514 (2.9)	14 (0.6)	485 (3.6)	9.6 (0.05)
Singapore	37 (0.7)	638 (3.2)	55 (0.7)	615 (3.5)	9 (0.4)	589 (5.9)	9.8 (0.03)
Russian Federation	36 (1.2)	544 (5.9)	55 (1.1)	536 (4.6)	9 (0.6)	526 (6.2)	9.7 (0.05)
England	35 (1.3)	542 (4.4)	54 (1.0)	513 (4.4)	11 (0.6)	478 (5.5)	9.6 (0.05)
Sweden	35 (1.4)	515 (3.7)	56 (1.3)	498 (2.7)	9 (0.6)	468 (5.4)	9.7 (0.06)
Malta	33 (0.8)	520 (2.3)	51 (0.8)	492 (1.6)	16 (0.6)	452 (3.6)	9.5 (0.03)
Hong Kong SAR	31 (1.6)	616 (5.1)	55 (1.3)	591 (4.2)	14 (0.8)	560 (7.1)	9.4 (0.07)
Hungary	30 (1.2)	532 (5.6)	57 (1.0)	511 (4.1)	13 (0.7)	489 (5.4)	9.4 (0.06)
United Arab Emirates	29 (0.8)	504 (3.7)	44 (0.7)	461 (2.1)	27 (0.7)	431 (2.9)	9.1 (0.04)
Japan	27 (1.1)	599 (3.9)	60 (0.9)	586 (2.3)	13 (0.7)	565 (4.6)	9.4 (0.05)
Italy	27 (0.9)	500 (3.8)	61 (0.8)	495 (2.8)	12 (0.8)	479 (4.4)	9.3 (0.04)
Chinese Taipei	27 (0.9)	617 (3.4)	63 (0.7)	597 (2.4)	10 (0.5)	568 (6.0)	9.4 (0.04)
Korea, Rep. of	24 (0.9)	621 (3.9)	69 (0.8)	605 (2.6)	7 (0.5)	568 (6.2)	9.4 (0.04)
Slovenia	12 (0.7)	527 (4.7)	66 (0.9)	519 (2.3)	22 (1.0)	502 (2.9)	8.5 (0.04)
International Avg.	44 (0.2)	492 (0.7)	47 (0.2)	479 (0.6)	9 (0.1)	458 (1.0)	

The proportions of students reporting that they have 'High sense of belonging', 'Sense of belonging' and 'Little sense of school belonging' are respectively 44%, 47% and 9% and the corresponding proportions of Maltese students are 33%, 51% and 16%. The scale score that measures students' sense of school belonging ranges from 11.3 (Morocco) to 8.5 (Slovenia), where Malta's mean scale score (9.5) is significantly below the international average (10.0). Figures 6.18

and 6.19 clearly show that there is a strong positive relationship between students' sense of school belonging and their attainment in mathematics and science. The mean scores of students taught by teachers who have a 'High sense of belonging', 'Sense of belonging' and 'Little sense of school belonging' are respectively 492, 479 and 458 in Mathematics and 498, 483 and 459 in Science. The corresponding mean scores of Maltese students are respectively 520, 492 and 452 in Mathematics and 510, 480 and 437 in Science.

Figure 6.19: Students' sense of school belonging and attainment in Science

Country	High Sense of School Belonging		Sense of School Belonging		Little Sense of School Belonging		Average Scale Score
	Percent of Students	Average Achievement	Percent of Students	Average Achievement	Percent of Students	Average Achievement	
Morocco	73 (0.9)	396 (2.3)	24 (0.8)	390 (3.8)	3 (0.3)	379 (7.7)	11.3 (0.05)
Jordan	66 (1.1)	431 (3.5)	28 (0.8)	429 (4.5)	6 (0.5)	410 (9.8)	11.0 (0.06)
Kazakhstan	66 (1.4)	537 (4.8)	33 (1.3)	525 (5.4)	1 (0.2)	~ ~	11.1 (0.06)
Egypt	63 (1.3)	380 (4.4)	30 (1.1)	363 (5.8)	7 (0.5)	363 (8.2)	10.9 (0.07)
Oman	62 (0.9)	464 (2.7)	33 (0.8)	447 (3.3)	5 (0.5)	427 (8.8)	10.8 (0.04)
South Africa (9)	60 (1.1)	362 (5.7)	36 (0.9)	355 (7.4)	4 (0.3)	369 (12.0)	10.7 (0.05)
Turkey	59 (1.1)	494 (4.2)	35 (0.9)	493 (4.8)	6 (0.4)	496 (7.5)	10.6 (0.05)
Thailand	58 (1.2)	456 (4.2)	40 (1.2)	458 (5.1)	2 (0.2)	~ ~	10.6 (0.05)
Kuwait	53 (1.5)	417 (5.8)	39 (1.2)	410 (6.9)	8 (0.6)	382 (9.6)	10.3 (0.07)
Botswana (9)	53 (0.8)	414 (2.5)	42 (0.8)	378 (4.0)	5 (0.4)	366 (10.8)	10.4 (0.03)
Lebanon	53 (1.3)	407 (5.6)	40 (1.2)	395 (5.8)	8 (0.5)	377 (9.1)	10.4 (0.06)
Norway (9)	52 (1.5)	520 (3.0)	41 (1.2)	503 (3.2)	7 (0.5)	467 (6.4)	10.4 (0.06)
Chile	50 (1.6)	461 (4.0)	39 (1.1)	452 (3.4)	11 (0.7)	434 (4.5)	10.2 (0.08)
Saudi Arabia	49 (1.5)	405 (5.1)	41 (1.2)	399 (5.2)	10 (0.8)	364 (8.3)	10.2 (0.06)
Israel	49 (1.4)	512 (4.3)	41 (1.0)	510 (4.1)	10 (0.7)	478 (7.1)	10.2 (0.07)
Malaysia	46 (1.3)	482 (4.3)	50 (1.1)	468 (4.5)	4 (0.5)	384 (12.1)	10.1 (0.05)
Iran, Islamic Rep. of	45 (1.3)	456 (5.4)	47 (1.1)	458 (3.6)	7 (0.5)	449 (6.2)	10.0 (0.05)
Canada	45 (1.1)	538 (2.2)	48 (0.9)	523 (2.3)	7 (0.5)	499 (3.5)	10.1 (0.05)
Georgia	44 (1.0)	453 (3.8)	51 (1.0)	440 (3.8)	5 (0.5)	424 (8.1)	10.1 (0.05)
New Zealand	43 (1.2)	528 (3.9)	49 (1.0)	509 (3.4)	8 (0.5)	474 (5.5)	10.0 (0.04)
Ireland	42 (1.3)	545 (2.8)	48 (1.0)	525 (3.1)	10 (0.7)	492 (6.8)	9.9 (0.06)
Bahrain	41 (0.8)	483 (3.0)	46 (0.9)	466 (3.2)	13 (1.0)	433 (6.3)	9.8 (0.05)
Australia	41 (1.1)	535 (2.9)	48 (0.9)	506 (2.3)	11 (0.5)	465 (5.1)	9.8 (0.05)
Qatar	39 (1.3)	483 (3.3)	46 (1.2)	454 (3.7)	15 (0.6)	409 (4.5)	9.7 (0.05)
Lithuania	38 (1.4)	521 (4.2)	54 (1.2)	520 (2.9)	8 (0.7)	505 (6.7)	9.8 (0.05)
United States	37 (0.9)	548 (3.3)	49 (0.7)	526 (2.8)	14 (0.6)	501 (3.6)	9.6 (0.05)
Singapore	37 (0.7)	614 (3.2)	55 (0.7)	591 (3.5)	9 (0.4)	564 (6.4)	9.8 (0.03)
Russian Federation	36 (1.2)	547 (5.6)	55 (1.1)	544 (4.2)	9 (0.6)	536 (5.5)	9.7 (0.05)
England	35 (1.3)	560 (4.1)	54 (1.0)	532 (3.9)	11 (0.6)	497 (6.3)	9.6 (0.05)
Sweden	35 (1.4)	539 (4.5)	56 (1.3)	519 (3.4)	9 (0.6)	489 (6.5)	9.7 (0.06)
Malta	33 (0.8)	510 (2.9)	51 (0.8)	480 (2.2)	16 (0.6)	437 (5.1)	9.5 (0.03)
Hong Kong SAR	31 (1.6)	562 (4.4)	55 (1.3)	542 (3.8)	14 (0.8)	525 (6.4)	9.4 (0.07)
Hungary	30 (1.2)	541 (5.2)	57 (1.0)	524 (3.6)	13 (0.7)	511 (4.3)	9.4 (0.06)
United Arab Emirates	29 (0.8)	520 (3.8)	44 (0.7)	472 (2.3)	27 (0.7)	441 (3.3)	9.1 (0.04)
Japan	27 (1.1)	579 (2.9)	60 (0.9)	570 (1.8)	13 (0.7)	558 (4.3)	9.4 (0.05)
Italy	27 (0.9)	502 (3.8)	61 (0.8)	500 (2.6)	12 (0.8)	486 (4.3)	9.3 (0.04)
Chinese Taipei	27 (0.9)	584 (3.0)	63 (0.7)	567 (2.0)	10 (0.5)	545 (5.1)	9.4 (0.04)
Korea, Rep. of	24 (0.9)	565 (3.6)	69 (0.8)	555 (2.1)	7 (0.5)	526 (5.3)	9.4 (0.04)
Slovenia	12 (0.7)	564 (4.9)	66 (0.9)	555 (2.6)	22 (1.0)	533 (3.1)	8.5 (0.04)
International Avg.	44 (0.2)	498 (0.6)	47 (0.2)	483 (0.6)	9 (0.1)	459 (1.1)	

Figure 6.20: Relationships between students' sense of school belonging and Maths scores by school type

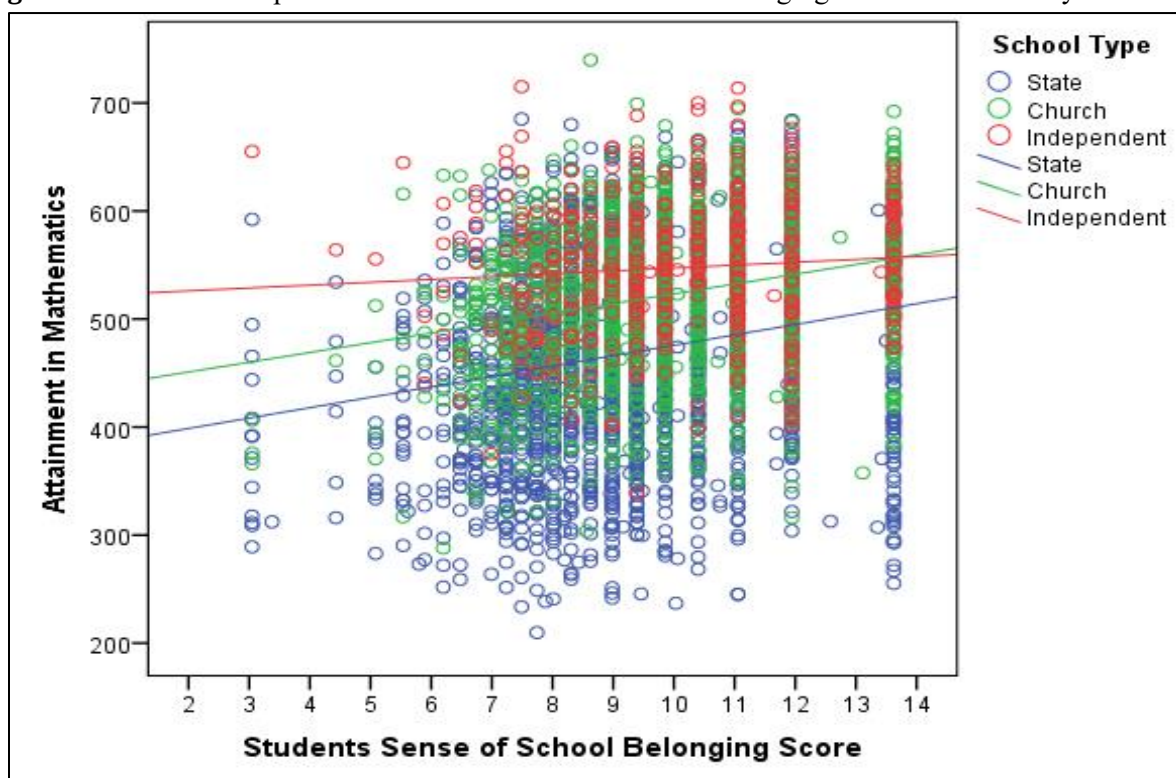
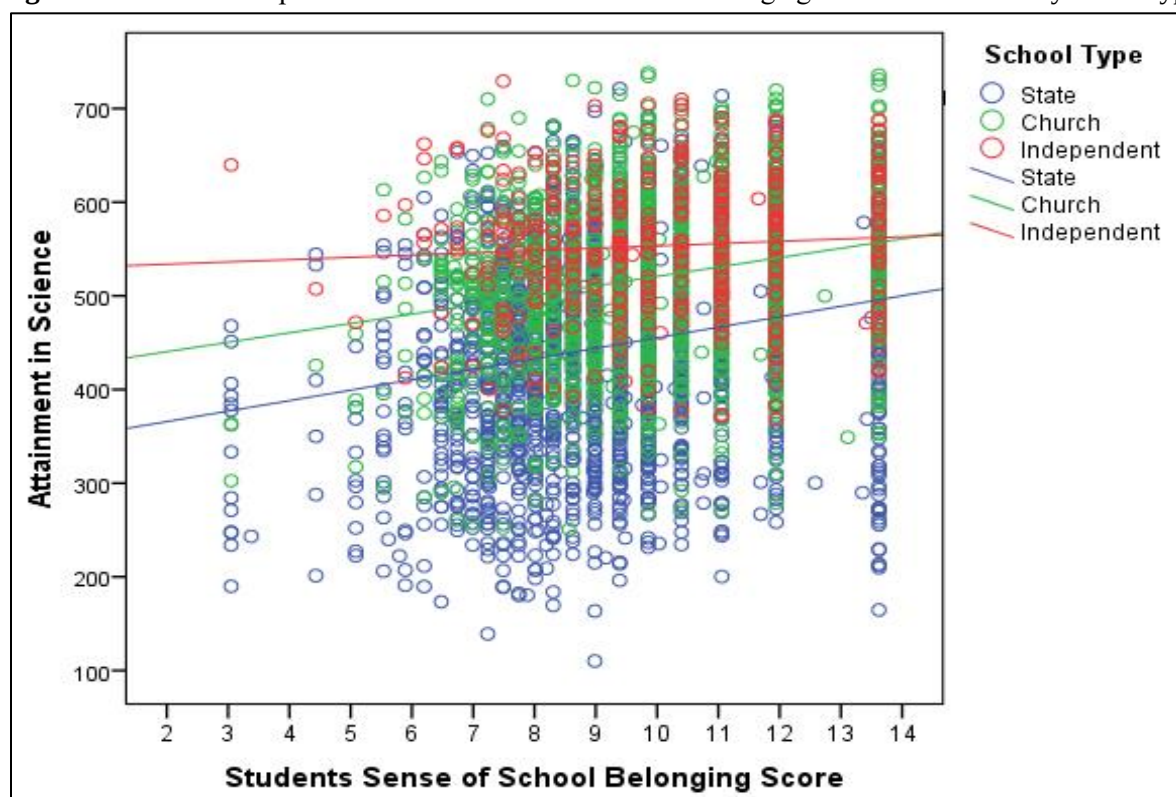


Figure 6.21: Relationships between students' sense of school belonging and Science scores by school type



Figures 6.20 and 6.21 clearly show that the positive relationship between the students' sense of school belonging and mathematics/science attainment is more conspicuous for students attending state and church schools rather than students attending independent schools. Figure 6.22 shows that the sense of school belonging for students attending independent and church schools is significantly higher than state schools. Table 6.11 shows that female students have a significantly higher sense of school belonging than their male counterparts.

Figure 6.22: Students' sense of school belonging grouped by school type

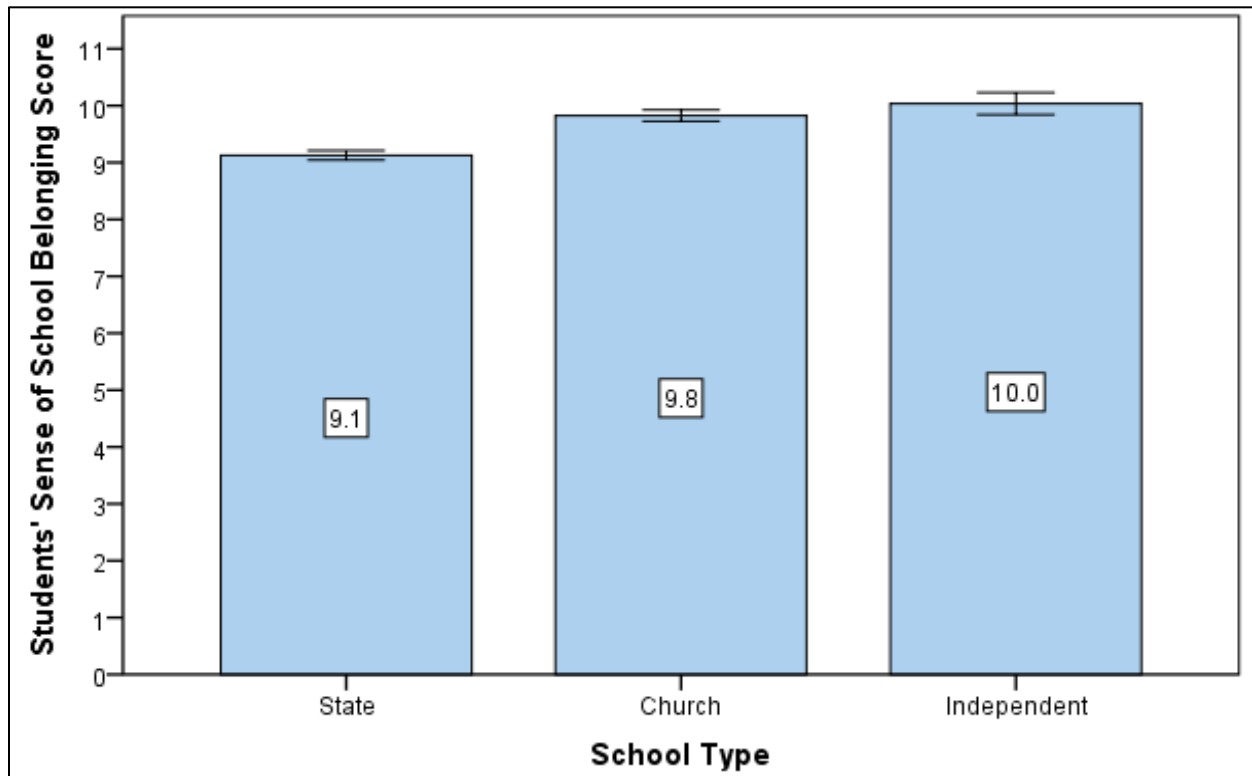


Table 6.11: Mean scores of students' sense of school belonging grouped by gender

		Sample size	Mean Score	Std. Deviation	P-value
Student Gender	Female	1872	9.65	1.929	0.000
	Male	1912	9.33	1.944	

7

Discipline, Safety and Bullying at School

7.1 Introduction

This chapter describes the views of heads of school and teachers regarding a number of school-related issues. It highlights the perspective of heads of school regarding school discipline problems and the teachers' perception about safety and order at school. Moreover, this chapter addresses other issues related to student bullying at school. A scale score is generated for each of these issues which will be used to identify differences between participating countries and school types.

7.2 School Discipline Problems

A scale score for school discipline problems was generated by considering the responses of heads of school to eleven aspects. Table 7.1 displays the responses of Maltese heads of school to these school discipline problems.

Table 7.1: Responses of Maltese head of schools regarding school discipline problems

To what degree is each of the following a problem among Year 9 students in your school?	Not a problem	Minor problem	Moderate problem	Serious problem
Arriving late at school	59.6%	34.0%	4.3%	2.1%
Absenteeism (i.e., unjustified absences)	51.1%	40.4%	6.4%	2.1%
Classroom disturbance	23.4%	51.1%	21.3%	4.3%
Cheating	55.3%	38.3%	4.3%	2.1%
Swearing	63.8%	25.5%	8.5%	2.1%
Vandalism	46.8%	40.4%	10.6%	2.1%
Theft	67.4%	28.3%	2.2%	2.2%
Intimidation or verbal abuse among students	17.0%	68.1%	12.8%	2.1%
Physical injury to other students	60.9%	30.4%	6.5%	2.2%
Intimidation or verbal abuse of teachers or staff	68.1%	25.5%	2.1%	4.3%
Physical injury to teachers or staff	95.7%	2.1%	0.0%	2.1%

Students in schools with hardly any problems had a score on the scale of at least 10.8, which corresponds to their head of school reporting 'Not a problem' for six of the eleven issues and 'Minor problem' for the other five, on average. Students in schools with moderate to severe

problems had a score no higher than 8.0, which corresponds to their head of school reporting 'Moderate problem' for six of the eleven issues and 'Minor problem' for the other five, on average. All other students attended schools with minor problems.

Figure 7.1: School discipline problems and attainment in Mathematics (Heads of School)

Country	Hardly Any Problems		Minor Problems		Moderate to Severe Problems		Average Scale Score
	Percent of Students	Average Achievement	Percent of Students	Average Achievement	Percent of Students	Average Achievement	
Singapore	74 (0.0)	630 (3.4)	26 (0.0)	595 (7.1)	0 (0.0)	~ ~	11.7 (0.00)
England	73 (4.5)	535 (6.3)	27 (4.5)	504 (10.7)	0 (0.0)	~ ~	11.6 (0.13)
Norway (9)	67 (4.5)	513 (2.7)	33 (4.5)	509 (4.6)	0 (0.0)	~ ~	11.2 (0.13)
Hong Kong SAR	66 (4.5)	602 (6.8)	33 (4.6)	574 (8.5)	1 (1.1)	~ ~	11.4 (0.15)
Kazakhstan	65 (4.2)	536 (7.1)	18 (3.3)	507 (12.1)	17 (3.2)	517 (13.3)	10.8 (0.23)
Ireland	64 (3.9)	531 (3.3)	34 (4.0)	514 (6.0)	2 (1.2)	~ ~	10.9 (0.13)
Georgia	57 (3.8)	451 (5.2)	40 (3.8)	456 (5.1)	3 (1.0)	474 (28.7)	10.8 (0.12)
Chinese Taipei	57 (3.8)	610 (3.8)	42 (3.7)	586 (4.5)	1 (0.8)	~ ~	11.1 (0.13)
Russian Federation	56 (3.7)	545 (6.4)	43 (3.5)	530 (6.0)	1 (0.8)	~ ~	10.8 (0.08)
Iran, Islamic Rep. of	55 (3.4)	446 (6.4)	41 (3.4)	423 (5.5)	4 (1.1)	436 (17.1)	11.0 (0.13)
Korea, Rep. of	55 (4.7)	606 (3.9)	38 (4.6)	606 (3.8)	7 (2.3)	600 (7.2)	11.0 (0.17)
United Arab Emirates	54 (2.3)	483 (3.3)	40 (2.2)	445 (3.3)	6 (0.9)	403 (7.9)	11.0 (0.08)
Japan	54 (3.9)	595 (3.4)	37 (4.2)	579 (4.9)	9 (2.3)	571 (11.9)	10.5 (0.13)
Bahrain	51 (0.2)	465 (2.1)	36 (0.2)	438 (2.3)	13 (0.2)	455 (5.0)	10.4 (0.02)
Lebanon	51 (4.6)	448 (5.1)	29 (4.3)	436 (7.1)	20 (3.5)	440 (9.6)	10.2 (0.23)
Qatar	51 (0.7)	439 (4.6)	34 (0.7)	436 (3.8)	15 (0.3)	434 (5.7)	10.2 (0.02)
Oman	50 (3.9)	411 (3.8)	27 (3.6)	402 (7.2)	23 (3.1)	388 (6.4)	10.2 (0.19)
Malta	50 (0.1)	520 (1.5)	45 (0.1)	466 (1.5)	5 (0.1)	465 (3.8)	10.6 (0.00)
Malaysia	50 (4.6)	477 (5.3)	48 (4.4)	454 (5.7)	3 (2.1)	455 (20.5)	10.8 (0.15)
Saudi Arabia	49 (4.3)	383 (7.0)	31 (3.9)	354 (6.5)	20 (3.5)	356 (9.5)	10.2 (0.24)
Australia	48 (3.2)	528 (4.7)	51 (3.2)	487 (4.4)	1 (0.6)	~ ~	10.6 (0.09)
Canada	45 (4.1)	538 (2.8)	54 (4.1)	520 (3.2)	1 (0.7)	~ ~	10.6 (0.12)
Thailand	42 (4.0)	450 (7.3)	53 (4.0)	418 (6.5)	5 (1.7)	405 (14.1)	10.4 (0.14)
Lithuania	40 (4.2)	524 (5.2)	57 (4.2)	503 (4.2)	2 (1.1)	~ ~	10.3 (0.10)
United States	34 (3.0)	539 (5.6)	64 (3.4)	511 (3.9)	2 (1.0)	~ ~	10.2 (0.09)
Jordan	34 (3.5)	398 (5.6)	43 (3.9)	377 (5.4)	23 (3.3)	382 (6.9)	9.6 (0.18)
Slovenia	32 (3.6)	519 (4.5)	63 (3.7)	516 (2.6)	5 (1.8)	509 (7.9)	10.0 (0.12)
New Zealand	31 (4.6)	507 (4.0)	66 (4.6)	485 (4.8)	3 (1.5)	438 (18.0)	10.2 (0.13)
Chile	29 (3.8)	454 (7.3)	58 (3.9)	421 (4.9)	13 (3.0)	398 (6.7)	9.8 (0.12)
Hungary	29 (3.9)	540 (8.4)	63 (4.1)	512 (5.1)	8 (2.1)	428 (12.2)	10.1 (0.12)
Italy	27 (4.2)	501 (6.2)	61 (4.5)	490 (3.7)	12 (2.6)	493 (11.0)	9.7 (0.12)
Kuwait	27 (3.3)	423 (11.1)	50 (4.0)	385 (4.9)	23 (3.5)	375 (11.2)	9.4 (0.15)
Israel	26 (3.6)	535 (9.3)	61 (3.6)	511 (6.6)	13 (2.3)	464 (12.2)	9.6 (0.14)
Sweden	26 (4.3)	515 (4.6)	70 (4.6)	496 (3.4)	4 (1.8)	483 (26.5)	9.8 (0.13)
Turkey	19 (2.6)	499 (12.5)	49 (3.8)	455 (5.1)	32 (3.4)	437 (7.6)	8.8 (0.14)
Egypt	19 (3.4)	394 (10.7)	42 (3.6)	396 (6.4)	40 (3.6)	388 (7.2)	8.4 (0.18)
Morocco	13 (2.1)	401 (8.4)	34 (3.4)	384 (3.9)	53 (3.2)	381 (3.1)	8.1 (0.12)
Botswana (9)	11 (2.8)	414 (9.6)	68 (3.8)	394 (2.8)	22 (3.5)	372 (5.3)	9.0 (0.11)
South Africa (9)	10 (2.1)	408 (19.4)	56 (3.7)	384 (6.9)	34 (3.8)	344 (4.4)	8.8 (0.12)
International Avg.	43 (0.6)	495 (1.1)	45 (0.6)	473 (0.9)	11 (0.4)	439 (2.4)	

Figure 7.2: School discipline problems and attainment in Science (Heads of School)

Country	Hardly Any Problems		Minor Problems		Moderate to Severe Problems		Average Scale Score
	Percent of Students	Average Achievement	Percent of Students	Average Achievement	Percent of Students	Average Achievement	
Singapore	74 (0.0)	606 (3.5)	26 (0.0)	571 (6.9)	0 (0.0)	~ ~	11.7 (0.00)
England	73 (4.5)	552 (6.0)	27 (4.5)	522 (10.3)	0 (0.0)	~ ~	11.6 (0.13)
Norway (9)	67 (4.5)	511 (3.3)	33 (4.5)	506 (6.0)	0 (0.0)	~ ~	11.2 (0.13)
Hong Kong SAR	66 (4.5)	552 (5.9)	33 (4.6)	530 (6.9)	1 (1.1)	~ ~	11.4 (0.15)
Kazakhstan	65 (4.2)	542 (6.6)	18 (3.3)	514 (11.8)	17 (3.2)	516 (11.4)	10.8 (0.23)
Ireland	64 (3.9)	537 (3.2)	34 (4.0)	519 (6.4)	2 (1.2)	~ ~	10.9 (0.13)
Georgia	57 (3.8)	441 (4.8)	40 (3.8)	446 (4.6)	3 (1.0)	459 (16.4)	10.8 (0.12)
Chinese Taipei	57 (3.8)	578 (3.2)	42 (3.7)	558 (3.7)	1 (0.8)	~ ~	11.1 (0.13)
Russian Federation	56 (3.7)	552 (6.1)	43 (3.5)	535 (5.0)	1 (0.8)	~ ~	10.8 (0.08)
Iran, Islamic Rep. of	55 (3.4)	465 (5.5)	41 (3.4)	444 (5.0)	4 (1.1)	460 (15.0)	11.0 (0.13)
Korea, Rep. of	55 (4.7)	557 (3.2)	38 (4.6)	555 (3.0)	7 (2.3)	549 (6.1)	11.0 (0.17)
United Arab Emirates	54 (2.3)	497 (3.5)	40 (2.2)	455 (4.3)	6 (0.9)	410 (7.6)	11.0 (0.08)
Japan	54 (3.9)	577 (2.4)	37 (4.2)	566 (3.4)	9 (2.3)	557 (8.2)	10.5 (0.13)
Bahrain	51 (0.2)	486 (2.8)	36 (0.2)	440 (3.5)	13 (0.2)	460 (8.6)	10.4 (0.02)
Lebanon	51 (4.6)	405 (7.7)	29 (4.3)	388 (10.6)	20 (3.5)	396 (14.0)	10.2 (0.23)
Qatar	51 (0.7)	459 (4.9)	34 (0.7)	452 (4.1)	15 (0.3)	458 (4.2)	10.2 (0.02)
Oman	50 (3.9)	462 (4.1)	27 (3.6)	450 (6.7)	23 (3.1)	443 (7.6)	10.2 (0.19)
Malta	50 (0.1)	515 (2.3)	45 (0.1)	446 (2.3)	5 (0.1)	443 (7.2)	10.6 (0.00)
Malaysia	50 (4.6)	484 (5.9)	48 (4.4)	456 (6.6)	3 (2.1)	476 (12.4)	10.8 (0.15)
Saudi Arabia	49 (4.3)	417 (6.8)	31 (3.9)	378 (8.0)	20 (3.5)	380 (11.7)	10.2 (0.24)
Australia	48 (3.2)	531 (4.4)	51 (3.2)	497 (3.9)	1 (0.6)	~ ~	10.6 (0.09)
Canada	45 (4.1)	534 (2.6)	54 (4.1)	522 (2.9)	1 (0.7)	~ ~	10.6 (0.12)
Thailand	42 (4.0)	473 (6.0)	53 (4.0)	444 (6.0)	5 (1.7)	433 (13.7)	10.4 (0.14)
Lithuania	40 (4.2)	531 (4.8)	57 (4.2)	511 (4.5)	2 (1.1)	~ ~	10.3 (0.10)
United States	34 (3.0)	549 (5.1)	64 (3.4)	523 (3.7)	2 (1.0)	~ ~	10.2 (0.09)
Jordan	34 (3.5)	442 (5.4)	43 (3.9)	416 (5.7)	23 (3.3)	422 (8.2)	9.6 (0.18)
Slovenia	32 (3.6)	556 (4.7)	63 (3.7)	550 (3.1)	5 (1.8)	545 (9.6)	10.0 (0.12)
New Zealand	31 (4.6)	529 (4.1)	66 (4.6)	505 (4.6)	3 (1.5)	457 (18.1)	10.2 (0.13)
Chile	29 (3.8)	482 (6.3)	58 (3.9)	448 (5.0)	13 (3.0)	424 (5.7)	9.8 (0.12)
Hungary	29 (3.9)	550 (7.4)	63 (4.1)	525 (4.6)	8 (2.1)	453 (12.3)	10.1 (0.12)
Italy	27 (4.2)	505 (6.2)	61 (4.5)	496 (3.7)	12 (2.6)	493 (11.5)	9.7 (0.12)
Kuwait	27 (3.3)	449 (11.8)	50 (4.0)	406 (6.0)	23 (3.5)	375 (12.2)	9.4 (0.15)
Israel	26 (3.6)	529 (9.2)	61 (3.6)	508 (6.2)	13 (2.3)	458 (11.8)	9.6 (0.14)
Sweden	26 (4.3)	541 (5.1)	70 (4.6)	517 (4.3)	4 (1.8)	489 (29.9)	9.8 (0.13)
Turkey	19 (2.6)	529 (10.8)	49 (3.8)	494 (4.3)	32 (3.4)	473 (6.7)	8.8 (0.14)
Egypt	19 (3.4)	375 (11.4)	42 (3.6)	374 (7.0)	40 (3.6)	367 (7.7)	8.4 (0.18)
Morocco	13 (2.1)	411 (8.4)	34 (3.4)	392 (4.3)	53 (3.2)	391 (3.3)	8.1 (0.12)
Botswana (9)	11 (2.8)	418 (12.4)	68 (3.8)	396 (3.6)	22 (3.5)	367 (7.1)	9.0 (0.11)
South Africa (9)	10 (2.1)	400 (24.8)	56 (3.7)	371 (8.4)	34 (3.8)	325 (6.1)	8.8 (0.12)
International Avg.	43 (0.6)	501 (11.2)	45 (0.6)	478 (0.9)	11 (0.4)	446 (2.2)	

The proportions of heads of school reporting that their school experiences ‘Hardly any problems’, ‘Minor problems’ and ‘Moderate to severe problems’ are 43%, 45% and 12% respectively. These proportions are somewhat different to those provided by Maltese heads of schools (50%, 45% and 5%). The scale score that measures school discipline problems ranges from 11.7 (Singapore) to about 8.1 (Morocco), where Malta’s mean scale score (10.6) is above the

international average (10), indicating that school discipline problems in Malta are less severe than most of the participating countries. Figures 7.1 and 7.2 clearly show that the lack of school discipline problems is positively related to the attainment in Mathematics and Science. The mean scores of students attending schools that have ‘Hardly any problems’, ‘Minor problems’ and ‘Moderate to severe problems’ are respectively 493, 473 and 439 in Mathematics and 501, 478 and 446 in Science. The corresponding mean scores of Maltese students are respectively 520, 466 and 443 in Mathematics and 515, 446 and 443 in Science.

Figure 7.3: Score distribution of school discipline problems (Maltese Heads of School)

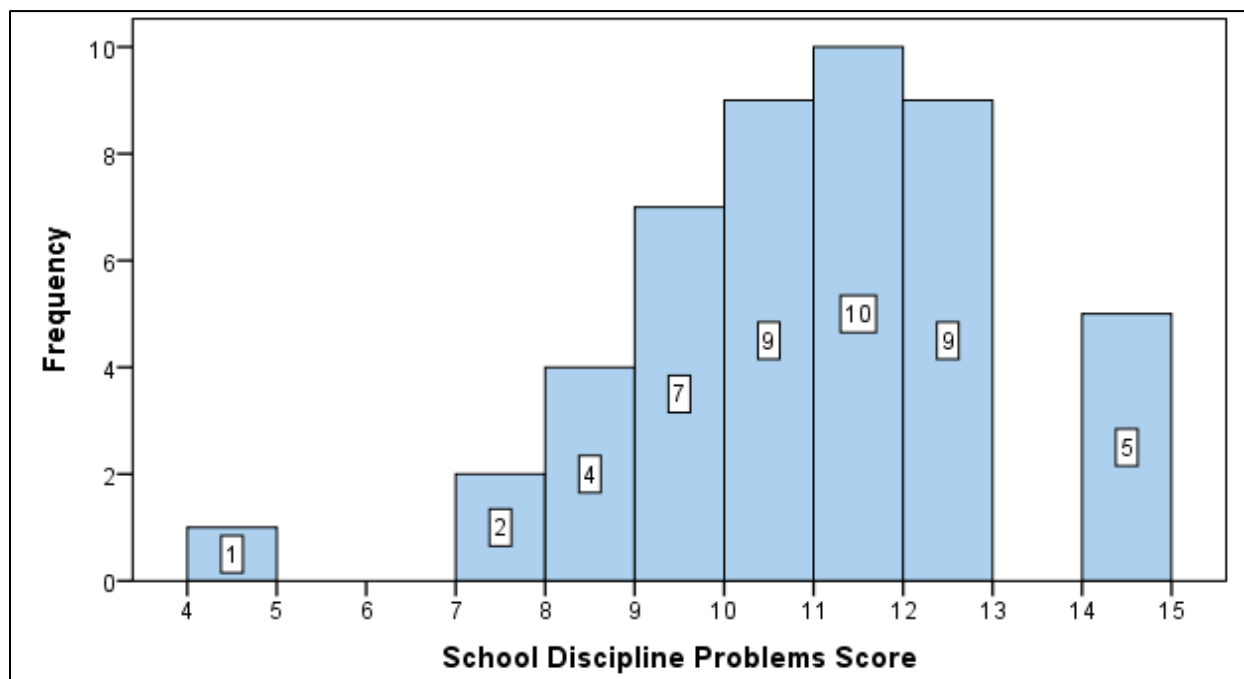


Figure 7.4: School discipline problems by school type (Maltese Heads of School)

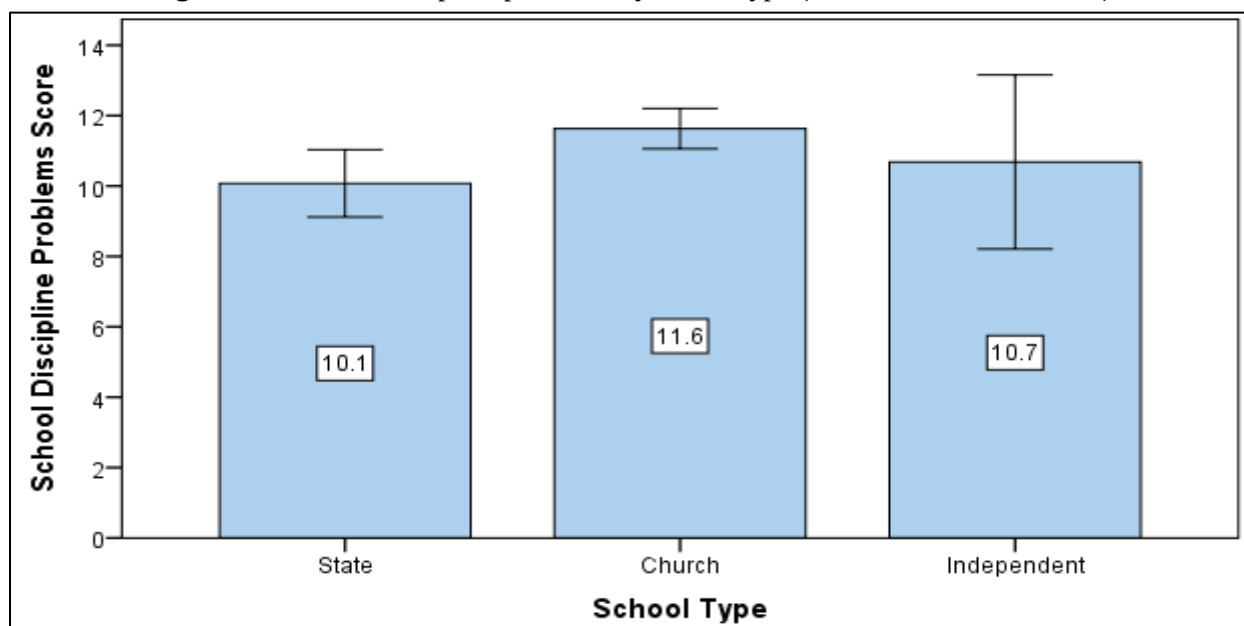


Figure 7.3 displays the score distribution of school discipline problems and Figure 7.4 shows that according to heads of school, church schools have the least disciplinary problems and state schools have the most.

7.3 Safe and Orderly Schools

A scale score for safe and orderly schools was generated by considering the responses of teachers to eight aspects. Tables 7.2 and 7.3 display the responses of Mathematics and Science teachers provided to the aspects describing safety and order in their schools.

Table 7.2: Responses of Mathematics teachers regarding their perception of school safety and order

Indicate the extent to which you agree or disagree with each of the following statements	Agree a lot	Agree a little	Disagree a little	Disagree a lot
This school is located in a safe neighbourhood	71.8%	20.2%	7.5%	0.5%
I feel safe at this school	70.4%	24.9%	3.8%	0.9%
This school's security policies and practices are sufficient	51.2%	32.9%	12.7%	3.3%
The students behave in an orderly manner	34.3%	44.1%	14.1%	7.5%
The students are respectful of the teachers	34.7%	43.2%	16.4%	5.6%
The students respect school property	31.0%	41.8%	20.2%	7.0%
This school has clear rules about student conduct	49.8%	38.0%	10.3%	1.9%
This school's rules are enforced in a fair and consistent manner	40.4%	37.6%	20.2%	1.9%

Table 7.3: Responses of Science teachers regarding their perception of school safety and order

Indicate the extent to which you agree or disagree with each of the following statements	Agree a lot	Agree a little	Disagree a little	Disagree a lot
This school is located in a safe neighbourhood	73.3%	16.6%	8.8%	1.3%
I feel safe at this school	71.0%	22.7%	4.1%	2.1%
This school's security policies and practices are sufficient	46.5%	36.5%	12.0%	5.0%
The students behave in an orderly manner	33.5%	39.2%	19.5%	7.7%
The students are respectful of the teachers	30.3%	43.9%	18.8%	7.0%
The students respect school property	20.8%	42.7%	28.3%	8.2%
This school has clear rules about student conduct	48.7%	33.9%	14.3%	3.0%
This school's rules are enforced in a fair and consistent manner	36.9%	40.1%	18.6%	4.3%

Students in very safe and orderly schools had a score on the scale of at least 10.6, which corresponds to their teachers 'Agreeing a lot' with four of the eight qualities of a safe and orderly school and 'Agreeing a little' with the other four, on average. Students in less than safe and orderly schools had a score no higher than 7.2, which corresponds to their teachers 'Disagreeing a little' with four of the eight qualities and 'Agreeing a little' with the other four, on average. All other students scoring between 7.2 and 10.6 attended safe and orderly schools.

Figure 7.5: Safe, orderly schools and attainment in Mathematics (Mathematics teachers)

Country	Very Safe and Orderly		Safe and Orderly		Less than Safe and Orderly		Average Scale Score
	Percent of Students	Average Achievement	Percent of Students	Average Achievement	Percent of Students	Average Achievement	
Qatar	75 (2.8)	440 (4.0)	23 (2.8)	424 (8.1)	2 (0.9)	~ ~	11.5 (0.10)
Norway (9)	72 (3.4)	515 (2.6)	28 (3.3)	506 (3.6)	0 (0.4)	~ ~	11.3 (0.11)
Ireland	70 (2.7)	534 (3.1)	26 (2.4)	505 (6.4)	4 (1.3)	452 (25.9)	11.6 (0.13)
Lebanon	67 (4.4)	447 (5.0)	30 (4.3)	434 (7.6)	3 (1.5)	417 (32.8)	11.1 (0.17)
United Arab Emirates	67 (2.0)	482 (3.2)	32 (1.9)	433 (5.2)	2 (0.5)	~ ~	11.4 (0.09)
Kazakhstan	61 (4.0)	529 (6.5)	38 (4.0)	526 (8.3)	0 (0.2)	~ ~	11.4 (0.16)
Australia	60 (3.0)	523 (3.6)	33 (2.7)	492 (4.5)	7 (1.6)	445 (10.1)	11.0 (0.16)
Israel	60 (2.9)	523 (6.3)	35 (2.9)	498 (7.8)	5 (0.9)	463 (19.3)	10.9 (0.12)
Singapore	59 (2.3)	629 (4.7)	38 (2.2)	609 (5.5)	3 (0.9)	586 (20.0)	11.2 (0.11)
Russian Federation	57 (2.9)	545 (4.9)	42 (2.8)	528 (7.4)	2 (1.0)	~ ~	10.7 (0.10)
Hong Kong SAR	56 (4.9)	606 (5.6)	43 (4.9)	580 (8.6)	1 (0.2)	~ ~	10.9 (0.16)
Kuwait	55 (4.1)	395 (7.2)	41 (4.1)	389 (8.8)	4 (1.4)	379 (12.5)	10.5 (0.13)
Iran, Islamic Rep. of	54 (3.3)	446 (6.4)	40 (3.4)	429 (6.4)	6 (1.5)	391 (10.3)	10.7 (0.14)
Oman	52 (3.1)	416 (4.1)	46 (3.1)	391 (3.7)	2 (1.0)	~ ~	10.7 (0.14)
Bahrain	50 (2.9)	464 (2.7)	44 (2.9)	443 (3.3)	6 (1.3)	453 (8.0)	10.2 (0.10)
New Zealand	50 (3.6)	507 (5.0)	42 (3.5)	479 (4.3)	8 (1.4)	482 (19.7)	10.7 (0.14)
Canada	50 (3.2)	533 (2.5)	45 (3.1)	529 (3.7)	4 (1.0)	507 (14.0)	10.7 (0.16)
England	50 (3.9)	527 (7.2)	44 (3.8)	514 (8.8)	6 (2.0)	461 (9.0)	10.6 (0.17)
Egypt	49 (4.2)	407 (5.0)	45 (4.2)	378 (6.3)	6 (1.8)	373 (15.9)	10.4 (0.15)
Lithuania	49 (4.1)	514 (4.2)	46 (4.3)	507 (4.9)	5 (1.9)	507 (14.7)	10.3 (0.15)
Saudi Arabia	48 (4.6)	378 (6.4)	42 (4.4)	361 (5.6)	10 (2.5)	339 (12.6)	10.3 (0.18)
Malta	48 (0.1)	509 (1.7)	46 (0.1)	485 (1.6)	6 (0.1)	447 (4.5)	10.4 (0.01)
United States	46 (3.0)	538 (4.1)	41 (2.7)	507 (5.1)	13 (2.0)	482 (9.2)	10.3 (0.16)
Georgia	45 (4.3)	465 (5.3)	53 (4.1)	445 (4.5)	2 (1.4)	~ ~	10.3 (0.15)
Thailand	44 (3.5)	441 (8.0)	51 (3.8)	423 (6.4)	6 (1.8)	430 (16.0)	10.3 (0.13)
Hungary	41 (3.8)	527 (5.5)	52 (3.7)	511 (6.1)	7 (1.7)	459 (17.2)	10.0 (0.14)
Jordan	41 (4.0)	400 (5.2)	48 (4.0)	380 (4.0)	11 (3.0)	360 (13.3)	9.9 (0.17)
Chinese Taipei	38 (3.4)	613 (5.1)	57 (3.7)	590 (3.9)	5 (1.7)	594 (9.7)	10.1 (0.14)
Chile	38 (3.8)	451 (5.8)	49 (4.2)	424 (6.4)	14 (2.5)	390 (7.4)	9.7 (0.16)
Malaysia	35 (3.6)	492 (6.8)	62 (3.5)	452 (5.3)	4 (1.9)	461 (10.9)	9.9 (0.14)
South Africa (9)	33 (3.5)	397 (10.4)	45 (3.3)	366 (6.3)	22 (3.0)	348 (4.9)	9.2 (0.15)
Sweden	31 (3.8)	511 (5.0)	63 (4.0)	497 (3.7)	6 (1.9)	484 (12.2)	9.8 (0.14)
Turkey	30 (3.6)	479 (7.6)	47 (3.9)	463 (7.1)	23 (2.9)	418 (8.9)	9.2 (0.16)
Korea, Rep. of	27 (2.8)	613 (3.8)	64 (3.1)	604 (3.6)	8 (2.2)	598 (12.0)	9.6 (0.12)
Morocco	26 (2.8)	399 (5.0)	52 (3.7)	382 (3.3)	23 (2.4)	372 (4.6)	9.1 (0.13)
Slovenia	19 (2.4)	527 (6.9)	71 (2.7)	515 (2.1)	10 (1.7)	512 (5.3)	9.3 (0.10)
Italy	17 (3.0)	515 (5.7)	75 (3.1)	492 (3.1)	8 (1.7)	461 (10.0)	9.1 (0.12)
Botswana (9)	15 (3.0)	415 (8.6)	53 (4.6)	389 (3.4)	32 (4.4)	385 (3.7)	8.3 (0.20)
Japan	14 (2.5)	583 (6.3)	73 (3.4)	590 (2.8)	14 (2.6)	574 (7.1)	8.8 (0.11)
International Avg.	46 (0.5)	493 (0.9)	46 (0.6)	474 (0.9)	8 (0.3)	453 (2.5)	

The proportions of Mathematics and Science teachers reporting that their schools are ‘Very safe and orderly’, ‘Safe and orderly’ and ‘Less than safe and orderly’ are around (46%, 46% and 8%) respectively. These proportions are somewhat different to those provided by Maltese Mathematics teachers (48%, 46% and 6%) and Maltese Science teachers (38%, 51% and 10%). For Mathematics teachers, the scale score that measures safety and order at school ranges from 11.6 (Ireland) to 8.3 (Botswana), where Malta’s mean scale score (10.4) is comparable to the international

average (10.3). For Science teachers, the scale score ranges from 11.5 (Kazakhstan) to 8.3 (Botswana), where Malta's mean scale score (10.1) is lower than the international average (10.3). Figures 7.5 and 7.6 clearly show that safety and order in schools is positively related to the attainment in Mathematics and Science. The mean scores of students attending schools that are 'Very safe and orderly', 'Safe and orderly' and 'Less than safe and orderly' are respectively 493, 474 and 453 in Mathematics and 499, 478 and 457 in Science. The corresponding mean scores of Maltese students are respectively 509, 485 and 447 in Mathematics and 503, 471 and 442 in Science.

Figure 7.6: Safe, orderly schools and attainment in Science (Science teachers)

Country	Very Safe and Orderly		Safe and Orderly		Less than Safe and Orderly		Average Scale Score
	Percent of Students	Average Achievement	Percent of Students	Average Achievement	Percent of Students	Average Achievement	
Norway (9)	71 (3.3)	513 (3.1)	29 (3.3)	504 (5.0)	0 (0.4)	~ ~	11.3 (0.12)
Lebanon	66 (4.0)	401 (7.1)	28 (3.7)	401 (9.3)	6 (1.9)	350 (19.3)	11.2 (0.20)
Kazakhstan	66 (2.9)	536 (4.7)	34 (3.0)	527 (7.6)	1 (0.3)	~ ~	11.5 (0.14)
United Arab Emirates	64 (2.3)	497 (3.1)	33 (2.3)	440 (5.4)	3 (1.2)	426 (12.0)	11.3 (0.10)
Ireland	64 (3.1)	544 (2.9)	32 (2.9)	514 (4.9)	4 (1.2)	475 (14.5)	11.3 (0.14)
Singapore	64 (2.2)	606 (4.2)	33 (2.1)	582 (7.9)	3 (0.8)	571 (15.0)	11.3 (0.09)
Qatar	64 (2.2)	468 (4.9)	35 (2.3)	434 (4.1)	1 (0.3)	~ ~	11.2 (0.10)
Iran, Islamic Rep. of	61 (3.1)	465 (5.7)	35 (3.2)	445 (5.3)	4 (1.3)	427 (10.5)	10.8 (0.12)
Hong Kong SAR	58 (4.5)	549 (4.5)	39 (4.4)	542 (8.4)	2 (1.2)	~ ~	10.7 (0.16)
Australia	56 (3.2)	529 (3.3)	38 (3.3)	501 (4.2)	6 (1.5)	482 (13.1)	10.8 (0.14)
Israel	55 (3.1)	514 (6.2)	39 (3.1)	507 (6.9)	6 (1.7)	470 (21.1)	10.7 (0.12)
New Zealand	53 (3.6)	536 (4.0)	40 (3.4)	498 (6.0)	7 (1.9)	455 (14.9)	10.6 (0.16)
Oman	52 (3.3)	462 (3.4)	42 (3.4)	449 (5.0)	6 (1.9)	438 (20.9)	10.6 (0.13)
Kuwait	52 (4.0)	426 (7.6)	39 (3.8)	395 (10.4)	9 (2.7)	372 (25.9)	10.5 (0.18)
Georgia	52 (2.5)	446 (3.8)	47 (2.5)	441 (3.9)	1 (0.5)	~ ~	10.5 (0.08)
England	51 (3.0)	551 (6.2)	43 (3.0)	527 (6.6)	5 (1.1)	498 (15.4)	10.7 (0.13)
Egypt	50 (3.9)	389 (6.1)	42 (3.7)	354 (6.7)	8 (1.9)	342 (17.3)	10.4 (0.15)
Chile	48 (4.4)	475 (5.9)	46 (4.7)	443 (5.8)	6 (2.1)	410 (11.7)	10.3 (0.19)
Russian Federation	47 (2.6)	550 (4.9)	50 (2.6)	538 (5.2)	2 (0.5)	~ ~	10.3 (0.08)
Canada	47 (2.6)	536 (2.9)	47 (2.5)	519 (4.0)	6 (1.0)	528 (10.5)	10.5 (0.12)
United States	45 (2.9)	549 (4.5)	42 (2.6)	526 (4.4)	12 (1.9)	490 (9.1)	10.3 (0.14)
Bahrain	45 (2.5)	475 (4.4)	47 (3.1)	458 (3.2)	8 (1.9)	452 (12.0)	10.2 (0.11)
Lithuania	44 (2.9)	519 (4.0)	51 (2.7)	518 (3.5)	5 (1.1)	528 (8.9)	10.1 (0.10)
Jordan	44 (3.5)	444 (4.6)	42 (4.0)	418 (5.3)	14 (2.9)	397 (9.7)	10.0 (0.16)
Thailand	42 (3.8)	461 (7.0)	52 (3.9)	451 (6.1)	6 (1.7)	463 (21.4)	10.1 (0.15)
Saudi Arabia	42 (4.2)	411 (6.9)	52 (4.1)	390 (6.1)	6 (2.0)	349 (19.8)	10.2 (0.20)
Hungary	41 (2.3)	542 (3.6)	53 (2.3)	516 (4.6)	6 (1.5)	500 (8.5)	10.1 (0.09)
Chinese Taipei	41 (3.6)	576 (4.1)	52 (3.9)	565 (3.5)	8 (2.1)	567 (12.8)	10.1 (0.14)
Malta	38 (0.4)	503 (2.5)	51 (0.4)	471 (1.9)	10 (0.2)	442 (4.3)	10.1 (0.02)
Malaysia	32 (3.8)	478 (7.2)	62 (4.3)	464 (6.4)	6 (1.9)	459 (23.6)	9.8 (0.13)
Sweden	31 (3.2)	544 (4.5)	61 (3.7)	515 (4.4)	8 (2.1)	496 (11.9)	9.8 (0.14)
Morocco	30 (2.0)	406 (4.9)	52 (2.1)	391 (2.4)	18 (1.9)	380 (3.9)	9.3 (0.11)
Korea, Rep. of	30 (3.7)	560 (2.8)	65 (4.0)	555 (2.8)	5 (1.7)	544 (4.8)	9.8 (0.15)
South Africa (9)	30 (3.5)	391 (13.4)	49 (3.3)	351 (6.9)	22 (2.8)	326 (6.3)	9.2 (0.18)
Turkey	28 (3.5)	515 (7.5)	54 (3.7)	489 (5.2)	18 (2.8)	472 (9.5)	9.2 (0.14)
Slovenia	20 (2.0)	557 (4.7)	71 (2.2)	551 (2.4)	9 (1.5)	542 (5.2)	9.3 (0.08)
Italy	18 (3.2)	515 (6.4)	75 (3.3)	497 (3.3)	8 (1.7)	469 (10.3)	9.2 (0.13)
Botswana (9)	14 (3.2)	426 (10.3)	56 (4.5)	387 (4.0)	30 (4.5)	394 (6.3)	8.3 (0.17)
Japan	11 (2.3)	590 (7.2)	77 (3.2)	570 (2.4)	12 (2.3)	558 (4.1)	8.9 (0.12)
International Avg.	45 (0.5)	499 (0.9)	47 (0.5)	478 (0.9)	8 (0.3)	457 (2.4)	

Figure 7.7: Safe and orderly schools by school type (Mathematics teachers)

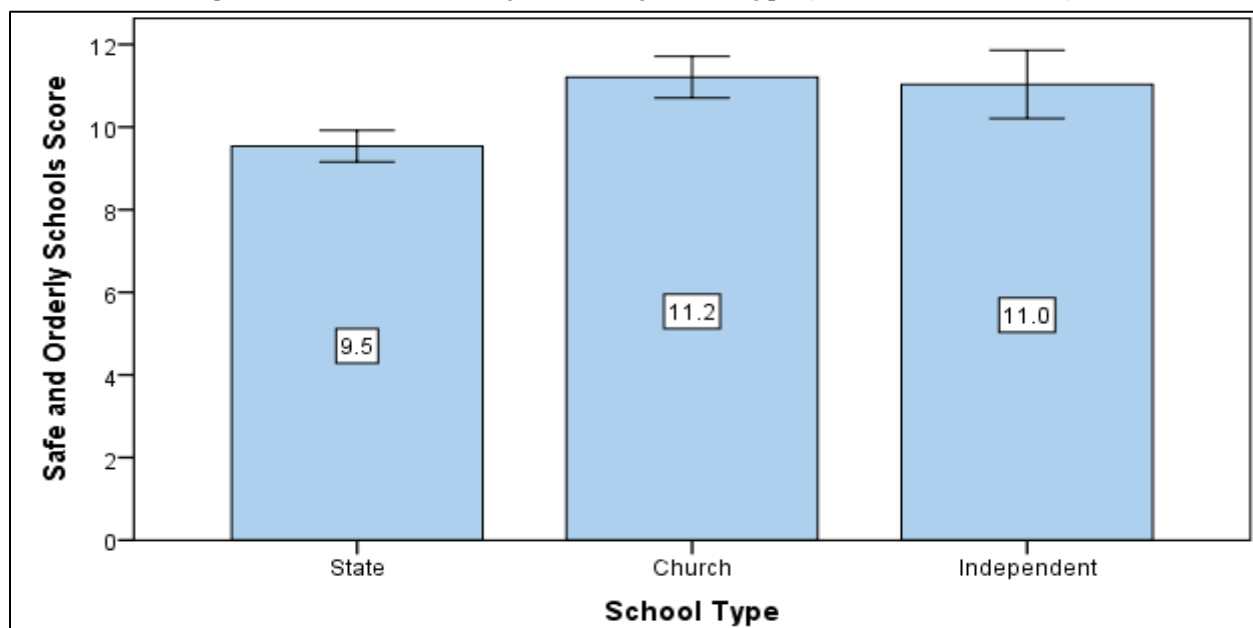


Figure 7.8: Safe and orderly schools by school type (Science teachers)

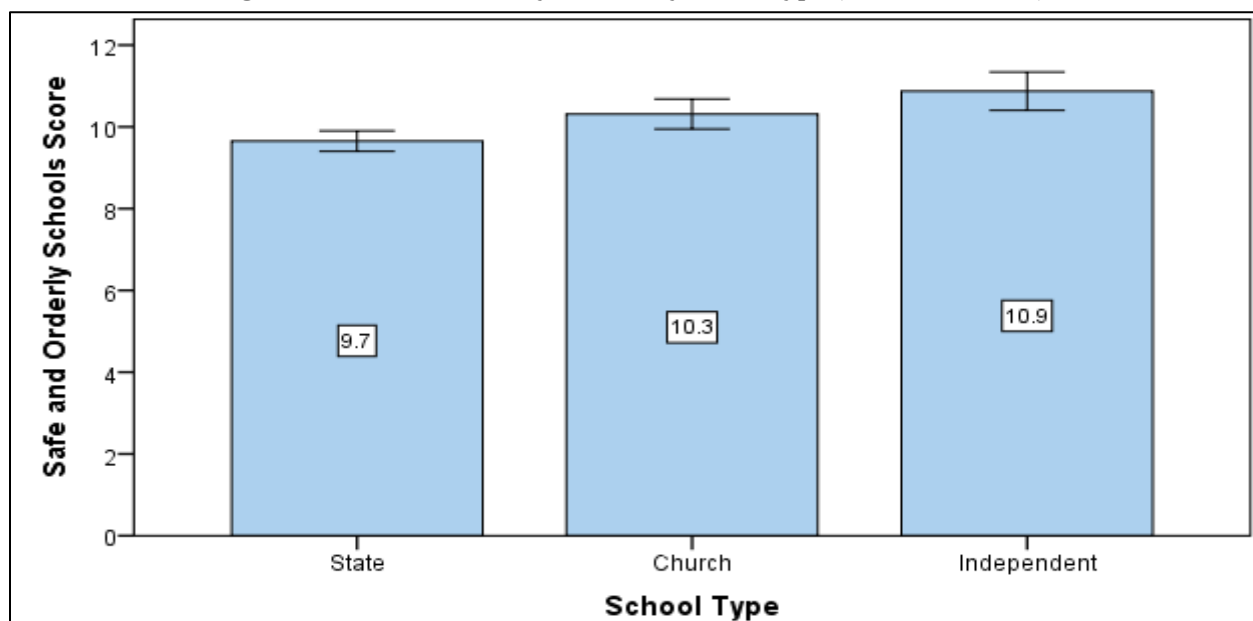


Table 7.4: Mean scores of safety and order in schools by gender of mathematics and science teachers

		Sample size	Mean Score	Std. Deviation	P-value
Gender of Mathematics teacher	Female	137	10.58	2.135	0.002
	Male	76	9.61	2.292	
Gender of Science teacher	Female	389	10.11	2.402	0.075
	Male	170	9.73	2.262	

Figures 7.7 and 7.8 show that both mathematics and science teachers agree that safety and order in state schools is significantly lower than in church and independent schools. Table 7.4 shows that female mathematics and science teachers perceive safety and order in schools better than males.

7.4 Bullying at School

A scale score that measures bullying at school was generated using students' responses to nine bullying behaviours, which are displayed in Table 7.5.

Table 7.5: Responses of Maltese students to bullying at school

During this year, how often have other students from your school done any of the following things to you?	At least once a week	1-2 times a month	A few times a year	Never
Made fun of me or called me names	16.1%	12.5%	29.1%	42.3%
Left me out of their games or activities	7.0%	11.2%	21.9%	60.0%
Spread lies about me	7.2%	10.4%	27.7%	54.7%
Stole something from me	4.0%	5.7%	19.6%	70.7%
Hit or hurt me	5.7%	6.0%	18.1%	70.2%
Made me do things I didn't want to do	3.9%	5.0%	14.2%	76.9%
Shared embarrassing information about me	4.5%	5.6%	16.7%	73.3%
Posted embarrassing things about me online	2.7%	2.6%	6.8%	88.0%
Threatened me	3.7%	4.1%	10.0%	82.1%

Students bullied almost never had a score on the scale of at least 9.3, which corresponds to 'Never' experiencing five of the nine bullying behaviours and experiencing each of the other four behaviours 'A few times a year', on average. Students bullied about weekly had a score no higher than 7.3, which corresponds to their experiencing each of five of the nine behaviours 'Once or twice a month' and each of the other four 'A few times a year', on average. All other students scoring between 7.3 and 9.3 were bullied about monthly.

Figure 7.9: Score distribution for school bullying

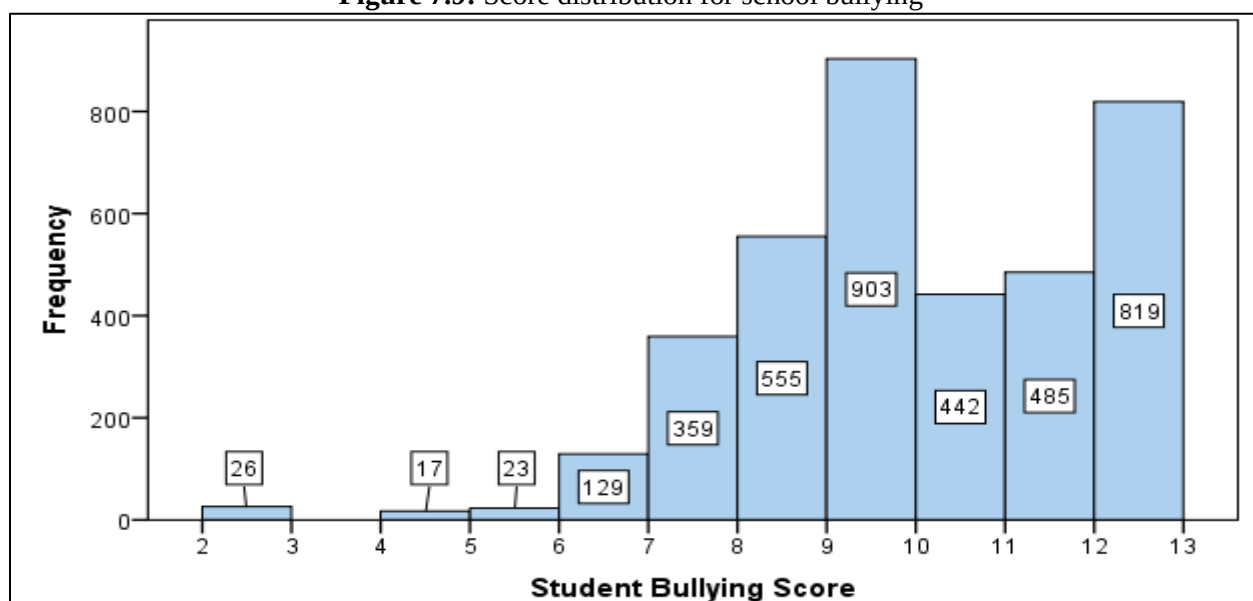


Figure 7.10: Students bullying at school and attainment in Mathematics (reported by students)

Country	Almost Never		About Monthly		About Weekly		Average Scale Score
	Percent of Students	Average Achievement	Percent of Students	Average Achievement	Percent of Students	Average Achievement	
Chinese Taipei	86 (0.7)	600 (2.4)	13 (0.6)	596 (5.1)	1 (0.2)	~ ~	11.3 (0.04)
Kazakhstan	86 (0.8)	531 (5.4)	13 (0.7)	513 (6.4)	2 (0.2)	~ ~	11.3 (0.05)
Korea, Rep. of	84 (0.6)	607 (2.7)	15 (0.6)	603 (3.9)	1 (0.2)	~ ~	11.1 (0.03)
Georgia	82 (1.0)	459 (3.5)	16 (0.9)	441 (6.0)	2 (0.3)	~ ~	11.0 (0.05)
Japan	80 (0.8)	585 (2.6)	18 (0.7)	596 (3.5)	2 (0.2)	~ ~	10.9 (0.05)
Chile	78 (0.8)	431 (3.3)	18 (0.7)	420 (4.4)	3 (0.4)	401 (8.1)	10.6 (0.04)
Norway (9)	75 (0.9)	514 (2.2)	22 (0.8)	509 (3.5)	3 (0.3)	478 (10.9)	10.6 (0.04)
Ireland	75 (0.9)	526 (2.7)	22 (0.9)	521 (3.6)	4 (0.3)	492 (6.8)	10.5 (0.04)
Sweden	74 (0.9)	504 (2.8)	23 (0.8)	497 (4.3)	3 (0.3)	459 (8.3)	10.5 (0.04)
Italy	73 (0.9)	497 (2.7)	25 (0.8)	488 (3.2)	2 (0.3)	~ ~	10.3 (0.04)
Hungary	73 (1.0)	521 (3.8)	25 (0.9)	502 (5.3)	2 (0.3)	~ ~	10.3 (0.04)
Slovenia	72 (1.1)	518 (2.2)	24 (1.0)	515 (2.7)	4 (0.3)	491 (10.3)	10.3 (0.04)
Lithuania	72 (1.3)	515 (3.1)	24 (1.1)	505 (4.0)	4 (0.4)	491 (8.0)	10.3 (0.06)
Turkey	69 (1.1)	468 (5.2)	26 (0.9)	447 (4.8)	6 (0.3)	397 (7.4)	10.3 (0.05)
Russian Federation	66 (1.0)	541 (4.9)	30 (0.9)	536 (5.1)	4 (0.3)	511 (7.9)	10.1 (0.04)
Canada	65 (0.8)	533 (2.1)	30 (0.7)	525 (2.4)	5 (0.3)	500 (5.0)	10.0 (0.03)
United States	64 (0.6)	522 (3.2)	29 (0.5)	518 (3.4)	7 (0.4)	494 (4.7)	10.0 (0.03)
Saudi Arabia	64 (1.2)	374 (4.4)	27 (1.0)	372 (6.1)	9 (0.6)	328 (7.8)	10.1 (0.06)
Malta	64 (0.9)	500 (1.5)	29 (0.8)	499 (2.2)	7 (0.5)	445 (7.2)	10.0 (0.03)
Jordan	64 (1.1)	400 (3.2)	26 (0.9)	378 (4.3)	11 (0.5)	342 (6.4)	10.1 (0.05)
England	62 (1.2)	524 (4.2)	32 (1.0)	516 (4.9)	6 (0.5)	496 (7.4)	9.9 (0.05)
Qatar	61 (1.0)	449 (2.8)	27 (0.7)	443 (3.9)	12 (0.8)	383 (7.5)	9.8 (0.05)
Iran, Islamic Rep. of	60 (0.8)	445 (4.7)	32 (0.8)	432 (5.5)	8 (0.5)	389 (6.4)	9.9 (0.04)
Kuwait	60 (1.1)	397 (4.7)	32 (1.0)	390 (6.0)	8 (0.6)	370 (9.6)	9.8 (0.05)
United Arab Emirates	58 (0.8)	477 (2.1)	32 (0.6)	461 (2.4)	10 (0.5)	414 (4.8)	9.7 (0.04)
Singapore	58 (0.8)	628 (3.0)	36 (0.7)	615 (3.8)	6 (0.4)	591 (7.1)	9.7 (0.03)
Australia	57 (1.0)	514 (3.2)	34 (0.8)	500 (3.2)	9 (0.4)	476 (5.1)	9.7 (0.04)
Hong Kong SAR	56 (1.1)	590 (4.4)	37 (1.0)	601 (5.4)	7 (0.6)	593 (8.4)	9.6 (0.04)
New Zealand	55 (1.0)	501 (3.9)	35 (0.8)	492 (3.6)	10 (0.5)	466 (4.9)	9.5 (0.04)
Egypt	55 (1.5)	418 (4.1)	29 (1.0)	381 (4.8)	16 (1.0)	335 (5.6)	9.7 (0.07)
Lebanon	52 (2.0)	456 (4.0)	28 (1.3)	446 (4.2)	19 (1.8)	412 (6.9)	9.5 (0.10)
Morocco	51 (0.8)	391 (2.6)	38 (0.7)	384 (2.4)	11 (0.5)	370 (3.8)	9.4 (0.04)
Bahrain	49 (0.8)	466 (2.0)	36 (0.7)	455 (2.3)	15 (0.6)	424 (3.4)	9.3 (0.04)
Malaysia	48 (1.1)	478 (3.6)	42 (0.7)	462 (3.5)	11 (0.8)	425 (5.5)	9.3 (0.05)
Oman	44 (0.9)	416 (2.5)	41 (0.8)	402 (3.1)	14 (0.7)	373 (5.3)	9.2 (0.04)
South Africa (9)	36 (1.2)	396 (5.5)	47 (0.9)	374 (4.2)	17 (0.9)	328 (5.4)	8.9 (0.04)
Thailand	33 (1.1)	435 (5.7)	50 (0.9)	435 (5.0)	17 (0.8)	415 (5.6)	8.8 (0.04)
Botswana (9)	26 (0.8)	408 (2.7)	51 (0.7)	400 (2.1)	23 (0.6)	368 (4.3)	8.4 (0.03)
Israel	--	--	--	--	--	--	--
International Avg.	63 (0.2)	488 (0.6)	29 (0.1)	478 (0.7)	8 (0.1)	434 (1.2)	

The proportions of students reporting that they experience school bullying ‘Almost never’, ‘About monthly’ and ‘About weekly’ are 63%, 29% and 8% respectively. These proportions are comparable to Maltese students (64%, 29% and 7%). The scale score that measures school bullying ranges from 11.3 (Chinese Taipei and Kazakhstan) to 8.4 (Botswana), where Malta’s mean scale score (10.0) is comparable to the international average. Figures 7.10 and 7.11 clearly show that

safety and order in schools is positively related to the attainment in Mathematics and Science. The mean scores of students experiencing school bullying ‘Almost never’, ‘About monthly’ and ‘About weekly’ are respectively 488, 478 and 434 in Mathematics and 495, 484 and 433 in Science. The corresponding mean scores of Maltese students are respectively 500, 499 and 445 in Mathematics and 489, 489 and 426 in Science. Bullying has most negative impact on academic attainment when it occurs regularly.

Figure 7.11: Students bullying at school and attainment in Science (reported by students)

Country	Almost Never		About Monthly		About Weekly		Average Scale Score
	Percent of Students	Average Achievement	Percent of Students	Average Achievement	Percent of Students	Average Achievement	
Chinese Taipei	86 (0.7)	570 (2.0)	13 (0.6)	568 (4.7)	1 (0.2)	~ ~	11.3 (0.04)
Kazakhstan	86 (0.8)	535 (4.5)	13 (0.7)	523 (6.3)	2 (0.2)	~ ~	11.3 (0.05)
Korea, Rep. of	84 (0.6)	556 (2.4)	15 (0.6)	554 (3.3)	1 (0.2)	~ ~	11.1 (0.03)
Georgia	82 (1.0)	450 (2.9)	16 (0.9)	432 (6.7)	2 (0.3)	~ ~	11.0 (0.05)
Japan	80 (0.8)	570 (2.0)	18 (0.7)	576 (2.8)	2 (0.2)	~ ~	10.9 (0.05)
Chile	78 (0.8)	458 (3.3)	18 (0.7)	447 (4.2)	3 (0.4)	422 (8.3)	10.6 (0.04)
Norway (9)	75 (0.9)	513 (2.7)	22 (0.8)	505 (4.3)	3 (0.3)	464 (13.6)	10.6 (0.04)
Ireland	75 (0.9)	533 (2.7)	22 (0.9)	526 (3.8)	4 (0.3)	493 (7.4)	10.5 (0.04)
Sweden	74 (0.9)	527 (3.4)	23 (0.8)	520 (5.1)	3 (0.3)	466 (11.7)	10.5 (0.04)
Italy	73 (0.9)	502 (2.8)	25 (0.8)	494 (2.6)	2 (0.3)	~ ~	10.3 (0.04)
Hungary	73 (1.0)	532 (3.5)	25 (0.9)	520 (4.8)	2 (0.3)	~ ~	10.3 (0.04)
Slovenia	72 (1.1)	553 (2.6)	24 (1.0)	552 (2.7)	4 (0.3)	517 (11.9)	10.3 (0.04)
Lithuania	72 (1.3)	522 (2.9)	24 (1.1)	516 (4.1)	4 (0.4)	488 (8.1)	10.3 (0.06)
Turkey	69 (1.1)	503 (4.3)	26 (0.9)	485 (4.3)	6 (0.3)	429 (7.5)	10.3 (0.05)
Russian Federation	66 (1.0)	547 (4.6)	30 (0.9)	542 (4.1)	4 (0.3)	521 (8.4)	10.1 (0.04)
Canada	65 (0.8)	532 (2.3)	30 (0.7)	525 (2.2)	5 (0.3)	502 (5.3)	10.0 (0.03)
United States	64 (0.6)	534 (2.9)	29 (0.5)	529 (3.2)	7 (0.4)	504 (4.9)	10.0 (0.03)
Saudi Arabia	64 (1.2)	411 (4.3)	27 (1.0)	394 (6.4)	9 (0.6)	325 (8.0)	10.1 (0.06)
Malta	64 (0.9)	489 (2.1)	29 (0.8)	489 (3.0)	7 (0.5)	426 (8.9)	10.0 (0.03)
Jordan	64 (1.1)	448 (3.3)	26 (0.9)	415 (4.1)	11 (0.5)	356 (6.1)	10.1 (0.05)
England	62 (1.2)	540 (3.9)	32 (1.0)	538 (4.5)	6 (0.5)	516 (7.8)	9.9 (0.05)
Qatar	61 (1.0)	472 (2.5)	27 (0.7)	461 (4.2)	12 (0.8)	389 (8.4)	9.8 (0.05)
Iran, Islamic Rep. of	60 (0.8)	465 (4.2)	32 (0.8)	453 (4.5)	8 (0.5)	410 (5.8)	9.9 (0.04)
Kuwait	60 (1.1)	419 (5.3)	32 (1.0)	407 (6.8)	8 (0.6)	368 (9.0)	9.8 (0.05)
United Arab Emirates	58 (0.8)	492 (2.2)	32 (0.6)	473 (2.6)	10 (0.5)	410 (5.4)	9.7 (0.04)
Singapore	58 (0.8)	603 (3.0)	36 (0.7)	592 (3.8)	6 (0.4)	563 (7.4)	9.7 (0.03)
Australia	57 (1.0)	521 (2.9)	34 (0.8)	507 (2.9)	9 (0.4)	483 (4.4)	9.7 (0.04)
Hong Kong SAR	56 (1.1)	541 (3.7)	37 (1.0)	553 (4.8)	7 (0.6)	545 (7.6)	9.6 (0.04)
New Zealand	55 (1.0)	521 (3.6)	35 (0.8)	512 (3.5)	10 (0.5)	485 (5.4)	9.5 (0.04)
Egypt	55 (1.5)	402 (4.1)	29 (1.0)	360 (5.1)	16 (1.0)	301 (6.7)	9.7 (0.07)
Lebanon	52 (2.0)	421 (6.0)	28 (1.3)	402 (6.0)	19 (1.8)	342 (9.6)	9.5 (0.10)
Morocco	51 (0.8)	402 (2.7)	38 (0.7)	392 (2.8)	11 (0.5)	371 (4.7)	9.4 (0.04)
Bahrain	49 (0.8)	484 (2.7)	36 (0.7)	472 (3.6)	15 (0.6)	414 (5.6)	9.3 (0.04)
Malaysia	48 (1.1)	489 (3.6)	42 (0.7)	467 (4.2)	11 (0.8)	410 (8.7)	9.3 (0.05)
Oman	44 (0.9)	471 (2.7)	41 (0.8)	453 (3.2)	14 (0.7)	416 (5.5)	9.2 (0.04)
South Africa (9)	36 (1.2)	393 (7.0)	47 (0.9)	357 (5.0)	17 (0.9)	296 (6.3)	8.9 (0.04)
Thailand	33 (1.1)	458 (4.9)	50 (0.9)	460 (4.5)	17 (0.8)	438 (4.9)	8.8 (0.04)
Botswana (9)	26 (0.8)	417 (3.7)	51 (0.7)	406 (2.7)	23 (0.6)	353 (5.0)	8.4 (0.03)
Israel	--	--	--	--	--	--	--
International Avg.	63 (0.2)	495 (0.6)	29 (0.1)	484 (0.7)	8 (0.1)	433 (1.4)	--

Figure 7.12: Relationships between prevalence of school bullying and Mathematics scores by school type

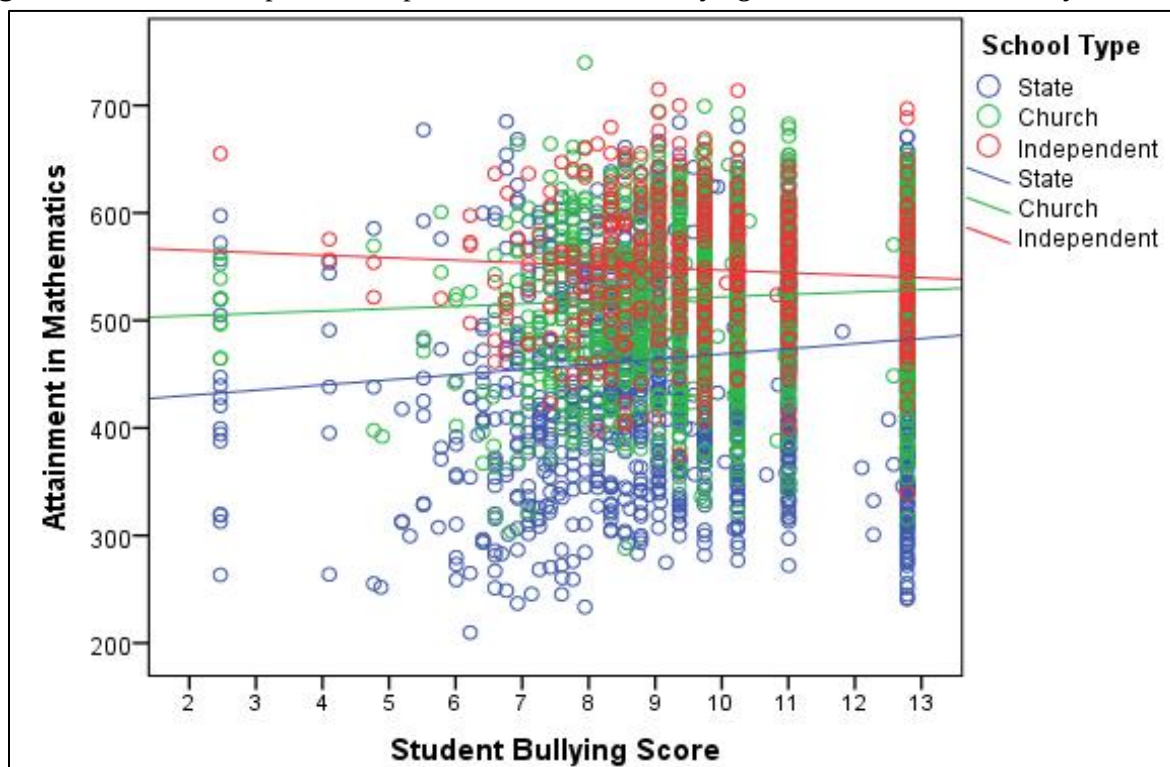
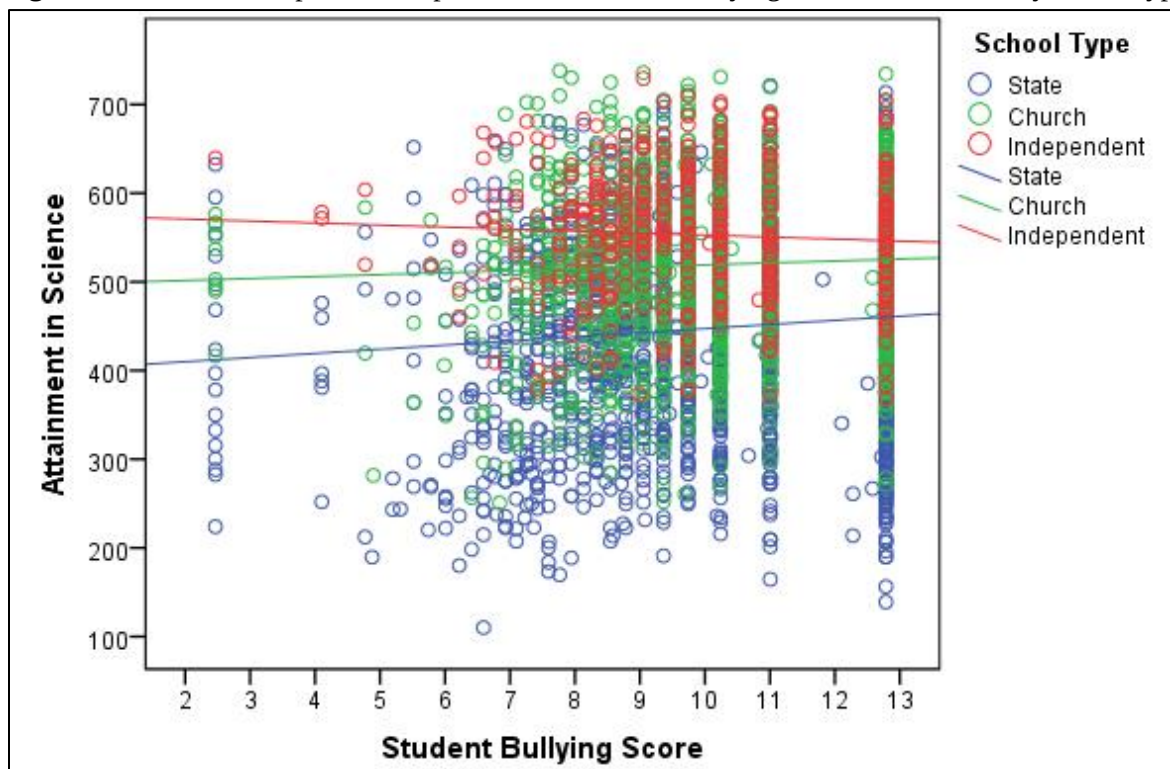


Figure 7.13: Relationships between prevalence of school bullying and Science scores by school type



Figures 7.12 and 7.13 clearly show that the positive relationship between the absence of school bullying and mathematics/science attainment is more conspicuous for students attending state and church schools rather than students attending independent schools. Figure 7.14 shows that in all school types, the mean bullying score exceeds the 9.3 threshold value indicating that school bullying rarely occurs, however it is more prevalent in independent schools than church schools. Table 7.6 shows that school bullying is significantly more prevalent between male rather than female students.

Figure 7.14: School bullying grouped by school type

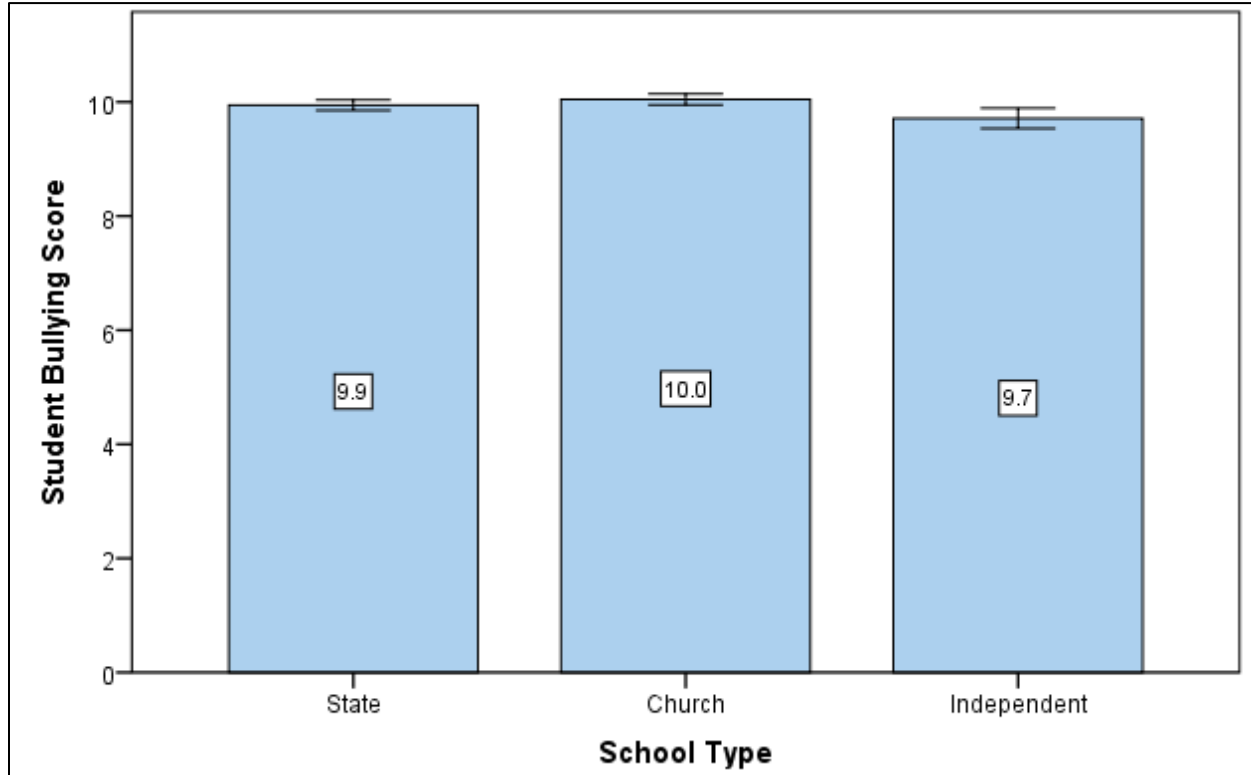


Table 7.6: Mean scores of school bullying grouped by gender

		Sample size	Mean Score	Std. Deviation	P-value
Student Gender	Female	1866	10.36	1.867	0.000
	Male	1892	9.56	1.984	

8

Education and Experience of Teachers and Heads of School

8.1 Introduction

This chapter examines the formal education and years of experience of teachers and heads of school. Moreover, this chapter investigates teachers' participation in professional development in Mathematics and Science, including content, curriculum, assessment, pedagogy and instruction, addressing students' needs, integrating information technology into the subject and improving students' critical thinking and problem-solving abilities.

8.2 Teachers' Formal Education

Tables 8.1 and 8.2 show that, in Malta, 93% of Mathematics teachers and 98% of Science teachers completed a Bachelor's degree. Of these teachers, 11.7% Mathematics teachers and 22.2% Science teachers completed a Master's degree or a PhD. The rest completed upper secondary or short-cycle tertiary education.

Table 8.1: Formal Education of Maltese Mathematics teachers

Highest level of formal education completed	Frequency	Percentage
Upper secondary	3	1.4%
Short-cycle tertiary	12	5.6%
Bachelor's or equivalent	171	80.3%
Master's or equivalent	27	12.7%
Doctor or equivalent	0	0.0%

Table 8.2: Formal Education of Maltese Science teachers

Highest level of formal education completed	Frequency	Percentage
Upper secondary	3	0.5%
Short-cycle tertiary	7	1.3%
Bachelor's or equivalent	425	76.0%
Master's or equivalent	118	21.1%
Doctor or equivalent	6	1.1%

Figures 8.1 and 8.2 display the proportions of Mathematics and Science teachers in TIMSS participating countries who completing a bachelor's or a postgraduate degree or failed to get a degree.

Figure 8.1: Formal Education of Mathematics Teachers

Country	Percent of Students by Teacher Educational Level			
	Completed Postgraduate University Degree**	Completed Bachelor's Degree or Equivalent but Not a Postgraduate Degree	Completed Post-Secondary Education but Not a Bachelor's Degree	No Further than Upper-Secondary Education
Australia	20 (2.7)	80 (2.7)	0 (0.0)	0 (0.0)
Bahrain	18 (4.0)	74 (4.6)	7 (2.0)	1 (1.0)
Botswana (9)	1 (0.9)	34 (5.6)	61 (5.6)	4 (2.0)
Canada	17 (2.6)	82 (2.7)	1 (0.6)	0 (0.0)
Chile	7 (2.4)	86 (3.0)	5 (1.6)	2 (1.8)
Chinese Taipei	51 (3.9)	49 (3.9)	0 (0.0)	0 (0.0)
Egypt	0 (0.2)	87 (2.9)	11 (2.8)	2 (1.1)
England	17 (3.0)	82 (3.1)	0 (0.4)	1 (0.5)
Georgia	88 (2.9)	10 (2.7)	0 (0.0)	2 (1.2)
Hong Kong SAR	43 (4.6)	53 (4.8)	3 (0.8)	1 (0.8)
Hungary	30 (3.2)	70 (3.2)	0 (0.3)	0 (0.0)
Iran, Islamic Rep. of	12 (2.4)	65 (3.4)	21 (2.7)	2 (1.1)
Ireland	32 (2.7)	66 (2.7)	0 (0.2)	1 (0.5)
Israel	37 (3.0)	59 (3.2)	3 (1.0)	0 (0.2)
Italy	11 (2.9)	71 (4.1)	18 (3.2)	0 (0.0)
Japan	9 (2.2)	90 (2.3)	1 (0.4)	0 (0.0)
Jordan	9 (2.9)	80 (3.6)	6 (2.1)	4 (1.6)
Kazakhstan	4 (1.5)	93 (2.1)	0 (0.4)	2 (1.2)
Korea, Rep. of	34 (3.5)	66 (3.5)	0 (0.0)	0 (0.0)
Kuwait	14 (3.9)	76 (4.1)	8 (1.4)	2 (1.1)
Lebanon	41 (4.4)	39 (4.1)	1 (0.7)	20 (3.5)
Lithuania	33 (3.4)	67 (3.3)	0 (0.2)	0 (0.2)
Malaysia	3 (1.2)	92 (2.0)	5 (1.4)	0 (0.0)
Malta	13 (0.1)	80 (0.1)	6 (0.1)	1 (0.0)
Morocco	5 (1.6)	32 (3.3)	22 (2.8)	41 (3.0)
New Zealand	46 (2.9)	44 (3.4)	9 (2.1)	0 (0.0)
Norway (9)	22 (3.6)	74 (3.5)	5 (1.7)	0 (0.0)
Oman	13 (1.5)	86 (1.6)	1 (0.6)	1 (0.3)
Qatar	30 (3.2)	66 (3.2)	2 (0.5)	1 (0.4)
Russian Federation	64 (3.9)	36 (3.9)	0 (0.4)	0 (0.0)
Saudi Arabia	3 (2.0)	88 (3.6)	5 (2.3)	4 (2.1)
Singapore	11 (1.6)	87 (1.8)	2 (0.8)	0 (0.0)
Slovenia	60 (3.5)	0 (0.2)	40 (3.5)	0 (0.0)
South Africa (9)	2 (0.7)	71 (2.8)	25 (2.8)	2 (0.9)
Sweden	35 (3.8)	59 (4.0)	4 (1.7)	1 (0.8)
Thailand	26 (3.1)	74 (3.1)	0 (0.0)	0 (0.0)
Turkey	7 (2.0)	90 (2.2)	3 (1.5)	0 (0.0)
United Arab Emirates	30 (2.2)	66 (2.7)	4 (1.2)	1 (0.3)
United States	58 (2.7)	42 (2.7)	0 (0.0)	0 (0.0)
International Avg.	25 (0.5)	66 (0.5)	7 (0.3)	2 (0.2)

The international average proportion of teacher who completed a Master's degree or a PhD in Mathematics and Science (25% and 28%) are respectively significantly higher than Malta's (13% and 22%). Georgia (88%) tops the list, followed by Russian Federation (64%), Slovenia (60%), United States (58%) and Chinese Taipei (51%). Conversely, Malta has significantly higher

proportions of Mathematics/Science teachers with a Bachelor's degree (80% and 76%) compared to the international average proportions (66% and 64%), while the proportions of Maltese teachers who completed post-secondary education but did not attain a degree (7% and 2%) are lower than the international average proportions (9% and 9%).

Figure 8.2: Formal Education of Science Teachers

Country	Percent of Students by Teacher Educational Level			
	Completed Postgraduate University Degree**	Completed Bachelor's Degree or Equivalent but Not a Postgraduate Degree	Completed Post-Secondary Education but Not a Bachelor's Degree	No Further than Upper-Secondary Education
Australia	19 (2.2)	81 (2.2)	1 (0.3)	0 (0.0)
Bahrain	19 (3.9)	80 (3.9)	0 (0.0)	1 (0.6)
Botswana (9)	1 (0.4)	37 (5.8)	59 (6.1)	3 (2.0)
Canada	20 (2.3)	80 (2.3)	0 (0.0)	0 (0.1)
Chile	7 (2.4)	88 (3.1)	4 (1.9)	1 (0.7)
Chinese Taipei	50 (3.5)	49 (3.4)	1 (0.7)	0 (0.0)
Egypt	4 (1.7)	84 (3.0)	7 (2.3)	4 (1.6)
England	26 (2.2)	74 (2.3)	0 (0.2)	0 (0.0)
Georgia	89 (1.7)	9 (1.6)	0 (0.0)	2 (0.6)
Hong Kong SAR	52 (4.5)	45 (4.5)	3 (1.5)	0 (0.0)
Hungary	33 (2.5)	67 (2.5)	0 (0.2)	0 (0.0)
Iran, Islamic Rep. of	6 (1.5)	78 (2.8)	15 (2.2)	0 (0.0)
Ireland	31 (2.8)	66 (2.8)	2 (0.9)	1 (0.6)
Israel	44 (3.6)	51 (3.6)	4 (1.4)	1 (0.5)
Italy	12 (3.0)	71 (4.0)	17 (3.1)	0 (0.0)
Japan	17 (2.9)	83 (2.9)	0 (0.0)	0 (0.0)
Jordan	6 (1.8)	83 (2.7)	2 (1.4)	8 (2.4)
Kazakhstan	3 (0.8)	95 (0.9)	1 (0.3)	1 (0.4)
Korea, Rep. of	37 (3.7)	63 (3.7)	0 (0.0)	0 (0.0)
Kuwait	13 (2.1)	87 (2.2)	0 (0.0)	1 (0.6)
Lebanon	40 (4.4)	27 (3.5)	19 (3.6)	15 (3.5)
Lithuania	41 (2.4)	58 (2.4)	1 (0.3)	0 (0.2)
Malaysia	4 (1.9)	90 (2.5)	6 (1.7)	0 (0.0)
Malta	22 (0.3)	76 (0.3)	1 (0.1)	1 (0.1)
Morocco	8 (1.4)	49 (2.6)	23 (1.9)	20 (2.1)
New Zealand	68 (3.6)	31 (3.6)	2 (0.7)	0 (0.0)
Norway (9)	25 (3.5)	69 (3.5)	6 (1.9)	0 (0.0)
Oman	15 (1.9)	82 (2.3)	1 (0.5)	2 (1.0)
Qatar	33 (2.3)	63 (2.4)	3 (0.7)	2 (0.3)
Russian Federation	74 (2.3)	25 (2.4)	1 (0.5)	0 (0.0)
Saudi Arabia	7 (2.5)	87 (3.4)	2 (1.5)	4 (1.9)
Singapore	18 (2.0)	81 (2.0)	1 (0.6)	0 (0.0)
Slovenia	60 (2.5)	0 (0.3)	39 (2.5)	0 (0.0)
South Africa (9)	3 (1.2)	58 (3.3)	29 (3.2)	10 (2.2)
Sweden	38 (3.6)	54 (3.5)	4 (1.5)	5 (1.4)
Thailand	28 (3.2)	72 (3.3)	1 (0.7)	0 (0.0)
Turkey	7 (2.1)	92 (2.1)	0 (0.4)	0 (0.0)
United Arab Emirates	39 (2.0)	57 (2.1)	1 (0.4)	2 (0.6)
United States	56 (2.6)	44 (2.5)	0 (0.0)	0 (0.4)
International Avg.	28 (0.4)	64 (0.5)	7 (0.3)	2 (0.2)

8.3 Teachers who majored in Education and Mathematics/Science

Figures 8.3 and 8.4 display the proportion of Year 9 school teachers who either majored in Mathematics/Science and/or in Mathematics/Science Education. These proportions vary considerably between participating countries.

Figure 8.3: Teachers who majored in Mathematics and/or Mathematics Education

Country	Major in Mathematics and Mathematics Education		Major in Mathematics but No Major in Mathematics Education		Major in Mathematics Education but No Major in Mathematics		All Other Majors		No Formal Education Beyond Upper-Secondary*	
	Percent of Students	Average Achievement	Percent of Students	Average Achievement	Percent of Students	Average Achievement	Percent of Students	Average Achievement	Percent of Students	Average Achievement
Australia	46 (3.3)	513 (4.7)	18 (2.7)	507 (10.3)	14 (2.7)	498 (9.8)	22 (2.7)	503 (6.0)	0 (0.0)	~ ~
Bahrain	33 (4.2)	460 (4.1)	48 (4.5)	452 (3.3)	16 (2.2)	440 (5.6)	3 (0.6)	469 (15.9)	1 (0.9)	~ ~
Botswana (9)	22 (4.0)	395 (6.4)	46 (5.2)	392 (4.4)	14 (3.2)	383 (6.3)	16 (3.6)	398 (6.8)	2 (1.3)	~ ~
Canada	19 (2.2)	545 (6.0)	8 (1.6)	537 (5.6)	15 (2.3)	546 (4.8)	59 (2.5)	521 (2.9)	0 (0.0)	~ ~
Chile	44 (4.7)	444 (6.2)	34 (4.2)	425 (7.1)	5 (2.0)	440 (15.8)	14 (3.4)	399 (8.9)	2 (1.7)	~ ~
Chinese Taipei	31 (3.1)	610 (5.8)	50 (3.8)	600 (4.6)	4 (1.5)	599 (16.9)	15 (2.3)	577 (4.8)	0 (0.0)	~ ~
Egypt	46 (4.4)	392 (6.1)	25 (3.5)	397 (8.5)	22 (3.2)	395 (9.3)	5 (1.5)	362 (16.7)	2 (0.9)	~ ~
England	44 (4.1)	520 (8.1)	37 (4.3)	526 (8.5)	4 (1.5)	475 (26.2)	15 (3.0)	504 (12.6)	1 (0.5)	~ ~
Georgia	46 (4.1)	453 (6.0)	45 (3.8)	458 (4.5)	4 (1.7)	439 (13.4)	3 (1.3)	435 (26.2)	2 (1.2)	~ ~
Hong Kong SAR	42 (4.1)	574 (8.2)	25 (3.5)	610 (8.2)	9 (2.3)	597 (16.3)	23 (3.9)	610 (8.2)	1 (0.8)	~ ~
Hungary	12 (2.4)	500 (14.4)	8 (2.3)	519 (18.2)	76 (3.3)	518 (4.3)	4 (1.3)	472 (17.2)	0 (0.0)	~ ~
Iran, Islamic Rep. of	21 (2.1)	440 (10.0)	46 (3.6)	441 (7.0)	22 (2.9)	445 (9.2)	9 (2.2)	407 (13.3)	2 (1.1)	~ ~
Ireland	33 (3.0)	519 (5.1)	36 (2.6)	532 (5.6)	8 (1.6)	534 (5.7)	22 (2.5)	510 (8.3)	1 (0.5)	~ ~
Israel	62 (2.6)	519 (5.9)	25 (2.2)	498 (6.7)	7 (1.7)	511 (14.2)	5 (1.0)	474 (18.2)	0 (0.2)	~ ~
Italy	25 (3.6)	494 (6.3)	20 (3.0)	495 (7.1)	9 (2.3)	491 (9.6)	46 (4.0)	492 (4.5)	0 (0.0)	~ ~
Japan	41 (3.5)	582 (3.9)	40 (3.2)	593 (3.5)	6 (1.8)	562 (10.9)	13 (2.0)	592 (6.9)	0 (0.0)	~ ~
Jordan	12 (2.5)	385 (9.2)	75 (3.3)	384 (3.9)	6 (1.7)	389 (14.0)	4 (1.3)	402 (16.2)	3 (1.2)	406 (11.1)
Kazakhstan	37 (3.8)	540 (8.4)	58 (3.8)	524 (7.9)	1 (0.8)	~ ~	1 (1.0)	~ ~	2 (1.2)	~ ~
Korea, Rep. of	18 (3.1)	610 (6.2)	30 (3.4)	606 (5.7)	49 (4.1)	603 (3.7)	3 (1.2)	618 (9.4)	0 (0.0)	~ ~
Kuwait	38 (4.5)	407 (9.0)	38 (3.9)	387 (5.4)	16 (2.9)	377 (12.1)	7 (2.2)	411 (37.2)	1 (0.9)	~ ~
Lebanon	20 (3.5)	426 (9.6)	46 (4.1)	451 (5.7)	3 (1.5)	470 (23.0)	11 (2.8)	442 (9.8)	20 (3.6)	431 (8.5)
Lithuania	55 (5.1)	512 (4.9)	36 (4.7)	508 (5.5)	8 (2.5)	508 (13.0)	1 (0.9)	~ ~	0 (0.2)	~ ~
Malaysia	31 (3.3)	466 (8.6)	27 (3.3)	478 (10.0)	18 (2.6)	477 (9.8)	24 (3.3)	449 (9.1)	0 (0.0)	~ ~
Malta	66 (0.1)	494 (1.2)	21 (0.1)	492 (2.2)	8 (0.1)	489 (4.2)	4 (0.0)	506 (7.7)	1 (0.0)	~ ~
Morocco	10 (2.1)	393 (8.0)	43 (3.3)	381 (3.9)	1 (0.5)	~ ~	9 (1.7)	375 (7.2)	37 (2.9)	388 (3.0)
New Zealand	29 (2.9)	496 (8.0)	30 (3.1)	503 (8.9)	7 (1.6)	502 (13.5)	34 (3.7)	481 (6.1)	0 (0.0)	~ ~
Norway (9)	15 (2.5)	512 (5.3)	54 (4.0)	515 (2.9)	2 (1.2)	~ ~	29 (3.5)	512 (3.5)	0 (0.0)	~ ~
Oman	40 (3.4)	398 (5.6)	42 (2.9)	406 (3.7)	17 (2.6)	409 (6.2)	0 (0.1)	~ ~	0 (0.3)	~ ~
Qatar	35 (2.9)	434 (6.1)	50 (3.3)	434 (5.0)	7 (1.7)	452 (16.7)	7 (1.4)	446 (15.8)	1 (0.3)	~ ~
Russian Federation	58 (4.0)	544 (4.5)	41 (3.9)	530 (6.8)	0 (0.0)	~ ~	1 (0.6)	~ ~	0 (0.0)	~ ~
Saudi Arabia	37 (4.3)	366 (7.7)	42 (4.4)	367 (6.8)	16 (2.9)	366 (7.4)	1 (1.0)	~ ~	3 (1.5)	360 (9.6)
Singapore	53 (2.6)	625 (5.2)	31 (2.4)	614 (7.0)	6 (1.1)	645 (11.1)	10 (1.5)	595 (11.4)	0 (0.0)	~ ~
Slovenia	39 (3.2)	511 (2.9)	40 (3.3)	518 (3.2)	20 (2.7)	527 (5.7)	1 (0.5)	~ ~	0 (0.0)	~ ~
South Africa (9)	24 (2.6)	379 (6.5)	48 (3.4)	363 (7.8)	13 (2.3)	396 (17.1)	11 (2.3)	369 (12.6)	2 (0.9)	~ ~
Sweden	50 (4.3)	506 (4.1)	17 (3.3)	495 (8.5)	21 (3.7)	497 (4.9)	11 (2.9)	489 (8.8)	1 (0.8)	~ ~
Thailand	34 (4.0)	419 (7.6)	47 (4.3)	437 (7.7)	3 (1.4)	440 (18.3)	16 (3.0)	439 (9.8)	0 (0.0)	~ ~
Turkey	53 (4.0)	460 (6.8)	18 (2.7)	470 (12.1)	27 (3.3)	444 (8.0)	3 (1.3)	463 (20.1)	0 (0.0)	~ ~
United Arab Emirates	36 (2.0)	478 (4.2)	49 (2.1)	457 (3.6)	10 (1.2)	445 (13.0)	5 (1.1)	493 (20.1)	0 (0.3)	~ ~
United States	35 (2.9)	521 (4.9)	12 (1.6)	512 (8.5)	22 (2.4)	513 (8.2)	31 (2.8)	522 (5.9)	0 (0.0)	~ ~
International Avg.	36 (0.6)	483 (1.1)	36 (0.5)	482 (1.2)	13 (0.4)	481 (2.1)	13 (0.4)	477 (2.4)	2 (0.2)	396 (4.3)

Figure 8.4: Teachers who majored in Science and/or Science Education

Country	Major in Science and Science Education		Major in Science but No Major in Science Education		Major in Science Education but No Major in Science		All Other Majors		No Formal Education Beyond Upper-Secondary*	
	Percent of Students	Average Achievement	Percent of Students	Average Achievement	Percent of Students	Average Achievement	Percent of Students	Average Achievement	Percent of Students	Average Achievement
Australia	63 (2.2)	516 (3.9)	21 (2.3)	519 (4.9)	8 (1.5)	513 (8.7)	8 (1.4)	502 (8.1)	0 (0.0)	~ ~
Bahrain	46 (3.9)	467 (4.8)	48 (3.8)	461 (3.9)	4 (0.8)	479 (10.6)	1 (0.2)	~ ~	1 (0.5)	~ ~
Botswana (9)	x x	x x	x x	x x	x x	x x	x x	x x	x x	x x
Canada	26 (2.7)	529 (5.2)	21 (2.7)	535 (5.5)	13 (2.7)	519 (6.7)	41 (3.0)	526 (3.6)	0 (0.1)	~ ~
Chile	36 (4.6)	477 (7.0)	25 (4.2)	468 (8.9)	10 (3.0)	450 (9.8)	28 (4.5)	422 (6.9)	1 (0.6)	~ ~
Chinese Taipei	17 (2.7)	564 (5.8)	75 (3.2)	572 (2.8)	1 (0.5)	~ ~	6 (1.8)	560 (7.7)	0 (0.0)	~ ~
Egypt	42 (3.6)	377 (7.3)	31 (3.3)	353 (7.6)	19 (3.1)	381 (11.3)	4 (1.7)	389 (27.2)	3 (1.4)	349 (9.5)
England	47 (3.0)	536 (5.5)	49 (3.1)	541 (6.5)	1 (0.4)	~ ~	3 (1.0)	526 (22.8)	0 (0.0)	~ ~
Georgia	33 (2.4)	446 (4.1)	63 (2.4)	443 (3.5)	1 (0.3)	~ ~	1 (0.5)	~ ~	2 (0.6)	~ ~
Hong Kong SAR	42 (4.7)	550 (7.7)	37 (3.9)	547 (6.1)	12 (3.2)	556 (10.3)	10 (2.4)	510 (16.2)	0 (0.0)	~ ~
Hungary	15 (1.6)	526 (6.0)	12 (1.5)	526 (6.6)	69 (2.3)	530 (3.6)	4 (0.7)	445 (15.2)	0 (0.0)	~ ~
Iran, Islamic Rep. of	19 (2.4)	456 (11.8)	11 (2.0)	464 (12.1)	64 (3.0)	458 (4.6)	6 (1.8)	432 (15.3)	0 (0.0)	~ ~
Ireland	44 (3.4)	535 (4.2)	49 (3.5)	532 (3.7)	2 (1.2)	~ ~	4 (1.0)	485 (15.7)	1 (0.6)	~ ~
Israel	64 (3.1)	518 (5.4)	28 (3.0)	489 (8.3)	3 (1.4)	478 (17.1)	4 (1.0)	522 (17.5)	1 (0.5)	~ ~
Italy	37 (4.1)	497 (4.9)	58 (4.3)	496 (3.8)	1 (0.9)	~ ~	4 (1.5)	508 (10.1)	0 (0.0)	~ ~
Japan	25 (3.5)	567 (4.0)	62 (4.2)	572 (2.5)	8 (2.3)	573 (8.8)	6 (2.0)	580 (5.5)	0 (0.0)	~ ~
Jordan	7 (1.9)	429 (9.9)	69 (3.3)	423 (4.4)	13 (2.6)	436 (8.7)	4 (1.4)	453 (31.6)	7 (1.9)	419 (11.4)
Kazakhstan	21 (2.9)	541 (8.0)	77 (2.9)	531 (5.2)	0 (0.3)	~ ~	0 (0.2)	~ ~	1 (0.4)	~ ~
Korea, Rep. of	42 (3.4)	556 (3.5)	51 (3.6)	555 (2.5)	7 (2.1)	557 (7.3)	0 (0.0)	~ ~	0 (0.0)	~ ~
Kuwait	29 (3.6)	434 (11.8)	60 (3.9)	394 (7.7)	9 (2.2)	429 (9.3)	2 (1.0)	~ ~	1 (0.5)	~ ~
Lebanon	22 (3.5)	408 (11.4)	56 (4.9)	405 (7.7)	0 (0.0)	~ ~	7 (2.1)	382 (14.2)	15 (3.5)	364 (18.7)
Lithuania	28 (2.1)	522 (4.5)	68 (2.1)	519 (2.9)	1 (0.3)	~ ~	3 (0.8)	494 (14.3)	0 (0.2)	~ ~
Malaysia	35 (3.6)	464 (8.1)	38 (3.0)	476 (8.1)	17 (2.8)	469 (12.4)	10 (2.4)	438 (20.8)	0 (0.0)	~ ~
Malta	38 (0.5)	490 (1.9)	56 (0.4)	474 (1.9)	1 (0.1)	~ ~	4 (0.2)	482 (5.9)	1 (0.1)	~ ~
Morocco	7 (1.2)	391 (4.7)	74 (2.1)	392 (3.1)	0 (0.0)	~ ~	0 (0.2)	~ ~	19 (1.9)	402 (3.9)
New Zealand	47 (4.0)	521 (3.8)	45 (3.5)	510 (6.6)	1 (0.4)	~ ~	7 (1.7)	499 (16.7)	0 (0.0)	~ ~
Norway (9)	15 (2.8)	515 (9.1)	27 (3.5)	515 (5.2)	12 (2.2)	512 (6.0)	46 (4.0)	506 (3.7)	0 (0.0)	~ ~
Oman	36 (2.9)	468 (3.7)	58 (2.9)	447 (3.9)	3 (1.3)	471 (13.1)	0 (0.3)	~ ~	2 (0.9)	~ ~
Qatar	29 (3.2)	475 (7.2)	61 (3.7)	446 (5.4)	4 (1.1)	445 (19.0)	4 (1.2)	471 (18.1)	2 (0.3)	~ ~
Russian Federation	50 (2.2)	549 (4.2)	48 (2.2)	540 (4.7)	1 (0.2)	~ ~	1 (0.3)	~ ~	0 (0.0)	~ ~
Saudi Arabia	17 (3.4)	376 (11.3)	63 (4.4)	391 (5.3)	15 (3.1)	433 (15.5)	2 (1.1)	~ ~	3 (1.4)	430 (9.6)
Singapore	54 (2.8)	596 (4.8)	41 (2.8)	599 (5.9)	2 (0.8)	~ ~	3 (1.0)	599 (23.3)	0 (0.0)	~ ~
Slovenia	18 (1.7)	550 (3.5)	77 (1.7)	551 (2.4)	2 (0.6)	~ ~	3 (0.7)	547 (8.5)	0 (0.0)	~ ~
South Africa (9)	23 (3.1)	379 (11.8)	50 (3.8)	350 (8.6)	9 (2.2)	360 (24.3)	8 (1.7)	352 (12.5)	10 (2.1)	351 (22.6)
Sweden	48 (4.3)	519 (4.5)	25 (3.2)	526 (7.3)	16 (3.7)	531 (6.0)	5 (1.7)	523 (7.9)	5 (1.4)	510 (18.0)
Thailand	20 (3.0)	457 (10.3)	41 (3.2)	453 (6.2)	24 (3.2)	463 (9.6)	16 (3.0)	463 (14.3)	0 (0.0)	~ ~
Turkey	30 (3.5)	486 (7.6)	27 (3.3)	508 (6.9)	42 (3.2)	490 (7.4)	0 (0.3)	~ ~	0 (0.0)	~ ~
United Arab Emirates	26 (2.2)	503 (6.1)	55 (2.4)	474 (4.4)	13 (1.4)	452 (8.1)	3 (0.9)	451 (15.1)	2 (0.5)	~ ~
United States	35 (3.0)	536 (5.1)	26 (2.6)	537 (6.4)	18 (2.4)	528 (5.6)	21 (2.1)	522 (6.8)	0 (0.4)	~ ~
International Avg.	32 (0.5)	493 (1.1)	47 (0.5)	488 (1.0)	11 (0.3)	480 (2.3)	7 (0.3)	485 (2.9)	2 (0.2)	404 (5.6)

In Maltese secondary schools the proportion of teachers who majored in both Mathematics and Mathematics Education (66%) and in both Science and Science Education (38%) are significantly higher than the corresponding international average proportions (36% and 32%). The

proportions of Maltese teachers who teach Mathematics and/or Science but majored in another subject (4% and 4%) are significantly lower than international average proportions (13% and 7%). Moreover, the proportions of Maltese teachers, with no formal education beyond upper secondary level, who are teaching Mathematics and Science (1% and 1%) are lower than the international average proportions (2% and 2%). Excluding teachers with no formal education beyond upper secondary level, the relationship between students' attainment and teachers' training is very weak. Tables 8.3 and 8.4 display the proportions of Mathematics and Science teachers who majored in the same or other subject areas during their tertiary education.

Table 8.3: Proportion of Mathematics teachers who majored in the same or other subject areas

During your tertiary education, what was your major or main area(s) of study?	Frequency	Percentage
Mathematics	184	87.6%
Biology	2	1.0%
Physics	62	29.5%
Chemistry	5	2.4%
Geography	1	0.5%
Education - Mathematics	158	75.2%
Education - Science	33	15.7%
Education - General	99	47.1%
Other	60	28.6%

Table 8.4: Proportion of Science teachers who majored in the same or other subject areas

During your tertiary education, what was your major or main area(s) of study?	Frequency	Percentage
Mathematics	145	26.2%
Biology	186	33.6%
Physics	238	43.0%
Chemistry	143	25.8%
Geography	120	21.7%
Education - Mathematics	79	14.3%
Education - Science	234	42.5%
Education - General	207	37.4%
Other	124	22.5%

8.4 Teachers' Years of Experience

Tables 8.5 and 8.6 display the duration distribution of the teachers' teaching experience, where 85.0% of Maltese mathematics teachers and 84.1% of science teachers have less than 20 years' experience.

Table 8.5: Years of teaching experience of Maltese Mathematics teachers

How many years will you have been teaching?	Frequency	Percentage
0-4 years	49	23.0%
5-9 years	51	23.9%
10-19 years	81	38.1%
20 years or more	32	15.0%

Table 8.6: Years of teaching experience of Maltese Science teachers

How many years will you have been teaching?	Frequency	Percentage
0-4 years	156	28.0%
5-9 years	140	25.1%
10-19 years	173	31.0%
20 years or more	89	15.9%

Figure 8.5: Teachers' Years of Experience and Attainment in Mathematics

Country	20 Years or More		At Least 10 but Less than 20 Years		At Least 5 but Less than 10 Years		Less than 5 Years		Average Years of Experience
	Percent of Students	Average Achievement	Percent of Students	Average Achievement	Percent of Students	Average Achievement	Percent of Students	Average Achievement	
Australia	36 (3.3)	514 (5.5)	28 (2.6)	505 (6.6)	19 (2.3)	508 (7.4)	18 (2.1)	498 (8.6)	16 (0.7)
Bahrain	20 (3.8)	455 (6.4)	41 (3.6)	453 (3.7)	22 (4.2)	463 (6.2)	18 (3.1)	437 (5.6)	12 (0.9)
Botswana (9)	8 (2.2)	398 (8.8)	32 (4.1)	386 (4.1)	22 (3.6)	401 (5.1)	38 (4.4)	388 (4.6)	9 (0.6)
Canada	28 (3.1)	533 (3.5)	45 (3.3)	527 (4.1)	15 (2.4)	532 (5.5)	12 (2.1)	536 (7.6)	15 (0.5)
Chile	36 (4.5)	430 (6.4)	21 (3.6)	431 (8.8)	22 (3.4)	430 (8.9)	21 (4.3)	429 (11.9)	16 (1.2)
Chinese Taipei	23 (3.4)	602 (7.1)	43 (4.0)	601 (4.7)	20 (3.3)	598 (7.3)	14 (2.6)	590 (9.7)	14 (0.7)
Egypt	46 (3.6)	394 (5.5)	22 (2.9)	405 (11.1)	23 (3.1)	376 (8.0)	9 (2.4)	393 (18.9)	17 (0.7)
England	17 (3.1)	511 (13.4)	25 (4.0)	524 (10.8)	29 (3.6)	508 (9.9)	29 (3.7)	525 (10.5)	11 (0.7)
Georgia	78 (3.1)	450 (4.0)	12 (2.7)	464 (12.2)	8 (2.0)	486 (16.3)	2 (0.8)	~ ~	26 (0.9)
Hong Kong SAR	32 (3.8)	603 (9.9)	26 (3.9)	586 (9.7)	25 (3.5)	589 (7.6)	17 (3.6)	601 (11.2)	14 (0.8)
Hungary	69 (3.6)	512 (4.5)	23 (3.5)	523 (11.1)	4 (1.5)	540 (26.8)	4 (1.1)	484 (26.4)	25 (0.8)
Iran, Islamic Rep. of	48 (3.8)	447 (6.7)	38 (3.8)	441 (6.5)	13 (2.2)	391 (7.8)	1 (0.7)	~ ~	18 (0.5)
Ireland	31 (2.8)	527 (5.2)	28 (2.5)	520 (7.3)	22 (2.1)	525 (6.1)	19 (2.4)	518 (4.8)	14 (0.6)
Israel	40 (2.5)	529 (7.4)	29 (2.5)	505 (10.6)	15 (1.9)	496 (9.6)	16 (1.7)	490 (9.9)	16 (0.5)
Italy	63 (4.1)	497 (3.6)	19 (3.2)	482 (5.6)	13 (2.7)	497 (6.3)	4 (1.6)	472 (19.4)	23 (1.0)
Japan	42 (3.6)	589 (3.7)	21 (3.0)	586 (7.5)	20 (2.7)	587 (5.0)	17 (2.5)	580 (5.3)	17 (0.8)
Jordan	14 (2.4)	383 (8.1)	26 (3.2)	392 (5.9)	34 (3.8)	390 (7.2)	26 (3.2)	378 (6.5)	10 (0.5)
Kazakhstan	57 (3.7)	536 (6.9)	21 (3.2)	521 (12.4)	12 (3.1)	515 (15.5)	10 (2.2)	517 (17.0)	20 (0.9)
Korea, Rep. of	36 (3.2)	609 (3.6)	22 (2.9)	606 (4.9)	15 (3.1)	610 (11.1)	26 (3.0)	599 (5.6)	14 (0.6)
Kuwait	21 (3.4)	392 (11.1)	36 (4.2)	401 (8.3)	30 (3.8)	393 (11.2)	13 (2.4)	371 (13.6)	13 (0.6)
Lebanon	25 (3.6)	456 (7.2)	32 (3.4)	433 (6.3)	27 (3.8)	441 (10.6)	16 (3.0)	440 (9.5)	13 (0.8)
Lithuania	76 (3.6)	511 (3.6)	18 (3.3)	518 (6.9)	4 (1.5)	472 (18.9)	2 (1.2)	~ ~	27 (0.8)
Malaysia	14 (2.4)	475 (10.8)	41 (4.0)	455 (7.4)	29 (4.0)	470 (8.3)	16 (2.9)	475 (8.9)	12 (0.6)
Malta	15 (0.1)	482 (2.6)	38 (0.2)	495 (1.6)	24 (0.1)	491 (2.0)	23 (0.1)	505 (2.2)	12 (0.0)
Morocco	54 (3.0)	392 (3.1)	14 (2.4)	375 (6.0)	11 (2.0)	379 (7.4)	20 (2.4)	374 (5.0)	20 (0.7)
New Zealand	40 (3.4)	502 (6.6)	26 (2.7)	485 (6.8)	14 (2.1)	493 (10.1)	21 (2.5)	488 (8.3)	17 (1.0)
Norway (9)	25 (3.5)	513 (4.1)	41 (4.1)	514 (3.9)	19 (2.9)	518 (4.3)	15 (2.7)	501 (4.1)	15 (0.8)
Oman	16 (2.4)	395 (6.9)	44 (3.9)	413 (4.2)	30 (3.1)	395 (5.4)	10 (2.0)	399 (8.3)	13 (0.5)
Qatar	20 (3.2)	439 (9.8)	43 (4.0)	432 (5.9)	28 (2.7)	437 (7.6)	9 (2.0)	452 (13.0)	13 (0.4)
Russian Federation	62 (3.3)	534 (5.7)	24 (3.5)	546 (9.1)	7 (1.7)	525 (9.8)	7 (1.7)	546 (22.6)	23 (0.7)
Saudi Arabia	14 (3.3)	374 (11.1)	39 (4.1)	375 (8.7)	26 (3.7)	361 (6.2)	21 (3.6)	357 (8.6)	11 (0.7)
Singapore	11 (1.6)	619 (14.8)	19 (2.2)	625 (8.3)	30 (2.4)	617 (7.4)	40 (2.5)	620 (5.8)	9 (0.4)
Slovenia	53 (3.3)	516 (2.7)	29 (2.9)	518 (4.4)	12 (2.1)	520 (6.5)	5 (1.3)	508 (7.9)	21 (0.7)
South Africa (9)	33 (3.5)	377 (8.7)	23 (3.4)	366 (8.8)	24 (3.2)	383 (13.1)	19 (2.9)	371 (9.2)	14 (0.7)
Sweden	21 (3.5)	502 (6.5)	46 (3.8)	504 (4.3)	20 (3.9)	502 (4.5)	13 (2.7)	482 (6.7)	14 (0.7)
Thailand	28 (3.1)	430 (8.8)	19 (3.0)	439 (14.3)	16 (2.7)	436 (10.8)	36 (3.8)	427 (8.7)	13 (0.9)
Turkey	11 (2.4)	476 (11.5)	31 (2.9)	497 (9.4)	25 (2.7)	452 (5.7)	33 (3.0)	420 (7.0)	10 (0.6)
United Arab Emirates	24 (2.2)	452 (6.6)	41 (2.5)	463 (5.0)	25 (2.3)	485 (5.9)	10 (1.1)	466 (8.2)	14 (0.3)
United States	25 (2.9)	527 (5.8)	38 (2.9)	509 (5.1)	18 (2.3)	526 (7.0)	19 (2.0)	520 (7.1)	14 (0.6)
International Avg.	34 (0.5)	484 (1.2)	30 (0.5)	483 (1.2)	20 (0.5)	480 (1.6)	17 (0.4)	477 (1.8)	16 (0.1)

Figure 8.6: Teachers' Years of Experience and Attainment in Science

Country	20 Years or More		At Least 10 but Less than 20 Years		At Least 5 but Less than 10 Years		Less than 5 Years		Average Years of Experience
	Percent of Students	Average Achievement	Percent of Students	Average Achievement	Percent of Students	Average Achievement	Percent of Students	Average Achievement	
Australia	26 (2.5)	519 (4.4)	29 (2.8)	512 (6.1)	25 (2.8)	521 (4.9)	20 (2.1)	508 (6.4)	13 (0.5)
Bahrain	17 (2.2)	455 (7.2)	41 (3.1)	459 (5.0)	22 (2.4)	480 (6.9)	19 (2.9)	476 (5.9)	12 (0.5)
Botswana (9)	6 (2.2)	403 (15.3)	40 (3.5)	393 (4.8)	20 (3.2)	415 (7.8)	33 (3.9)	381 (5.4)	9 (0.5)
Canada	24 (2.8)	529 (5.1)	50 (3.3)	526 (2.8)	15 (2.2)	536 (5.8)	11 (2.2)	519 (8.5)	14 (0.5)
Chile	29 (4.3)	459 (8.5)	19 (3.7)	457 (9.7)	23 (3.9)	449 (7.5)	29 (4.2)	455 (8.2)	14 (1.1)
Chinese Taipei	30 (3.1)	582 (5.3)	32 (3.2)	561 (4.5)	17 (2.8)	571 (5.1)	21 (2.8)	563 (5.9)	14 (0.7)
Egypt	44 (3.5)	387 (5.2)	24 (3.0)	371 (8.2)	21 (2.5)	351 (11.7)	10 (2.2)	361 (15.6)	16 (0.5)
England	17 (2.5)	555 (12.1)	28 (2.4)	534 (6.5)	25 (2.6)	531 (8.2)	29 (2.7)	537 (7.7)	11 (0.7)
Georgia	64 (2.2)	440 (3.5)	20 (1.6)	448 (4.6)	11 (1.5)	455 (6.0)	5 (1.0)	454 (6.7)	23 (0.6)
Hong Kong SAR	31 (4.1)	540 (7.8)	38 (4.6)	544 (6.0)	18 (3.8)	542 (10.5)	13 (3.3)	567 (10.4)	15 (0.7)
Hungary	64 (2.5)	526 (4.1)	22 (1.9)	530 (5.9)	10 (1.4)	513 (8.3)	4 (0.7)	534 (9.6)	23 (0.5)
Iran, Islamic Rep. of	61 (2.9)	463 (5.2)	30 (3.2)	454 (7.4)	8 (1.9)	436 (13.7)	1 (0.6)	~ ~	19 (0.3)
Ireland	34 (3.2)	534 (4.3)	31 (3.1)	521 (5.3)	20 (2.6)	540 (5.5)	15 (2.6)	538 (8.4)	15 (0.7)
Israel	35 (3.8)	518 (7.3)	26 (2.9)	513 (9.2)	18 (2.8)	485 (10.2)	21 (2.7)	508 (9.6)	15 (0.8)
Italy	63 (4.1)	500 (3.7)	19 (3.2)	486 (6.5)	13 (2.7)	505 (6.7)	5 (1.7)	492 (19.7)	23 (1.0)
Japan	45 (3.9)	569 (3.2)	21 (3.1)	578 (6.0)	13 (2.7)	577 (4.7)	21 (3.5)	568 (4.6)	18 (0.9)
Jordan	11 (2.2)	417 (8.5)	27 (3.1)	437 (6.7)	28 (2.5)	416 (5.8)	34 (3.2)	428 (7.0)	9 (0.5)
Kazakhstan	53 (2.6)	533 (5.9)	23 (1.8)	532 (6.2)	12 (1.4)	532 (8.1)	12 (1.5)	533 (8.2)	20 (0.6)
Korea, Rep. of	36 (4.2)	554 (3.0)	28 (3.6)	558 (2.9)	15 (3.2)	557 (6.9)	21 (3.2)	554 (4.9)	15 (0.9)
Kuwait	24 (3.8)	415 (19.4)	24 (4.0)	422 (13.7)	36 (4.3)	396 (6.4)	15 (3.2)	408 (13.9)	12 (0.8)
Lebanon	16 (3.4)	392 (22.5)	29 (3.5)	392 (10.7)	28 (3.3)	410 (8.8)	27 (3.9)	394 (10.2)	10 (0.8)
Lithuania	71 (2.1)	516 (2.6)	18 (2.1)	525 (6.1)	5 (0.9)	528 (10.6)	6 (1.0)	533 (6.8)	24 (0.5)
Malaysia	16 (3.3)	459 (14.7)	34 (3.8)	476 (8.5)	35 (3.7)	462 (9.1)	15 (2.9)	477 (11.4)	12 (0.7)
Malta	16 (0.3)	483 (3.2)	31 (0.5)	481 (2.2)	25 (0.4)	463 (2.7)	28 (0.5)	494 (2.4)	11 (0.1)
Morocco	45 (2.7)	399 (2.9)	26 (2.0)	395 (4.2)	10 (1.6)	388 (4.5)	20 (1.7)	381 (4.7)	18 (0.6)
New Zealand	31 (3.5)	523 (6.2)	27 (2.7)	506 (8.4)	23 (3.2)	512 (8.7)	19 (2.7)	520 (8.0)	15 (0.9)
Norway (9)	21 (3.3)	511 (4.8)	36 (4.1)	509 (5.2)	22 (2.9)	515 (5.5)	21 (2.8)	506 (6.2)	13 (0.8)
Oman	11 (2.4)	448 (10.0)	38 (3.4)	456 (4.3)	41 (3.9)	457 (5.1)	11 (2.0)	459 (5.3)	11 (0.5)
Qatar	16 (1.8)	421 (9.5)	35 (2.9)	464 (6.7)	33 (2.9)	470 (7.6)	16 (1.8)	450 (7.9)	11 (0.4)
Russian Federation	66 (1.9)	544 (4.0)	19 (1.4)	540 (5.9)	7 (1.4)	546 (11.9)	8 (1.0)	546 (8.4)	23 (0.5)
Saudi Arabia	19 (3.7)	405 (13.7)	39 (4.7)	411 (8.1)	24 (3.7)	396 (7.0)	18 (3.6)	375 (10.3)	12 (0.7)
Singapore	10 (1.4)	586 (11.6)	20 (2.1)	611 (7.7)	32 (2.6)	598 (7.6)	39 (2.7)	591 (5.0)	8 (0.4)
Slovenia	59 (2.4)	550 (2.8)	26 (2.1)	552 (2.5)	10 (1.4)	558 (4.8)	5 (1.1)	549 (6.2)	22 (0.5)
South Africa (9)	31 (3.8)	371 (11.9)	31 (3.4)	351 (11.2)	20 (3.2)	339 (13.2)	18 (2.8)	372 (13.3)	15 (0.8)
Sweden	15 (2.4)	528 (7.0)	45 (4.0)	523 (4.9)	20 (4.0)	527 (7.2)	19 (3.2)	509 (7.0)	13 (0.6)
Thailand	30 (3.3)	463 (7.8)	22 (3.5)	455 (9.3)	28 (3.7)	448 (8.2)	19 (2.7)	461 (12.1)	14 (0.8)
Turkey	19 (3.0)	519 (7.6)	33 (3.3)	510 (7.8)	22 (3.2)	492 (7.4)	26 (3.3)	454 (7.2)	12 (0.6)
United Arab Emirates	20 (1.7)	458 (7.2)	35 (2.5)	459 (5.3)	28 (2.2)	495 (5.4)	18 (2.4)	501 (9.1)	12 (0.4)
United States	22 (2.3)	532 (6.4)	38 (2.8)	532 (4.7)	15 (2.1)	541 (8.4)	24 (2.8)	526 (5.8)	13 (0.5)
International Avg.	32 (0.5)	487 (1.4)	30 (0.5)	487 (1.1)	20 (0.4)	486 (1.3)	18 (0.4)	486 (1.4)	15 (0.1)

Figures 8.5 and 8.6 clearly display a significantly higher proportion of Maltese mathematics and science teachers with less than 10 years teaching experience (47% and 53%) which are significantly higher than the international average proportions (37% and 38%). Moreover, the proportions of Maltese mathematics and science teachers with at least 20 years teaching experience (15% to 15.9%) are significantly lower than the international average proportions (34% and 32%). In

fact, the average years of experience of Maltese teachers (11 years) is significantly less than the international average (15 years), which indicates that Malta has one of the youngest teaching workforces of all participating countries. Malta is preceded by Singapore (8 years), Botswana (9 years) and Jordan (9 years). On the other hand, the Russian Federation, Hungary, Slovenia, Lithuania, Italy, Kazakhstan and Georgia have the oldest teaching workforce, where teachers' average teaching experience exceeds 20 years. The relationship between the students' attainment scores in Mathematics/Science and the years of teaching experience is very weak. The mean attainment scores of students taught by teachers with '20 years of teaching experience', 'between 10 and 20 years', 'between 5 and 10 years' and 'less than 5 years' are respectively 484, 483, 480 and 477 in Mathematics and 487, 487, 486 and 486 in Science.

8.5 Teacher Participation in Professional Development

Tables 8.7 and 8.8 display the participation of Mathematics and Science teachers in various areas of professional development during the last two years.

Table 8.7: Participation of mathematics teachers in professional development

In the past two years, have you participated in professional development in any of the following?	Frequency	Percentage
Mathematics content	102	45.1%
Mathematics pedagogy/instruction	126	59.9%
Mathematics curriculum	113	53.7%
Integrating information technology into mathematics	121	57.4%
Improving students' critical thinking or problem-solving skills	74	33.3%
Mathematics assessment	86	41.3%
Addressing individual students' needs	92	43.8%

Table 8.8: Participation of science teachers in professional development

In the past two years, have you participated in professional development in any of the following?	Frequency	Percentage
Science content	300	55.1%
Science pedagogy/instruction	327	60.0%
Science curriculum	328	60.3%
Integrating information technology into science	307	56.3%
Improving students' critical thinking or problem-solving skills	242	44.6%
Science assessment	203	37.2%
Addressing individual students' needs	267	49.0%

Figure 8.7 shows that the proportion of Maltese mathematics teachers participating, during the last two years, in developing Mathematics pedagogy/instruction (60%), Mathematics curriculum (54%), integrating information technology into mathematics (57%) and addressing individual students' needs (44%) were higher than the international average proportions (59%, 50%, 50% and 42% respectively). On the other hand, the proportion of mathematics teachers participating in

developing Mathematics content (45%), Mathematics assessment (41%) and improving students' critical thinking or problem-solving skills (33%) were lower than the international average proportions (56%, 44% and 45% respectively). United States, Qatar, Australia, Kazakhstan, Lebanon, Lithuania and United Arab Emirates record a higher rate of teacher participation in all Mathematics areas of professional development, while Norway, Hungary, Chile, Morocco, Oman and Turkey register a lower rate of teacher participation in all areas.

Figure 8.7: Teacher Participation in Professional Development in Mathematics

Country	Percent of Students by Teachers' Area of Professional Development						
	Mathematics Content	Mathematics Pedagogy/ Instruction	Mathematics Curriculum	Integrating Information Technology Into Mathematics	Improving Students' Critical Thinking or Problem Solving Skills	Mathematics Assessment	Addressing Individual Students' Needs
Australia	65 (2.6)	67 (2.7)	71 (2.8)	59 (2.6)	49 (3.9)	47 (3.4)	58 (3.8)
Bahrain	45 (3.2)	65 (2.9)	44 (2.7)	69 (2.9)	60 (3.5)	58 (3.6)	64 (3.6)
Botswana (9)	45 (4.1)	28 (3.7)	51 (4.8)	26 (4.1)	31 (4.3)	39 (4.3)	33 (4.5)
Canada	66 (3.1)	72 (3.2)	47 (3.3)	62 (3.2)	64 (3.2)	49 (3.7)	57 (2.6)
Chile	48 (4.0)	41 (4.6)	30 (3.5)	27 (4.1)	30 (4.0)	22 (3.7)	18 (3.2)
Chinese Taipei	78 (3.3)	65 (3.6)	72 (3.5)	60 (3.3)	40 (3.6)	65 (3.6)	46 (3.9)
Egypt	49 (4.0)	60 (3.7)	40 (3.6)	40 (3.5)	55 (4.0)	47 (4.1)	56 (3.9)
England	59 (4.2)	65 (4.4)	65 (3.7)	41 (4.7)	43 (4.4)	43 (4.3)	48 (4.4)
Georgia	39 (4.3)	41 (4.2)	41 (4.5)	53 (4.7)	40 (4.5)	34 (4.2)	35 (4.3)
Hong Kong SAR	63 (4.3)	64 (4.7)	51 (4.5)	58 (4.5)	42 (4.5)	42 (4.4)	50 (4.4)
Hungary	28 (3.3)	36 (3.3)	15 (2.7)	31 (3.5)	18 (2.7)	20 (3.2)	22 (3.3)
Iran, Islamic Rep. of	74 (3.0)	83 (2.9)	55 (3.9)	39 (3.5)	42 (3.4)	40 (2.7)	36 (3.0)
Ireland	94 (1.2)	78 (2.6)	91 (1.7)	65 (2.9)	71 (2.5)	40 (2.6)	35 (2.7)
Israel	69 (2.7)	70 (2.5)	60 (2.9)	65 (2.8)	42 (3.4)	34 (2.5)	51 (2.6)
Italy	26 (3.3)	40 (3.4)	30 (3.7)	41 (4.0)	25 (3.2)	24 (3.3)	45 (4.1)
Japan	70 (3.0)	68 (3.6)	28 (3.6)	39 (3.6)	30 (3.4)	23 (3.3)	37 (3.7)
Jordan	25 (3.3)	36 (3.4)	24 (2.7)	31 (3.3)	49 (3.3)	26 (3.4)	42 (3.8)
Kazakhstan	59 (3.9)	73 (3.9)	60 (4.2)	82 (3.2)	75 (3.7)	66 (4.0)	66 (3.8)
Korea, Rep. of	51 (3.1)	63 (3.3)	44 (3.1)	32 (3.1)	34 (3.3)	46 (3.8)	38 (3.3)
Kuwait	63 (4.1)	62 (4.3)	61 (4.0)	45 (3.9)	56 (3.8)	50 (4.0)	57 (4.3)
Lebanon	57 (4.8)	60 (4.3)	51 (4.5)	53 (4.3)	53 (4.1)	57 (4.7)	47 (4.6)
Lithuania	62 (4.4)	61 (4.3)	57 (3.8)	70 (3.5)	53 (3.6)	68 (3.5)	50 (4.6)
Malaysia	47 (3.6)	65 (3.6)	46 (3.7)	36 (4.0)	70 (3.7)	56 (3.3)	33 (3.6)
Malta	45 (0.1)	60 (0.2)	54 (0.2)	57 (0.1)	33 (0.1)	41 (0.1)	44 (0.1)
Morocco	23 (3.0)	27 (2.9)	20 (2.8)	41 (3.0)	14 (2.3)	24 (2.9)	13 (2.5)
New Zealand	66 (3.2)	63 (3.6)	61 (2.6)	58 (3.5)	37 (3.2)	51 (2.6)	48 (3.0)
Norway (9)	18 (3.3)	24 (3.6)	11 (2.6)	36 (3.2)	12 (2.7)	22 (3.5)	12 (2.5)
Oman	50 (3.4)	56 (3.5)	36 (3.2)	38 (3.1)	41 (3.0)	36 (3.1)	27 (2.7)
Qatar	67 (3.0)	71 (3.1)	60 (3.5)	62 (3.5)	59 (3.2)	62 (2.8)	64 (3.1)
Russian Federation	70 (3.7)	79 (3.1)	77 (3.2)	78 (2.4)	42 (3.6)	51 (4.0)	51 (3.7)
Saudi Arabia	49 (4.8)	69 (4.3)	36 (4.1)	37 (3.8)	44 (4.5)	33 (4.1)	40 (4.3)
Singapore	68 (2.5)	90 (1.7)	65 (2.6)	62 (2.6)	55 (2.7)	51 (2.9)	38 (2.9)
Slovenia	60 (3.5)	57 (3.6)	36 (2.7)	55 (3.2)	36 (3.3)	40 (3.2)	35 (2.9)
South Africa (9)	84 (3.0)	58 (3.6)	86 (2.4)	45 (3.5)	56 (3.2)	73 (2.7)	52 (3.7)
Sweden	58 (4.6)	70 (4.4)	39 (4.5)	18 (2.5)	52 (4.1)	52 (4.0)	25 (3.6)
Thailand	70 (3.5)	73 (3.6)	56 (4.1)	63 (3.5)	57 (3.9)	50 (3.9)	31 (3.4)
Turkey	19 (2.6)	27 (3.2)	25 (3.0)	27 (3.0)	26 (3.0)	33 (3.3)	21 (2.7)
United Arab Emirates	59 (2.4)	60 (2.8)	60 (2.3)	71 (2.1)	71 (2.2)	59 (2.6)	68 (2.1)
United States	78 (2.5)	70 (2.7)	84 (2.0)	65 (2.9)	62 (2.7)	61 (2.8)	59 (3.1)
International Avg.	56 (0.6)	59 (0.6)	50 (0.5)	50 (0.5)	45 (0.6)	44 (0.6)	42 (0.6)

Figure 8.8: Teacher Participation in Professional Development in Science

Country	Percent of Students by Teachers' Area of Professional Development						
	Science Content	Science Pedagogy/ Instruction	Science Curriculum	Integrating Information Technology into Science	Improving Students' Critical Thinking or Inquiry Skills	Science Assessment	Addressing Individual Students' Needs
Australia	61 (2.7)	57 (3.3)	68 (2.7)	53 (2.8)	50 (2.7)	42 (2.8)	57 (2.6)
Bahrain	53 (2.5)	69 (2.5)	55 (2.6)	63 (2.3)	58 (2.8)	57 (3.3)	59 (3.1)
Botswana (9)	38 (5.1)	26 (4.2)	36 (4.7)	22 (3.8)	21 (3.8)	28 (3.9)	30 (4.5)
Canada	37 (3.5)	39 (3.2)	28 (3.3)	47 (3.9)	37 (2.9)	26 (3.4)	43 (3.6)
Chile	43 (5.0)	28 (3.8)	31 (4.1)	29 (4.1)	25 (4.3)	23 (4.0)	24 (3.5)
Chinese Taipei	70 (3.6)	67 (4.2)	62 (3.7)	51 (4.1)	38 (3.9)	48 (4.0)	37 (4.2)
Egypt	45 (3.9)	62 (4.0)	38 (3.6)	59 (3.7)	59 (3.9)	54 (3.9)	55 (4.1)
England	54 (2.9)	61 (3.0)	62 (2.9)	32 (3.1)	41 (3.2)	53 (2.9)	56 (2.8)
Georgia	44 (2.7)	47 (2.6)	43 (2.5)	58 (2.7)	46 (2.3)	43 (2.7)	42 (3.0)
Hong Kong SAR	69 (4.0)	70 (3.8)	63 (4.0)	53 (4.3)	48 (4.6)	40 (4.4)	49 (4.7)
Hungary	31 (2.2)	36 (2.3)	18 (2.1)	37 (2.5)	16 (2.1)	13 (1.7)	25 (2.0)
Iran, Islamic Rep. of	86 (2.4)	87 (1.9)	62 (3.0)	46 (3.3)	36 (3.0)	57 (3.3)	35 (2.8)
Ireland	42 (3.4)	38 (3.1)	28 (2.8)	36 (3.7)	34 (3.1)	26 (2.9)	24 (2.9)
Israel	65 (3.2)	63 (3.2)	57 (3.4)	60 (3.4)	61 (3.1)	35 (3.1)	47 (3.6)
Italy	25 (3.1)	27 (3.6)	22 (3.3)	37 (3.6)	18 (3.1)	16 (3.0)	41 (3.9)
Japan	76 (3.4)	77 (3.3)	35 (4.2)	36 (3.9)	23 (3.4)	31 (3.9)	30 (3.8)
Jordan	18 (2.3)	38 (3.1)	20 (2.5)	31 (3.2)	48 (3.9)	27 (3.2)	38 (3.9)
Kazakhstan	73 (2.0)	76 (1.9)	70 (2.4)	88 (1.8)	77 (2.5)	71 (2.5)	71 (2.4)
Korea, Rep. of	69 (3.9)	76 (3.2)	56 (4.1)	46 (4.2)	47 (4.4)	50 (3.8)	39 (3.9)
Kuwait	69 (4.2)	74 (4.0)	60 (4.5)	61 (3.7)	61 (4.2)	60 (4.2)	62 (3.7)
Lebanon	66 (4.1)	60 (4.0)	54 (4.3)	56 (4.4)	55 (4.4)	50 (4.2)	42 (4.5)
Lithuania	62 (1.8)	54 (2.6)	54 (2.3)	64 (2.5)	46 (2.0)	60 (2.1)	51 (2.0)
Malaysia	49 (4.4)	75 (3.9)	56 (4.0)	54 (4.0)	75 (3.5)	74 (3.8)	35 (4.0)
Malta	55 (0.5)	60 (0.5)	60 (0.5)	56 (0.5)	45 (0.5)	37 (0.5)	49 (0.4)
Morocco	34 (2.0)	43 (2.2)	30 (2.0)	43 (2.2)	14 (1.3)	35 (2.1)	12 (1.6)
New Zealand	63 (3.5)	57 (4.6)	60 (2.8)	58 (4.0)	48 (3.7)	41 (4.0)	42 (4.2)
Norway (9)	12 (2.5)	9 (2.5)	4 (1.7)	3 (1.3)	7 (2.0)	12 (2.9)	7 (2.3)
Oman	47 (3.2)	62 (3.4)	34 (2.9)	44 (3.6)	45 (3.5)	52 (3.5)	31 (3.3)
Qatar	59 (3.1)	67 (2.4)	56 (2.9)	68 (2.7)	69 (2.6)	60 (2.9)	60 (3.2)
Russian Federation	74 (1.8)	75 (2.6)	79 (1.7)	77 (1.8)	57 (2.4)	60 (2.3)	54 (2.5)
Saudi Arabia	57 (4.5)	71 (4.0)	59 (4.7)	50 (4.5)	66 (4.2)	52 (4.7)	47 (4.1)
Singapore	70 (2.6)	91 (1.5)	67 (2.5)	67 (2.6)	65 (2.0)	59 (2.2)	40 (2.7)
Slovenia	74 (1.9)	66 (2.0)	49 (2.4)	65 (2.2)	37 (1.9)	41 (2.3)	39 (2.6)
South Africa (9)	79 (3.1)	52 (3.9)	81 (2.6)	50 (3.5)	58 (3.9)	67 (3.7)	54 (3.7)
Sweden	35 (3.3)	32 (3.4)	36 (3.9)	28 (3.3)	23 (3.9)	32 (4.3)	28 (3.7)
Thailand	76 (3.0)	84 (2.9)	60 (3.9)	67 (3.3)	59 (4.0)	52 (4.3)	35 (4.2)
Turkey	24 (3.3)	22 (3.1)	18 (3.0)	22 (2.7)	16 (2.4)	28 (3.6)	12 (2.0)
United Arab Emirates	62 (2.2)	69 (2.5)	57 (2.3)	72 (2.4)	74 (1.9)	64 (2.1)	73 (1.9)
United States	75 (2.8)	64 (2.8)	76 (2.4)	63 (3.3)	68 (2.7)	47 (3.1)	66 (2.4)
International Avg.	55 (0.5)	57 (0.5)	49 (0.5)	50 (0.5)	45 (0.5)	44 (0.5)	42 (0.5)

Figure 8.8 shows that the proportion of Maltese science teachers participating, during the last two years, in developing Science pedagogy/instruction (60%), Science curriculum (60%), integrating information technology into science (56%) and addressing individual students' needs (49%) were higher than the international average proportions (57%, 49%, 50%, and 42% respectively). The proportion of Maltese science teachers participating in Science assessment (37%) was lower than the international average proportion (44%). Maltese participation proportions in Science content (55%) and improving students' critical thinking or inquiry skills (45%) were similar to international average proportion. United States, Kazakhstan, Kuwait, Lebanon, Qatar, Russian Federation, Saudi

Arabia and United Arab Emirates record a higher rate of teacher participation in all Science areas of professional development. On the other hand, Morocco, Turkey, Sweden, Hungary, Botswana, Chile, Ireland, Italy and Norway register a lower rate of teacher participation in all areas.

8.6 Heads of School' Formal Education

Figure 8.9 shows that all Maltese heads of school have a bachelor's degree and 58% have a postgraduate degree, which exceeds the international average proportion (50%).

Figure 8.9: Heads of School' formal education

Country	Percent of Students by Principal Educational Level			Current Requirements	
	Completed Postgraduate University Degree	Completed Bachelor's Degree or Equivalent but Not a Postgraduate Degree	Did Not Complete Bachelor's Degree	Teaching Experience	Completion of Specialized School Leadership Training Program
Australia	56 (3.3)	43 (3.1)	1 (1.0)	●	○
Bahrain	36 (0.2)	64 (0.2)	0 (0.0)	●	●
Botswana (9)	12 (2.9)	76 (4.0)	12 (2.8)	●	○
Canada	56 (3.1)	44 (3.1)	0 (0.0)	●	●
Chile	64 (4.6)	36 (4.6)	0 (0.0)	●	●
Chinese Taipei	83 (3.0)	17 (3.0)	0 (0.0)	●	●
Egypt	6 (1.6)	87 (2.3)	7 (1.8)	–	–
England	87 (3.4)	13 (3.4)	0 (0.0)	○	○
Georgia	98 (1.3)	2 (1.3)	0 (0.0)	○	○
Hong Kong SAR	89 (2.9)	11 (2.9)	0 (0.0)	●	●
Hungary	43 (4.6)	57 (4.6)	0 (0.0)	○	●
Iran, Islamic Rep. of	16 (2.9)	77 (3.1)	7 (1.7)	○	○
Ireland	65 (4.2)	34 (4.2)	1 (1.0)	●	○
Israel	89 (2.0)	10 (1.9)	0 (0.4)	●	●
Italy	20 (3.6)	74 (4.2)	6 (2.2)	●	○
Japan	8 (2.4)	92 (2.4)	0 (0.0)	●	○
Jordan	50 (3.8)	48 (3.9)	2 (0.9)	○	○
Kazakhstan	14 (2.5)	86 (2.5)	0 (0.5)	●	●
Korea, Rep. of	79 (3.1)	21 (3.1)	0 (0.0)	●	●
Kuwait	17 (2.9)	72 (3.3)	11 (1.9)	●	●
Lebanon	58 (4.6)	28 (4.2)	15 (3.4)	●	●
Lithuania	54 (4.7)	46 (4.7)	0 (0.0)	●	○
Malaysia	35 (4.4)	65 (4.4)	0 (0.0)	●	●
Malta	58 (0.1)	42 (0.1)	0 (0.0)	●	●
Morocco	8 (1.7)	63 (3.1)	29 (2.6)	●	●
New Zealand	65 (4.6)	32 (4.2)	2 (2.2)	●	○
Norway (9)	41 (4.6)	58 (4.6)	1 (1.0)	○	○
Oman	27 (2.8)	68 (2.9)	5 (1.5)	●	●
Qatar	41 (0.5)	57 (0.5)	3 (0.0)	●	●
Russian Federation	84 (3.0)	16 (3.0)	0 (0.0)	●	○
Saudi Arabia	18 (3.3)	72 (3.6)	9 (2.3)	●	○
Singapore	61 (0.0)	39 (0.0)	0 (0.0)	●	●
Slovenia	99 (0.7)	1 (0.7)	0 (0.0)	●	●
South Africa (9)	12 (2.1)	80 (2.6)	8 (1.8)	●	○
Sweden	33 (4.1)	60 (4.6)	8 (2.5)	○	●
Thailand	94 (1.9)	6 (1.9)	0 (0.0)	●	●
Turkey	23 (3.0)	76 (3.1)	2 (0.8)	●	○
United Arab Emirates	50 (1.9)	48 (2.0)	2 (0.6)	●	●
United States	98 (0.7)	2 (0.7)	0 (0.0)	●	●
International Avg.	50 (0.5)	47 (0.5)	3 (0.2)		

● Yes ○ No

8.7 Heads of School' Years of Experience

Figure 8.10 shows that the proportion of Maltese heads of school with less than five years of experience (55%) is significantly higher than the international average (32%), while the proportion with twenty years of experience (4%) is significantly lower than the international average (12%). Moreover, the average number of years of experience of Maltese heads of school, which is around 7 years, is two years less than the international average (9 years). This mean duration is lowest in Japan (5 years), Bahrain (6 years) and Egypt (6 years) and highest in Lebanon (15 years), Korea (15 years), Lithuania (15 years) and Thailand (15 years),

Figure 8.10: Heads of School Years of Experience

Country	Percent of Students by Years of Experience as Head of School				Mean years of experience as head of school
	20 years or more	At least 10 but Less than 20 years	At least 5 but less than 10 years	Less than 5 years	
Australia	12 (2.4)	32 (4.3)	32 (4.1)	23 (3.4)	10 (0.5)
Bahrain	4 (0.1)	13 (0.2)	32 (0.2)	52 (0.3)	6 (0.0)
Botswana (9)	6 (2.2)	19 (2.9)	41 (4.4)	33 (4.2)	8 (0.5)
Canada	0 (0.3)	32 (3.5)	35 (3.6)	32 (3.6)	8 (0.4)
Chile	17 (3.3)	21 (3.4)	24 (3.7)	38 (4.0)	10 (0.8)
Chinese Taipei	6 (2.0)	29 (3.7)	30 (3.6)	35 (3.8)	8 (0.5)
Egypt	3 (1.2)	20 (3.5)	27 (3.6)	50 (4.3)	6 (0.5)
England	1 (1.0)	28 (4.7)	36 (4.5)	35 (4.8)	7 (0.5)
Georgia	16 (3.0)	15 (3.1)	38 (4.4)	31 (4.4)	9 (0.7)
Hong Kong SAR	12 (2.9)	31 (4.2)	33 (4.2)	24 (3.9)	11 (0.7)
Hungary	15 (3.5)	31 (4.4)	32 (3.9)	22 (3.5)	11 (0.7)
Iran, Islamic Rep. of	13 (2.1)	36 (3.1)	27 (2.5)	24 (3.0)	10 (0.5)
Ireland	7 (2.3)	24 (3.4)	38 (4.0)	31 (3.8)	8 (0.5)
Israel	10 (2.3)	26 (3.0)	32 (3.2)	33 (3.4)	9 (0.5)
Italy	18 (3.4)	23 (3.6)	28 (3.6)	30 (3.9)	10 (0.7)
Japan	0 (0.0)	8 (2.0)	38 (4.3)	54 (4.2)	5 (0.2)
Jordan	9 (2.1)	25 (2.9)	37 (3.6)	30 (3.6)	8 (0.5)
Kazakhstan	11 (2.2)	28 (3.7)	32 (4.1)	29 (3.9)	10 (0.7)
Korea, Rep. of	36 (4.4)	0 (0.0)	17 (2.9)	47 (4.5)	15 (1.5)
Kuwait	8 (2.6)	23 (3.4)	43 (4.3)	26 (3.3)	9 (0.7)
Lebanon	34 (4.9)	25 (3.9)	19 (3.7)	21 (4.0)	15 (1.1)
Lithuania	33 (4.1)	36 (3.9)	18 (3.5)	13 (3.0)	15 (0.9)
Malaysia	4 (1.5)	22 (3.0)	29 (4.1)	45 (4.7)	7 (0.5)
Malta	4 (0.0)	21 (0.1)	19 (0.1)	55 (0.1)	7 (0.0)
Morocco	1 (0.7)	20 (2.2)	38 (3.2)	40 (3.0)	7 (0.3)
New Zealand	12 (3.8)	36 (5.0)	33 (5.6)	19 (4.0)	11 (0.7)
Norway (9)	6 (2.1)	32 (4.3)	32 (4.7)	31 (4.4)	9 (0.6)
Oman	13 (2.3)	43 (4.1)	21 (2.9)	23 (2.9)	11 (0.5)
Qatar	12 (0.4)	27 (0.5)	40 (0.5)	21 (0.7)	10 (0.1)
Russian Federation	20 (3.7)	29 (3.9)	24 (3.3)	27 (3.7)	12 (0.8)
Saudi Arabia	9 (2.6)	33 (4.7)	17 (3.3)	40 (4.8)	9 (0.7)
Singapore	2 (0.0)	37 (0.0)	25 (0.0)	35 (0.0)	8 (0.0)
Slovenia	8 (2.1)	36 (4.1)	34 (4.4)	22 (3.7)	10 (0.5)
South Africa (9)	18 (2.6)	28 (2.8)	20 (2.9)	34 (3.5)	10 (0.7)
Sweden	7 (2.4)	34 (4.9)	28 (3.8)	31 (4.5)	9 (0.6)
Thailand	29 (3.3)	41 (3.6)	21 (2.9)	9 (1.8)	15 (0.7)
Turkey	8 (2.2)	23 (3.3)	21 (3.1)	48 (3.3)	7 (0.5)
United Arab Emirates	18 (1.5)	31 (1.6)	29 (2.0)	22 (2.1)	11 (0.3)
United States	7 (1.7)	19 (2.8)	31 (2.9)	44 (3.3)	7 (0.4)
International Avg.	12 (0.4)	27 (0.5)	29 (0.6)	32 (0.6)	9 (0.1)

9

Teaching Mathematics and Science topics

9.1 Introduction

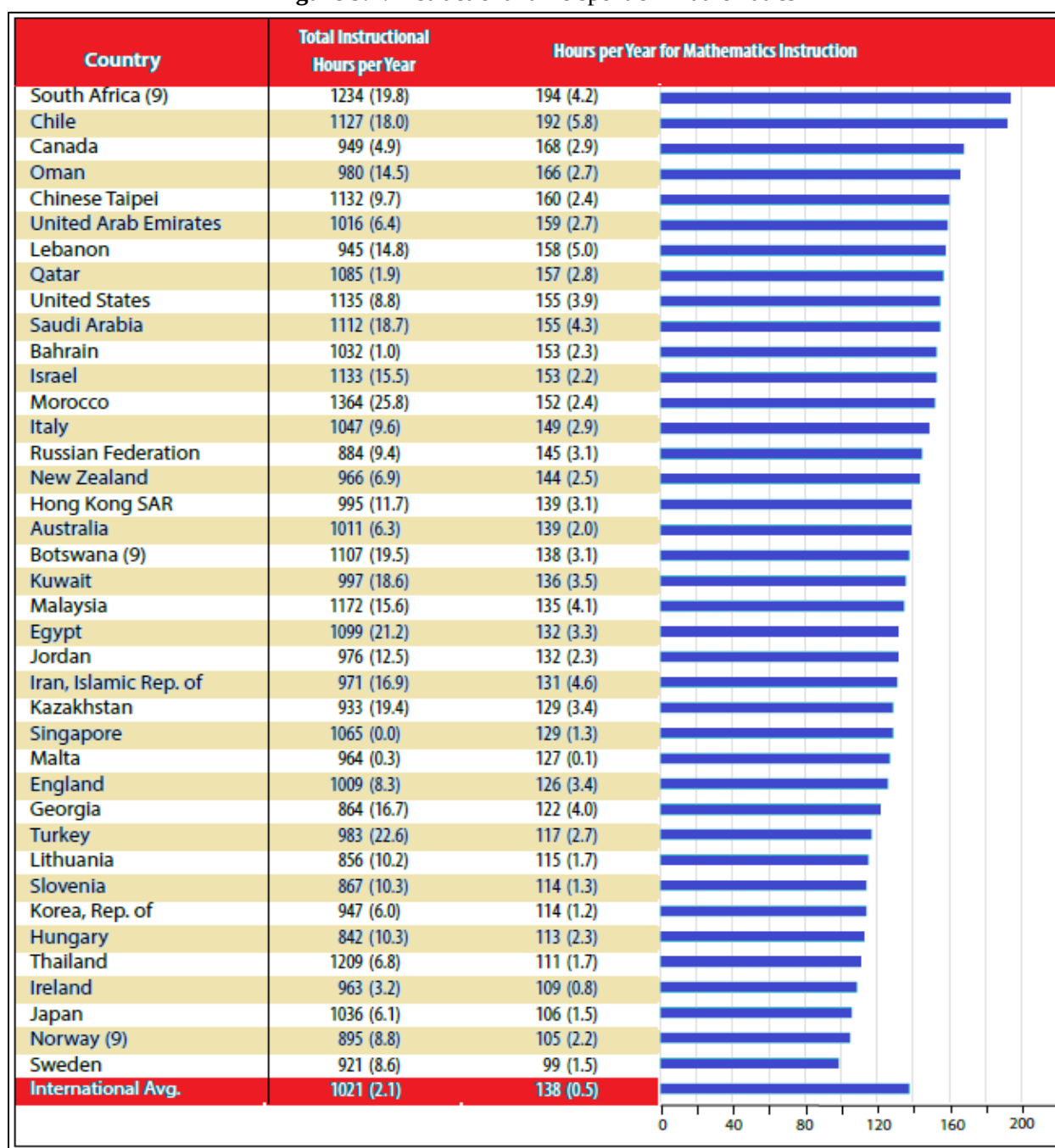
Besides a positive attitude towards mathematics and science, attainment in these subjects also depends on school and classroom resources, instructional time, duration of assigned homework and teacher emphasis on problem-solving and science investigation. Both Mathematics and Science satisfy curiosity with knowledge. Mathematics can stimulate moments of pleasure and wonder when a student solves a problem for the first time, discovers a more elegant solution to a problem or sees hidden connections. Science can stimulate students' curiosity about phenomena and events in the world around them. The topics that will be reviewed in this chapter include the instructional time spent on mathematics and science and the number of TIMSS topics that are intended to be covered by the end of Year 9; computer activities during mathematics and science lessons; students' use of the Internet for mathematics and science schoolwork; resources available for conducting science experiments; teachers' emphasis on science investigation; duration of assigned mathematics and science homework; teaching limitations caused by students' lack of prerequisite knowledge, lack of nutrition and sleep, disruption and lack of interest; and frequency of student absences. These topics are investigated using the responses in the students', teachers' and heads of school questionnaire and the results are compared between all participating countries.

9.2 Instructional Time for Mathematics and Science

The total instructional hours per year was computed by multiplying the number of school days per year with the number of instructional hours per day. The Mathematics instructional hours per year was computed by multiplying the ratio of Mathematics instructional hours per week and schools days per week with school days per year. Table 9.1 displays the weekly duration of mathematics lessons in Malta, where the total number of instructional hours per day is five hours 20 minutes and the total number of school days per year ranges from 160 to 180 days.

Table 9.1: Distribution of instructional time for Mathematics per week in Malta

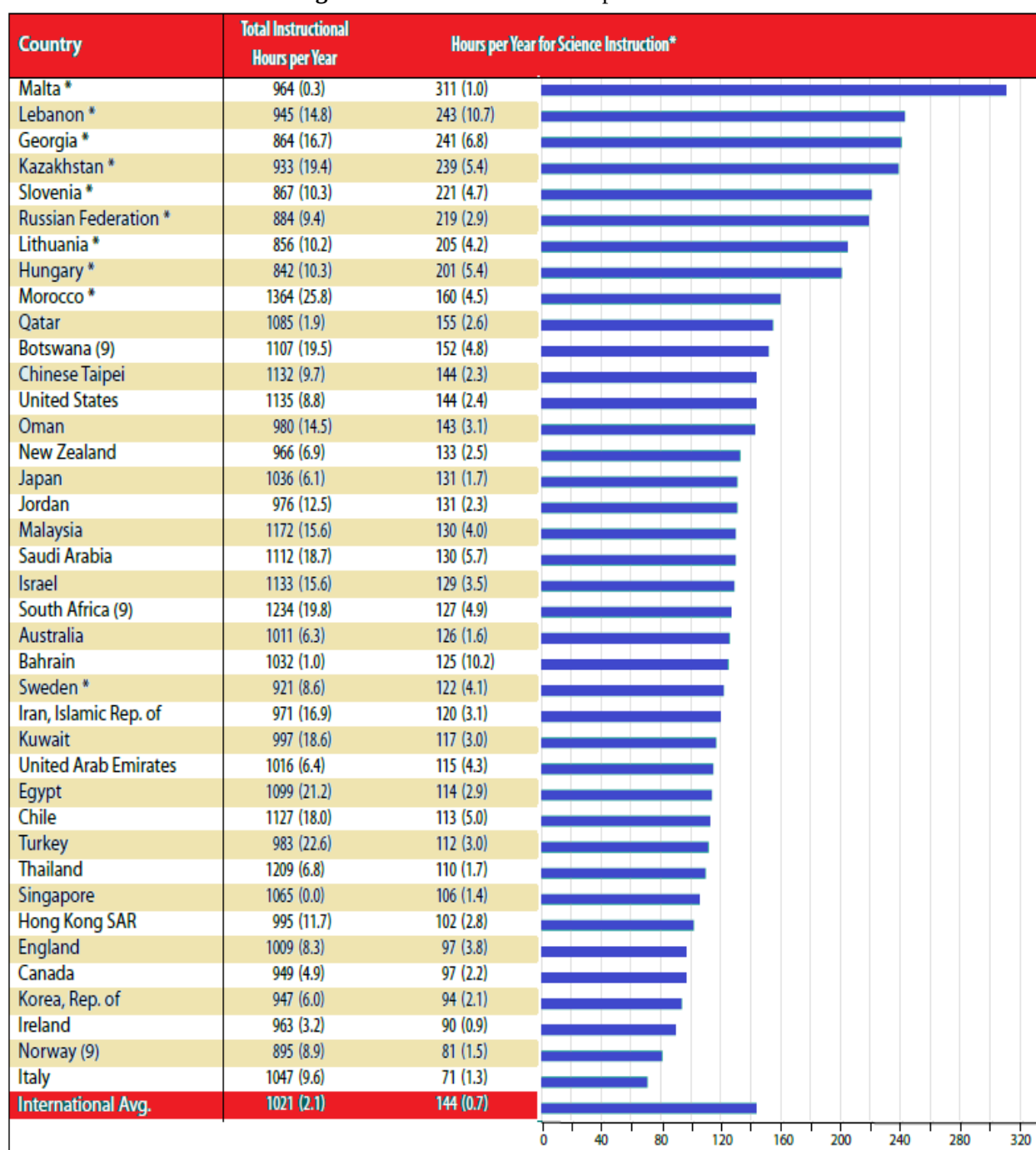
In a typical week, how much time do you spend teaching mathematics to the students in this class?	Frequency	Percentage
200 minutes or less	119	58.3%
201-240 minutes	81	39.7%
More than 240 minutes	4	2.0%

Figure 9.1: Instructional time spent on Mathematics

The total yearly instructional duration (964 hours), reported by Maltese heads of school is 57 hours less than the international average (1021 hours). Morocco (1364 hours) has the highest total instructional hours per year, followed by South Africa (1234 hours), Thailand (1209 hours) and Malaysia (1172 hours), while Hungary (842 hours) has the least. The yearly instructional time for Mathematics, reported by Maltese teachers (127 hours) is 11 hours less than the international average (138 hours). South Africa (194 hours) has the highest yearly instructional time for Mathematics followed by Chile (192 hours), Canada (168 hours) and Oman (166 hours), while Sweden (99 hours) has the least.

Table 9.2: Distribution of instructional time for Science per week in Malta

In a typical week, how much time do you spend teaching science to the students in this class?	Frequency	Percentage
120 minutes or less	145	22.8%
121-160 minutes	310	63.5%
161-240 minutes	0	0.0%
More than 240 minutes	72	13.7%

Figure 9.2: Instructional time spent on Science

The total instructional hours per year was computed by multiplying the number of school days per year with the number of instructional hours per day. The Science instructional hours per year was computed by multiplying the ratio of Science instructional hours per week and schools days per week with school days per year. Table 9.2 displays the weekly duration of science lessons, as reported by Maltese science teachers. Figure 9.2 shows that the yearly science instructional time for Malta (311 hours), reported by science teachers, is the largest of all participating countries and is 167 hours more than the international average (144 hours). This is followed by Lebanon (243 hours), Georgia (241 hours) and Kazakhstan (239 hours). In countries marked with an asterisk, including Malta, Biology, Chemistry, Physics and Geography are taught as separate subjects. The total instructional hours include the total time spent in the teaching of all these subjects.

9.3 TIMSS Mathematics and Science topics taught at school

Tables 9.3 to 9.6 display the proportion of Maltese teachers who mostly taught the mathematics topic last year, mostly taught the topic this year or have not taught the topic yet.

Table 9.3: Topics related to Number which are taught in Maltese schools

Choose the response that best describes when the students in this class have been taught Numbers	Mostly taught before this year	Mostly taught this year	Not yet taught or not introduced
Computing with whole numbers	87.4%	12.1%	0.5%
Comparing and ordering rational numbers	73.8%	24.3%	1.9%
Computing with rational numbers (fractions, decimals, and integers)	59.7%	39.8%	0.5%
Concepts of irrational numbers	22.3%	29.1%	48.5%
Problem-solving involving percentages or proportions	25.9%	66.8%	7.3%

Table 9.4: Topics related to Algebra which are taught in Maltese schools

Choose the response that best describes when the students in this class have been taught Algebra	Mostly taught before this year	Mostly taught this year	Not yet taught or not introduced
Simplifying and evaluating algebraic expressions	35.4%	58.3%	6.3%
Simple linear equations and inequalities	17.5%	66.0%	16.5%
Simultaneous (two variables) equations	1.0%	51.5%	47.6%
Numeric, algebraic, and geometric patterns or sequences (extension, missing terms, patterns)	17.5%	61.7%	20.9%
Representation of functions as ordered pairs, tables, graphs, words, or equations	13.1%	59.7%	27.2%
Properties of functions (slopes, intercepts, etc.)	10.7%	52.9%	36.4%

Table 9.5: Topics related to Geometry which are taught in Maltese schools

Choose the response that best describes when the students in this class have been taught Geometry	Mostly taught before this year	Mostly taught this year	Not yet taught or not introduced
Geometric properties of angles and geometric shapes (triangles, quadrilaterals, and polygons)	49.8%	47.8%	2.4%
Congruent figures and similar triangles	1.0%	9.2%	89.9%
Relationship between three-dimensional shapes and their two-dimensional representations	16.9%	30.9%	52.2%
Using appropriate measurement formulas for areas, volumes perimeters, circumferences, surface areas	16.4%	70.5%	13.0%
Points on the Cartesian plane	42.0%	40.1%	17.9%
Translation, reflection, and rotation	35.7%	15.9%	48.3%

Table 9.6: Topics related to Data handling and Chance which are taught in Maltese schools

Choose the response that best describes when the students in class have been taught Data and Chance	Mostly taught before this year	Mostly taught this year	Not yet taught or not introduced
Characteristics of data sets (mean, median, mode, and shape of distributions)	40.1%	45.4%	14.5%
Interpreting data sets (e.g., draw conclusions, make predictions)	16.0%	31.6%	52.4%
Judging, predicting, and determining the chances of possible outcomes	27.1%	27.5%	45.4%

Figure 9.3: Percentage of students taught the TIMSS Mathematics topics

Country	All Mathematics (20 topics)	Number (5 topics)	Algebra (6 topics)	Geometry (6 topics)	Data and Chance (3 topics)
Australia	76 (0.9)	90 (0.9)	65 (1.5)	77 (1.4)	71 (2.2)
Bahrain	88 (0.5)	95 (0.5)	83 (0.7)	90 (0.8)	83 (1.6)
Botswana (9)	67 (1.5)	72 (2.4)	56 (2.4)	76 (1.8)	62 (3.2)
Canada	76 (0.8)	89 (0.8)	61 (1.2)	85 (1.3)	69 (1.9)
Chile	80 (1.5)	90 (1.3)	65 (2.4)	87 (1.6)	78 (3.4)
Chinese Taipei	72 (0.6)	95 (0.7)	88 (0.7)	72 (1.5)	2 (0.6)
Egypt	82 (0.7)	96 (0.6)	71 (1.3)	85 (0.9)	78 (2.0)
England	77 (1.3)	82 (1.0)	72 (1.9)	77 (2.2)	76 (2.2)
Georgia	71 (1.0)	96 (0.6)	72 (1.6)	61 (1.5)	45 (2.9)
Hong Kong SAR	73 (1.0)	93 (1.3)	72 (1.5)	79 (1.3)	33 (2.7)
Hungary	85 (0.7)	98 (0.4)	78 (1.0)	90 (0.9)	67 (2.7)
Iran, Islamic Rep. of	71 (0.9)	90 (1.0)	45 (1.3)	84 (1.1)	63 (2.8)
Ireland	73 (1.0)	92 (0.8)	72 (1.5)	58 (1.8)	75 (2.3)
Israel	82 (0.8)	90 (0.7)	90 (0.8)	78 (1.1)	59 (2.4)
Italy	75 (0.8)	99 (0.3)	49 (1.4)	92 (0.9)	56 (2.9)
Japan	88 (0.6)	81 (1.2)	91 (0.8)	95 (0.6)	79 (2.3)
Jordan	86 (0.8)	99 (0.6)	94 (0.8)	80 (1.5)	64 (2.6)
Kazakhstan	81 (0.9)	99 (0.2)	84 (1.4)	71 (1.3)	63 (2.7)
Korea, Rep. of	80 (0.6)	81 (0.7)	94 (0.6)	90 (0.9)	34 (3.1)
Kuwait	75 (1.1)	88 (0.9)	60 (1.6)	82 (1.5)	69 (2.5)
Lebanon	60 (1.3)	88 (1.0)	47 (1.7)	62 (1.7)	34 (3.3)
Lithuania	61 (1.0)	89 (0.8)	50 (1.5)	56 (1.5)	49 (2.5)
Malaysia	71 (1.3)	96 (0.7)	54 (2.1)	86 (1.3)	36 (3.4)
Malta	74 (0.0)	89 (0.0)	77 (0.1)	63 (0.1)	63 (0.1)
Morocco	60 (0.8)	96 (0.6)	50 (1.3)	54 (1.2)	29 (2.1)
New Zealand	75 (1.1)	87 (1.0)	69 (1.5)	69 (1.8)	76 (2.2)
Norway (9)	65 (0.8)	87 (1.0)	51 (1.7)	58 (1.6)	65 (2.5)
Oman	77 (0.8)	90 (0.7)	62 (1.1)	85 (1.1)	72 (1.9)
Qatar	80 (0.7)	89 (0.7)	77 (1.3)	84 (1.0)	66 (2.5)
Russian Federation	--	--	--	--	--
Saudi Arabia	89 (0.8)	99 (0.5)	81 (1.5)	91 (1.0)	87 (2.1)
Singapore	88 (0.4)	98 (0.4)	94 (0.5)	80 (0.6)	77 (1.4)
Slovenia	60 (0.7)	97 (0.6)	49 (1.1)	63 (1.1)	14 (1.2)
South Africa (9)	80 (1.2)	97 (0.8)	80 (1.6)	81 (1.5)	49 (3.6)
Sweden	61 (1.3)	78 (1.4)	55 (2.7)	59 (1.7)	49 (2.6)
Thailand	70 (1.1)	99 (0.5)	54 (1.9)	80 (1.8)	31 (2.6)
Turkey	82 (0.7)	100 (0.2)	62 (1.7)	79 (1.0)	99 (0.6)
United Arab Emirates	84 (0.6)	92 (0.6)	79 (0.9)	84 (0.7)	78 (1.4)
United States	90 (0.7)	98 (0.4)	92 (0.8)	84 (1.3)	83 (2.0)
International Avg.	76 (0.1)	92 (0.1)	70 (0.2)	77 (0.2)	60 (0.4)

The mathematical topics least covered by Maltese teachers by mid-April at Year 9 are concepts of irrational numbers in Numbers; simultaneous equations and properties of functions in Algebra; congruent figures and similar triangles, relationship between three-dimensional shapes and their two-dimensional representations, and translation, reflection, and rotation in Geometry; interpreting data sets and judging, predicting, and determining the chances of possible outcomes in Data Handling and Chance. Figure 9.3 shows that the proportions of Maltese students who were taught all mathematics topics (74%) is marginally lower than the international average (76%). There are higher proportions of Maltese students who were taught Algebra and Data Handling and Chance, and lower proportions who were taught Algebra and Geometry compared to the international averages.

Tables 9.7 to 9.10 display the proportion of Maltese teachers who mostly taught the science topic last year, mostly taught the topic this year or have not taught the topic yet.

Table 9.7: Topics related to Biology which are taught in Maltese schools

Choose the response that best describes when the students in this class have been taught Biology	Mostly taught before this year	Mostly taught this year	Not yet taught or not introduced
Differences among major taxonomic groups of organisms	25.6%	31.4%	43.0%
Major organs and organ systems in humans and other organisms	21.0%	14.3%	64.7%
Cells, their structure and functions, including respiration and photosynthesis as cellular processes	21.3%	34.0%	44.7%
Life cycles, sexual reproduction, and heredity	15.4%	5.9%	78.7%
Role of variation and adaptation in survival/extinction of species in a changing environment	18.6%	13.0%	68.4%
Interdependence of populations of organisms in an ecosystem	26.3%	16.0%	57.7%
Human health and the importance of diet and exercise in maintaining health	24.9%	11.1%	64.0%

Table 9.8: Topics related to Chemistry which are taught in Maltese schools

Choose the response that best describes when the students in this class have been taught Chemistry	Mostly taught before this year	Mostly taught this year	Not yet taught or not introduced
Classification, composition, and particulate structure of matter	25.7%	28.4%	45.9%
Physical and chemical properties of matter	26.3%	30.8%	43.0%
Mixtures and solutions	25.2%	27.3%	47.5%
Properties and uses of common acids and bases	24.7%	15.6%	59.7%
Chemical change	13.5%	24.4%	62.1%
The role of electrons in chemical bonds	8.8%	28.9%	62.3%

Table 9.9: Topics related to Physics which are taught in Maltese schools

Choose the response that best describes when the students in this class have been taught Physics	Mostly taught before this year	Mostly taught this year	Not yet taught or not introduced
Physical states and changes in matter	12.1%	50.5%	37.4%
Energy forms, transformations, heat, and temperature	8.8%	44.0%	47.2%
Basic properties/behaviours of light	6.3%	13.9%	79.8%
Electric circuits and properties and uses of permanent magnets and electromagnets	7.3%	4.8%	87.9%
Forces and motion	9.1%	55.9%	35.0%

Table 9.10: Topics related to Earth Science which are taught in Maltese schools

Choose the response that best describes when the students in class have been taught Earth Science	Mostly taught before this year	Mostly taught this year	Not yet taught or not introduced
Earth's structure and physical features	33.9%	14.7%	51.4%
Earth's processes, cycles, and history	20.3%	27.7%	52.0%
Earth's resources, their use and conservation	17.7%	29.6%	52.7%
Earth in the solar system and the universe	15.9%	15.2%	68.9%

Figure 9.4: Percentage of students taught the TIMSS Science topics

Country	All Science (22 topics)	Biology (7 topics)	Chemistry (6 topics)	Physics (5 topics)	Earth Science (4 topics)
Australia	59 (1.0)	55 (1.2)	61 (1.3)	54 (1.3)	67 (2.4)
Bahrain	84 (0.6)	90 (1.0)	80 (0.8)	75 (1.4)	93 (1.1)
Botswana (9)	60 (1.3)	88 (1.4)	42 (1.6)	50 (2.4)	50 (2.6)
Canada	67 (1.1)	73 (1.5)	54 (1.7)	61 (1.8)	81 (2.2)
Chile	83 (1.3)	85 (1.9)	81 (2.1)	81 (2.0)	87 (2.4)
Chinese Taipei	67 (1.0)	89 (2.6)	89 (0.7)	61 (1.1)	5 (1.5)
Egypt	82 (1.0)	82 (1.3)	81 (1.4)	82 (1.2)	85 (1.9)
England	81 (1.0)	83 (1.4)	78 (1.1)	85 (1.3)	77 (1.9)
Georgia	70 (0.8)	55 (1.8)	69 (1.7)	68 (1.6)	98 (0.6)
Hong Kong SAR	55 (1.3)	64 (2.2)	46 (1.9)	72 (1.6)	34 (3.1)
Hungary	87 (0.7)	79 (1.2)	99 (0.5)	86 (0.9)	85 (1.9)
Iran, Islamic Rep. of	76 (1.2)	70 (1.6)	81 (1.4)	81 (1.6)	76 (1.9)
Ireland	66 (0.8)	66 (1.3)	84 (1.3)	69 (1.4)	34 (2.1)
Israel	70 (1.3)	65 (1.9)	86 (1.1)	78 (1.3)	44 (2.8)
Italy	79 (1.0)	86 (1.1)	86 (1.8)	67 (1.6)	71 (2.5)
Japan	60 (0.8)	56 (1.2)	67 (1.1)	73 (1.4)	40 (1.7)
Jordan	89 (0.9)	89 (1.0)	90 (1.1)	85 (1.5)	90 (1.5)
Kazakhstan	82 (0.7)	68 (1.5)	84 (1.4)	85 (0.9)	96 (0.9)
Korea, Rep. of	60 (1.0)	49 (1.6)	59 (1.4)	76 (1.1)	64 (1.5)
Kuwait	80 (1.3)	81 (1.6)	81 (1.5)	75 (1.5)	80 (2.5)
Lebanon	83 (1.3)	80 (2.5)	85 (1.7)	86 (2.7)	--
Lithuania	74 (1.0)	77 (1.8)	63 (1.8)	67 (2.3)	91 (1.2)
Malaysia	61 (1.5)	64 (1.6)	64 (1.8)	72 (1.7)	37 (2.6)
Malta	61 (0.3)	48 (0.5)	82 (0.7)	53 (0.3)	59 (0.2)
Morocco	63 (0.8)	70 (0.9)	54 (1.1)	57 (1.4)	75 (1.7)
New Zealand	50 (1.2)	47 (2.0)	58 (1.8)	55 (1.7)	40 (2.4)
Norway (9)	63 (1.0)	55 (1.6)	81 (1.6)	46 (1.7)	71 (2.1)
Oman	81 (0.8)	82 (0.8)	72 (1.3)	81 (1.5)	93 (1.3)
Qatar	77 (1.1)	74 (1.5)	77 (1.5)	83 (1.4)	75 (1.7)
Russian Federation	--	--	--	--	--
Saudi Arabia	85 (1.1)	85 (1.5)	88 (1.3)	77 (1.9)	90 (1.8)
Singapore	68 (0.9)	69 (1.4)	78 (1.3)	85 (1.0)	28 (2.1)
Slovenia	70 (0.6)	72 (1.0)	80 (1.0)	43 (1.4)	87 (1.5)
South Africa (9)	79 (1.5)	85 (1.6)	88 (1.3)	76 (2.3)	56 (3.3)
Sweden	71 (0.9)	66 (1.3)	74 (1.5)	74 (1.7)	--
Thailand	73 (1.1)	67 (2.0)	85 (1.5)	69 (1.5)	72 (1.6)
Turkey	87 (0.7)	90 (0.9)	100 (0.2)	94 (0.8)	55 (2.5)
United Arab Emirates	82 (0.8)	80 (1.1)	84 (0.8)	82 (1.2)	85 (1.2)
United States	85 (1.1)	90 (1.1)	82 (1.7)	76 (1.8)	90 (1.2)
International Avg.	73 (0.2)	73 (0.2)	76 (0.2)	72 (0.3)	68 (0.3)

The science topics least covered by Maltese teachers by the mid- April at Year 9 are life cycles, sexual reproduction, and heredity in Biology, chemical change and the role of electrons in chemical bonds in Chemistry, electric circuits and properties and uses of permanent magnets and electromagnets in Physics, and Earth in the solar system and the universe in Earth Science. Figure 9.4 shows that the proportions of Maltese students who were taught all science topics (61%) is significantly lower than the international average (73%). There is a larger proportion of Maltese students who were taught the Chemistry topics and lower proportions who were taught the Biology, Physics and Earth Science topics compared to the international averages.

9.4 Teachers' Emphasis on Science Investigation

A scale score for teachers' emphasis on science investigation was generated by using the science teachers' responses on eight Science Investigation Emphasis items displayed in Table 9.11. Teachers who emphasized science investigation in about half the lessons or more had a score on the scale of at least 11.3, which corresponds to the teachers using all eight activities in 'about half the lessons', on average. Teachers who scored less than 11.3 emphasized science investigation in less than half the lessons.

Table 9.11: Teachers' emphasis on Science investigation

In teaching science to this class, how often do you ask students to do the following?	Almost every lesson	About half the lessons	Some lessons	Never
Observe natural phenomena and describe what they see	17.0%	48.1%	32.3%	2.6%
Watch me demonstrate an experiment or investigation	4.9%	31.3%	54.9%	8.9%
Design or plan experiments or investigations	0.9%	22.6%	62.3%	14.1%
Conduct experiments or investigations	2.6%	37.3%	49.2%	10.9%
Present data from experiments or investigations	2.3%	28.2%	58.4%	11.1%
Interpret data from experiments or investigations	2.1%	32.3%	55.1%	10.6%
Use evidence from experiments to support conclusions	8.1%	37.4%	47.4%	7.2%
Do field work outside of class	0.4%	3.2%	52.0%	44.4%

Figure 9.5: Teachers' emphasis score distribution on Science Investigation

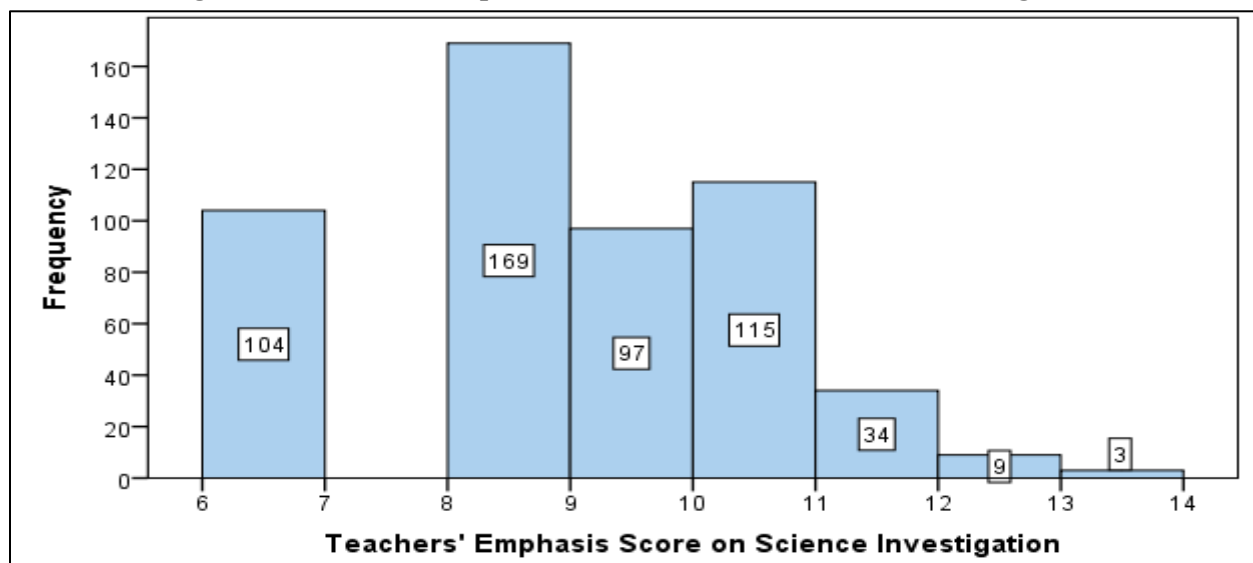
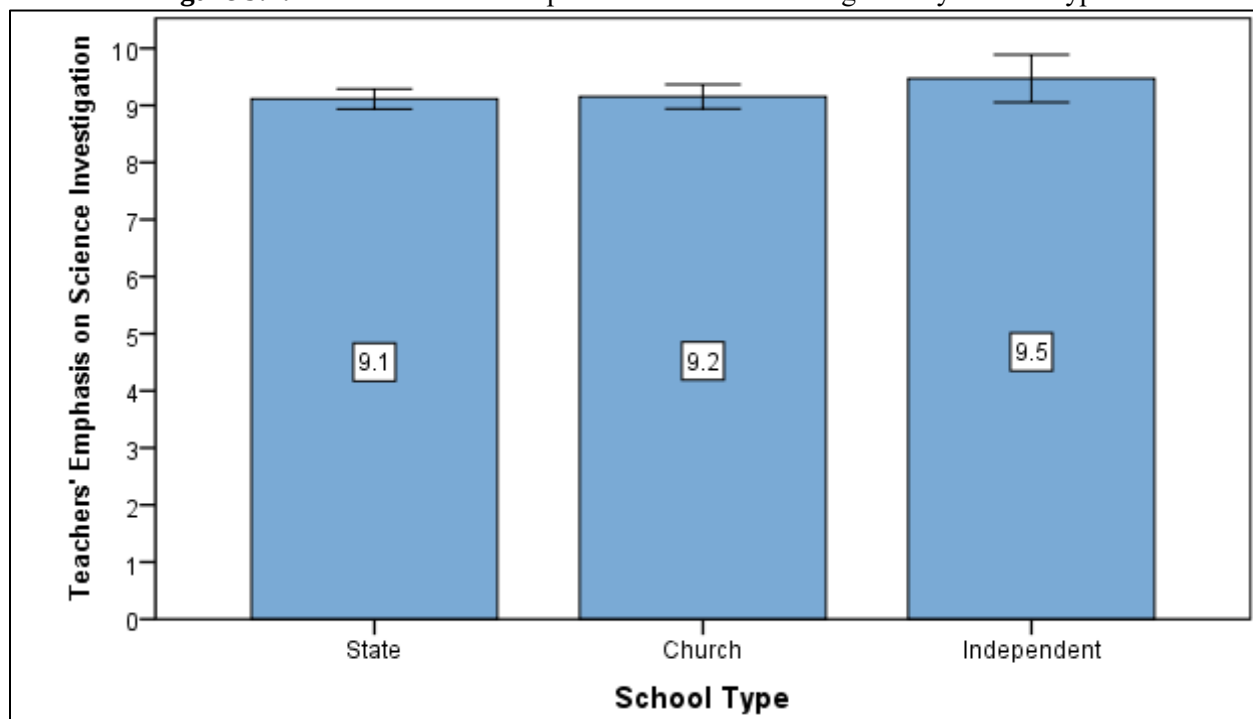


Figure 9.6: Teachers' emphasis on Science investigation and attainment score in Science

Country	About Half the Lessons or More		Less than Half the Lessons		Average Scale Score
	Percent of Students	Average Achievement	Percent of Students	Average Achievement	
Oman	69 (2.9)	456 (3.1)	31 (2.9)	453 (5.6)	11.9 (0.10)
Iran, Islamic Rep. of	62 (3.1)	463 (4.7)	38 (3.1)	446 (6.6)	11.6 (0.11)
Lebanon	52 (3.9)	403 (6.2)	48 (3.9)	392 (9.2)	11.3 (0.11)
Kuwait	48 (4.5)	407 (8.7)	52 (4.5)	411 (7.3)	11.2 (0.15)
Morocco	46 (2.4)	396 (3.4)	54 (2.4)	391 (2.9)	11.1 (0.08)
United Arab Emirates	44 (2.5)	487 (4.6)	56 (2.5)	471 (4.0)	10.8 (0.11)
Jordan	43 (3.6)	437 (5.7)	57 (3.6)	418 (4.5)	10.9 (0.13)
Egypt	42 (4.1)	375 (7.3)	58 (4.1)	367 (5.5)	10.7 (0.16)
Saudi Arabia	40 (4.3)	408 (7.2)	60 (4.3)	388 (5.9)	10.8 (0.18)
Kazakhstan	39 (2.6)	530 (6.6)	61 (2.6)	535 (5.1)	10.7 (0.13)
Bahrain	38 (3.2)	477 (4.1)	62 (3.2)	457 (3.5)	10.6 (0.13)
Turkey	38 (3.2)	496 (7.4)	62 (3.2)	492 (4.8)	10.7 (0.12)
Qatar	37 (4.0)	450 (6.9)	63 (4.0)	459 (4.8)	10.7 (0.14)
South Africa (9)	35 (4.0)	363 (9.5)	65 (4.0)	355 (7.2)	10.3 (0.18)
Thailand	31 (4.0)	469 (8.9)	69 (4.0)	450 (5.1)	10.1 (0.16)
Malaysia	30 (3.4)	478 (8.9)	70 (3.4)	465 (5.7)	10.4 (0.16)
Israel	27 (2.7)	498 (9.5)	73 (2.7)	512 (4.9)	10.0 (0.11)
Botswana (9)	26 (3.6)	391 (6.5)	74 (3.6)	395 (3.5)	10.0 (0.15)
Chile	25 (4.4)	443 (8.1)	75 (4.4)	460 (4.8)	9.8 (0.18)
Hong Kong SAR	25 (3.6)	565 (6.6)	75 (3.6)	539 (5.0)	10.1 (0.13)
United States	21 (2.5)	541 (6.1)	79 (2.5)	531 (3.5)	9.7 (0.12)
Ireland	20 (2.5)	540 (4.7)	80 (2.5)	535 (3.0)	10.1 (0.11)
Japan	18 (3.2)	567 (3.7)	82 (3.2)	572 (2.0)	9.9 (0.13)
England	18 (1.9)	547 (6.1)	82 (1.9)	536 (5.2)	10.0 (0.08)
Georgia	17 (1.7)	443 (4.4)	83 (1.7)	443 (3.3)	9.5 (0.08)
Australia	16 (2.4)	520 (7.0)	84 (2.4)	515 (3.0)	9.8 (0.10)
Korea, Rep. of	16 (2.7)	555 (3.3)	84 (2.7)	556 (2.4)	9.3 (0.15)
Italy	15 (2.7)	494 (8.9)	85 (2.7)	499 (2.9)	9.1 (0.15)
Slovenia	14 (1.4)	553 (3.4)	86 (1.4)	551 (2.5)	9.4 (0.07)
Hungary	13 (1.3)	547 (4.6)	87 (1.3)	523 (3.5)	9.2 (0.07)
Canada	12 (2.3)	522 (10.3)	88 (2.3)	528 (2.3)	9.2 (0.12)
Chinese Taipei	11 (2.6)	581 (6.3)	89 (2.6)	568 (2.3)	8.9 (0.14)
Russian Federation	11 (1.5)	556 (8.7)	89 (1.5)	543 (4.3)	8.9 (0.08)
New Zealand	10 (1.9)	516 (12.3)	90 (1.9)	516 (3.7)	9.5 (0.11)
Malta	8 (0.3)	477 (4.0)	92 (0.3)	482 (1.7)	9.1 (0.02)
Singapore	8 (1.6)	617 (15.1)	92 (1.6)	595 (3.5)	9.0 (0.09)
Lithuania	7 (1.0)	514 (5.1)	93 (1.0)	520 (2.9)	8.4 (0.07)
Norway (9)	5 (2.0)	512 (20.6)	95 (2.0)	510 (3.1)	8.3 (0.12)
Sweden	5 (1.2)	497 (19.7)	95 (1.2)	524 (3.5)	8.4 (0.13)
International Avg.	27 (0.5)	490 (1.3)	73 (0.5)	485 (0.7)	

Figure 9.5 displays the teachers' emphasis score distribution on science investigation, where the majority of science teachers are scoring below the 11.3 threshold value. Figure 9.6 shows that the percentage of Maltese students (8%) whose teachers emphasized science investigation in at least half the lessons is significantly lower than the international average (27%). There is no evidence that students' attainment in Science depends on teachers' emphasis on science investigation.

Figure 9.7: Maltese teachers' emphasis on Science investigation by School Type**Table 9.12:** Teachers' emphasis on Science investigation by Gender

Gender of Teacher		Sample Size	Mean	Std. Deviation	P-value
Teachers' Emphasis on Science Investigation	Female	373	9.273	1.477	0.008
	Male	158	8.889	1.582	

Figure 9.7 shows that science teachers in Independent schools put more emphasis on science investigation than teachers in state and church schools, but the difference is not significant. Table 9.12 shows that female science teachers put significantly more emphasis on science investigation than their male counterparts since the p-value is less than the 0.05 level of significance.

9.5 Resources for conducting Science experiments

Malta, Hong Kong, Ireland, Sweden, England and Singapore have science laboratories in all schools and this proportion (100%) is significantly higher than the international average (85%). The availability of laboratories in schools has a positive effect on attainment in Science. Figure 9.8 shows that the mean Science score of students attending schools where laboratories are available (489) is significantly higher than their counterparts attending schools where laboratories are not available (450). Moreover, 92% of Maltese heads of school reported that science teachers have assistance available when students conduct experiments. In fact this percentage is amongst the largest and is

significantly higher than the international average (58%). There is no evidence that students' attainment in Science depends on the availability of laboratory assistance.

Figure 9.8: Resources for conducting Science Experiments (reported by Heads of School)

Country	Schools Have a Science Laboratory				Teachers Have Assistance Available when Students are Conducting Experiments			
	Yes		No		Yes		No	
	Percent of Students	Average Achievement	Percent of Students	Average Achievement	Percent of Students	Average Achievement	Percent of Students	Average Achievement
Hong Kong SAR	100 (0.0)	545 (4.2)	0 (0.0)	~ ~	98 (1.2)	544 (4.2)	2 (1.2)	~ ~
Ireland	100 (0.0)	530 (2.9)	0 (0.0)	~ ~	12 (2.9)	515 (15.1)	88 (2.9)	532 (2.9)
Malta	100 (0.0)	480 (1.6)	0 (0.0)	~ ~	92 (0.1)	479 (1.7)	8 (0.1)	489 (3.9)
Sweden	100 (0.0)	522 (3.4)	0 (0.0)	~ ~	16 (3.1)	525 (9.3)	84 (3.1)	522 (3.6)
England	100 (0.0)	544 (4.7)	0 (0.0)	~ ~	67 (4.9)	541 (6.3)	33 (4.9)	550 (11.2)
Singapore	100 (0.0)	597 (3.2)	0 (0.0)	~ ~	98 (0.0)	597 (3.2)	2 (0.0)	~ ~
New Zealand	99 (0.3)	512 (3.3)	1 (0.3)	~ ~	50 (5.4)	508 (6.0)	50 (5.4)	515 (5.5)
Japan	99 (0.6)	571 (1.8)	1 (0.6)	~ ~	38 (3.9)	579 (4.0)	62 (3.9)	566 (2.3)
Korea, Rep. of	99 (0.7)	556 (2.2)	1 (0.7)	~ ~	49 (3.8)	560 (2.9)	51 (3.8)	551 (3.1)
Australia	99 (0.9)	514 (2.9)	1 (0.9)	~ ~	69 (3.7)	515 (3.6)	31 (3.7)	511 (5.3)
Malaysia	99 (0.9)	471 (4.2)	1 (0.9)	~ ~	89 (2.9)	472 (4.4)	11 (2.9)	460 (14.2)
Bahrain	98 (0.1)	466 (2.2)	2 (0.1)	~ ~	93 (0.2)	463 (2.3)	7 (0.2)	498 (5.3)
Qatar	98 (0.0)	457 (3.1)	2 (0.0)	~ ~	91 (0.5)	451 (3.2)	9 (0.5)	513 (6.7)
United Arab Emirates	98 (1.3)	474 (2.5)	2 (1.3)	~ ~	95 (0.5)	475 (2.5)	5 (0.5)	494 (7.2)
Chinese Taipei	98 (1.0)	571 (2.1)	2 (1.0)	~ ~	88 (2.3)	572 (2.4)	12 (2.3)	554 (9.5)
Kuwait	98 (1.5)	410 (5.8)	2 (1.5)	~ ~	89 (2.9)	406 (5.8)	11 (2.9)	447 (26.0)
Oman	97 (0.8)	454 (2.7)	3 (0.8)	433 (8.6)	82 (2.5)	456 (3.0)	18 (2.5)	442 (7.4)
Egypt	96 (1.3)	373 (4.4)	4 (1.3)	347 (10.2)	94 (2.0)	375 (4.5)	6 (2.0)	315 (11.5)
Norway (9)	93 (2.4)	509 (3.1)	7 (2.4)	515 (16.0)	35 (4.4)	510 (4.6)	65 (4.4)	509 (3.9)
Thailand	93 (1.9)	457 (4.4)	7 (1.9)	442 (11.0)	22 (3.3)	472 (10.8)	78 (3.3)	451 (4.6)
Jordan	93 (1.6)	428 (3.5)	7 (1.6)	406 (11.1)	86 (2.3)	428 (3.9)	14 (2.3)	413 (8.4)
Saudi Arabia	92 (2.7)	401 (4.6)	8 (2.7)	347 (15.7)	87 (3.2)	400 (4.8)	13 (3.2)	372 (14.5)
Lebanon	89 (2.8)	406 (5.5)	11 (2.8)	339 (16.4)	75 (4.0)	402 (7.2)	25 (4.0)	388 (13.0)
Israel	88 (2.3)	509 (4.3)	12 (2.3)	487 (13.7)	85 (2.4)	508 (4.4)	15 (2.4)	499 (13.8)
Botswana (9)	87 (3.0)	394 (3.4)	13 (3.0)	380 (10.3)	54 (4.7)	390 (5.0)	46 (4.7)	397 (4.9)
Russian Federation	84 (2.9)	546 (4.3)	16 (2.9)	534 (11.6)	51 (3.1)	547 (4.6)	49 (3.1)	542 (5.9)
Kazakhstan	82 (3.3)	531 (4.7)	18 (3.3)	538 (14.5)	94 (1.8)	533 (4.5)	6 (1.8)	526 (21.3)
Morocco	80 (2.4)	396 (2.9)	20 (2.4)	384 (4.6)	44 (3.1)	399 (4.0)	56 (3.1)	390 (3.1)
Turkey	78 (2.7)	502 (4.5)	22 (2.7)	464 (9.2)	13 (2.7)	510 (11.1)	87 (2.7)	491 (4.1)
United States	74 (3.2)	534 (3.8)	26 (3.2)	524 (5.7)	27 (3.2)	536 (4.9)	73 (3.2)	529 (4.0)
Iran, Islamic Rep. of	73 (3.0)	467 (5.0)	27 (3.0)	428 (6.5)	26 (2.5)	466 (8.7)	74 (2.5)	453 (4.7)
Georgia	73 (3.1)	446 (3.3)	27 (3.1)	436 (6.7)	13 (2.8)	463 (8.6)	87 (2.8)	441 (3.4)
Italy	71 (4.2)	501 (3.4)	29 (4.2)	491 (5.5)	12 (2.2)	501 (10.8)	88 (2.2)	499 (2.9)
Canada	69 (3.2)	532 (2.4)	31 (3.2)	516 (3.7)	45 (3.1)	536 (3.2)	55 (3.1)	520 (2.6)
Chile	68 (3.8)	463 (4.8)	32 (3.8)	436 (5.8)	17 (3.6)	461 (11.7)	83 (3.6)	454 (4.3)
Slovenia	50 (4.5)	551 (3.4)	50 (4.5)	552 (3.7)	80 (3.3)	551 (3.0)	20 (3.3)	554 (4.9)
South Africa (9)	49 (2.8)	397 (8.7)	51 (2.8)	320 (5.6)	46 (3.9)	359 (7.1)	54 (3.9)	359 (10.0)
Hungary	30 (3.9)	542 (8.8)	70 (3.9)	519 (3.3)	22 (3.8)	548 (11.5)	78 (3.8)	520 (3.5)
Lithuania	11 (3.0)	528 (7.7)	89 (3.0)	518 (3.2)	15 (2.9)	519 (7.6)	85 (2.9)	519 (3.3)
International Avg.	85 (0.4)	489 (0.7)	15 (0.4)	450 (2.0)	58 (0.5)	489 (1.1)	42 (0.5)	481 (1.5)

Figure 9.8 shows that Malta, Hong Kong and Singapore have more laboratory facilities and laboratory assistants than other countries. Lithuania, Hungary and South Africa have the least lab facilities and lab assistance.

9.6 Computer activities during Mathematics and Science lessons

Figure 9.9 shows that Malta has the lowest percentage (4%) of mathematics teachers who allow their students to use computers/tablets during mathematics lessons. This is significantly lower than the international average (32%). Moreover, only half of these nine mathematics teachers use these computers/tablets at least once monthly for the four activities displayed in Table 9.13.

Figure 9.9: Computer activity during Mathematics lessons

Country	Computers Available for Students to Use in Mathematics Lessons			Percent of Students Whose Teachers Have Them Use Computers at Least Monthly			
	Percent of Students	Average Achievement		To Explore Mathematics Principles and Concepts	To Practice Skills and Procedures	To Look Up Ideas and Information	To Process and Analyze Data
	Yes	Yes	No				
Sweden	65 (3.6)	499 (4.0)	502 (4.0)	25 (3.7)	38 (4.0)	32 (4.2)	26 (3.9)
Australia	62 (3.4)	512 (3.5)	506 (5.4)	51 (3.5)	52 (3.6)	48 (3.6)	44 (3.2)
Kazakhstan	53 (3.9)	531 (7.6)	525 (7.4)	45 (4.5)	50 (4.1)	51 (4.2)	45 (4.5)
Canada	50 (3.3)	528 (3.7)	533 (3.2)	35 (2.8)	36 (3.1)	33 (3.0)	31 (3.1)
Chile	49 (4.6)	423 (5.5)	437 (5.8)	29 (4.3)	36 (4.4)	32 (4.5)	36 (4.3)
Egypt	48 (3.9)	395 (6.1)	390 (5.8)	35 (4.0)	42 (4.1)	45 (4.0)	32 (3.7)
Russian Federation	47 (3.5)	535 (5.1)	540 (6.4)	36 (3.5)	41 (3.6)	42 (3.2)	34 (3.5)
New Zealand	47 (3.5)	501 (4.8)	488 (5.7)	36 (3.3)	35 (3.3)	35 (3.3)	33 (3.5)
United Arab Emirates	44 (2.2)	481 (4.5)	456 (3.8)	38 (2.0)	40 (2.1)	40 (2.2)	37 (2.3)
Japan	43 (3.7)	585 (4.1)	588 (3.4)	3 (1.0)	6 (1.8)	4 (1.3)	5 (1.5)
Italy	43 (3.7)	493 (4.3)	495 (4.1)	28 (3.2)	29 (3.3)	31 (3.5)	26 (2.9)
Norway (9)	40 (3.9)	513 (3.5)	513 (3.2)	27 (3.9)	35 (4.1)	27 (4.0)	29 (3.8)
Jordan	39 (3.3)	394 (6.5)	378 (4.0)	29 (3.4)	28 (3.4)	32 (3.5)	25 (3.3)
Thailand	39 (4.5)	442 (8.5)	425 (6.1)	25 (4.0)	26 (4.2)	28 (4.3)	23 (4.1)
United States	39 (2.9)	519 (5.0)	518 (4.3)	27 (2.8)	31 (2.9)	29 (2.8)	26 (2.8)
Korea, Rep. of	39 (3.6)	604 (4.3)	607 (3.6)	25 (3.3)	22 (3.1)	24 (3.2)	19 (2.6)
Lithuania	38 (4.0)	508 (4.9)	512 (4.5)	21 (3.7)	24 (3.4)	29 (3.8)	23 (3.5)
Georgia	38 (3.6)	453 (6.6)	452 (4.5)	33 (3.8)	31 (3.5)	34 (3.8)	33 (3.7)
Qatar	36 (2.6)	422 (6.6)	445 (4.3)	31 (2.3)	33 (2.5)	30 (2.7)	26 (2.9)
Singapore	35 (2.5)	617 (6.0)	621 (4.1)	27 (2.2)	27 (2.3)	23 (2.0)	19 (2.0)
Hungary	30 (3.8)	509 (8.0)	516 (4.6)	20 (3.3)	27 (3.6)	22 (3.2)	18 (3.0)
Bahrain	30 (2.8)	458 (3.8)	452 (2.2)	23 (2.4)	23 (2.7)	24 (2.8)	16 (1.9)
England	29 (4.1)	511 (9.7)	520 (6.0)	17 (3.6)	23 (3.7)	17 (3.3)	13 (2.9)
Chinese Taipei	28 (3.5)	604 (6.8)	597 (2.9)	13 (2.8)	11 (2.6)	16 (2.8)	11 (2.5)
Iran, Islamic Rep. of	28 (3.0)	457 (8.6)	429 (5.1)	18 (2.7)	19 (2.8)	17 (2.8)	18 (2.7)
Ireland	25 (2.8)	515 (6.2)	525 (3.4)	11 (1.9)	12 (2.0)	10 (1.7)	10 (1.8)
Hong Kong SAR	21 (3.6)	591 (10.7)	596 (5.5)	13 (2.8)	12 (2.8)	13 (2.8)	12 (2.6)
Slovenia	19 (2.5)	517 (6.7)	516 (2.1)	12 (2.2)	14 (2.1)	13 (1.9)	13 (1.9)
Kuwait	19 (3.4)	393 (16.7)	393 (4.2)	14 (3.4)	17 (3.4)	17 (3.4)	15 (3.4)
Saudi Arabia	17 (2.9)	396 (12.7)	361 (4.6)	13 (2.9)	13 (2.8)	16 (3.0)	14 (3.1)
Israel	17 (2.4)	536 (11.8)	508 (4.3)	11 (2.0)	13 (2.2)	12 (2.1)	11 (1.9)
Turkey	16 (2.3)	471 (13.2)	456 (5.0)	13 (2.1)	11 (2.2)	15 (2.2)	12 (2.1)
Morocco	11 (2.2)	400 (6.9)	382 (2.6)	5 (1.4)	4 (1.4)	6 (1.6)	5 (1.4)
Malaysia	10 (2.0)	477 (11.7)	465 (4.6)	6 (1.5)	5 (1.7)	7 (1.5)	4 (1.3)
South Africa (9)	9 (1.7)	430 (12.4)	367 (4.9)	5 (1.4)	6 (1.6)	5 (1.4)	4 (1.5)
Oman	9 (1.8)	403 (9.9)	404 (3.1)	9 (1.8)	6 (1.5)	9 (1.7)	2 (0.6)
Lebanon	8 (2.3)	451 (11.8)	442 (3.9)	5 (2.0)	5 (1.8)	3 (1.1)	5 (1.8)
Botswana (9)	8 (2.4)	375 (6.1)	393 (2.4)	3 (1.5)	3 (1.7)	4 (1.7)	2 (1.4)
Malta	4 (0.0)	470 (5.4)	495 (1.1)	2 (0.0)	2 (0.0)	2 (0.0)	2 (0.0)
International Avg.	32 (0.5)	485 (1.3)	481 (0.7)	21 (0.5)	23 (0.5)	22 (0.5)	19 (0.5)

Table 9.13: Computer use to explore, process and analyze data during Mathematics lessons

If computers are available, how often do the students do these activities on computers during lessons?	Almost every day	Once or twice a week	Once or twice a month	Almost never
Explore mathematics principles and concepts	0	1	4	4
Practice skills and procedures	1	0	4	4
Look up ideas and information	0	0	4	5
Process and analyze data	0	0	5	4

Figure 9.10: Computer activity during Science lessons

Country	Computers Available for Students to Use in Science Lessons			Percent of Students Whose Teachers Have Them Use Computers at Least Monthly				
	Percent of Students	Average Achievement		To Practice Skills and Procedures	To Look Up Ideas and Information	To Do Scientific Procedures or Experiments	To Study Natural Phenomena Through Simulations	To Process and Analyze Data
	Yes	Yes	No					
Sweden	80 (3.1)	520 (3.9)	533 (6.2)	42 (4.0)	74 (3.5)	30 (3.7)	28 (3.4)	52 (4.2)
Kazakhstan	74 (3.0)	534 (5.2)	531 (8.3)	73 (3.1)	74 (3.1)	70 (3.2)	70 (3.1)	72 (3.0)
Australia	66 (3.0)	519 (3.0)	509 (5.1)	53 (3.3)	65 (3.0)	47 (3.5)	49 (3.2)	55 (3.1)
Russian Federation	64 (2.2)	547 (4.6)	539 (6.3)	54 (2.3)	60 (2.5)	46 (2.2)	40 (2.4)	50 (2.5)
Egypt	61 (3.5)	377 (5.7)	362 (6.7)	54 (3.7)	58 (3.6)	50 (3.6)	50 (3.8)	42 (3.9)
New Zealand	60 (4.0)	517 (4.7)	514 (7.3)	38 (4.3)	56 (4.4)	26 (3.3)	40 (4.6)	35 (4.0)
Canada	58 (2.6)	531 (2.6)	521 (3.6)	41 (3.1)	55 (2.9)	37 (3.1)	38 (3.2)	40 (3.1)
Georgia	57 (2.5)	446 (3.2)	440 (4.5)	50 (2.6)	54 (2.5)	40 (2.7)	44 (2.4)	50 (2.6)
Chile	56 (4.2)	459 (5.3)	454 (5.4)	36 (3.8)	51 (4.3)	30 (3.5)	33 (3.8)	42 (4.1)
Japan	55 (4.2)	571 (3.0)	570 (3.2)	8 (2.1)	19 (3.2)	11 (2.4)	18 (3.1)	12 (2.7)
Norway (9)	53 (4.1)	511 (3.7)	508 (4.7)	39 (4.4)	46 (4.2)	36 (4.4)	31 (4.2)	34 (4.1)
Lithuania	53 (2.5)	519 (3.3)	519 (3.6)	42 (2.3)	48 (2.4)	36 (2.4)	29 (2.1)	36 (2.2)
Singapore	52 (2.3)	592 (4.9)	602 (4.4)	31 (2.2)	41 (2.2)	27 (1.8)	34 (2.2)	27 (1.9)
United States	51 (3.4)	541 (4.4)	527 (4.3)	40 (2.9)	49 (3.3)	41 (3.2)	40 (3.0)	41 (3.0)
Korea, Rep. of	50 (3.9)	554 (3.3)	557 (2.7)	25 (3.2)	30 (3.4)	28 (3.5)	28 (3.3)	26 (3.2)
United Arab Emirates	50 (2.7)	486 (4.4)	472 (5.5)	44 (2.7)	48 (2.7)	43 (2.7)	41 (2.6)	44 (2.8)
Thailand	49 (4.1)	468 (6.4)	445 (5.8)	40 (4.2)	47 (4.2)	42 (4.0)	45 (4.3)	40 (4.3)
Italy	48 (3.9)	499 (4.2)	498 (3.7)	30 (3.4)	44 (3.8)	28 (3.5)	26 (3.0)	32 (3.4)
England	48 (3.3)	543 (5.8)	534 (6.3)	23 (2.6)	44 (3.4)	18 (2.3)	24 (2.7)	28 (2.7)
Jordan	44 (4.0)	438 (4.9)	417 (5.0)	39 (3.8)	44 (4.1)	36 (3.7)	36 (3.9)	33 (3.4)
Chinese Taipei	44 (3.8)	574 (4.1)	566 (2.8)	17 (2.7)	23 (3.0)	26 (3.4)	19 (2.8)	19 (2.6)
Qatar	42 (2.7)	452 (5.5)	459 (5.1)	39 (2.6)	41 (2.7)	35 (2.4)	38 (2.5)	36 (2.9)
Hungary	42 (2.5)	522 (5.1)	529 (4.4)	34 (2.3)	38 (2.4)	29 (2.0)	32 (2.3)	30 (2.2)
Israel	41 (3.3)	522 (7.5)	499 (5.3)	36 (3.1)	38 (3.1)	33 (3.1)	33 (3.0)	32 (3.0)
Iran, Islamic Rep. of	39 (3.9)	477 (5.3)	443 (6.0)	31 (3.3)	36 (3.6)	33 (3.7)	28 (3.3)	24 (2.9)
Saudi Arabia	38 (4.1)	413 (7.7)	386 (5.6)	31 (4.1)	32 (4.2)	31 (4.1)	30 (4.0)	28 (4.1)
Kuwait	38 (4.3)	410 (10.9)	408 (6.3)	36 (4.1)	38 (4.3)	36 (4.2)	34 (4.1)	32 (4.1)
Bahrain	36 (2.1)	463 (4.9)	467 (3.3)	27 (2.5)	34 (2.2)	31 (2.5)	31 (2.4)	26 (2.7)
Slovenia	32 (2.6)	551 (3.4)	551 (2.6)	23 (2.4)	29 (2.5)	19 (2.3)	25 (2.5)	25 (2.5)
Turkey	30 (3.4)	528 (6.9)	480 (4.4)	27 (3.4)	28 (3.4)	27 (3.2)	25 (3.3)	25 (3.3)
Ireland	26 (3.1)	533 (4.3)	538 (3.3)	12 (2.5)	17 (2.8)	10 (2.2)	12 (2.1)	11 (2.4)
Morocco	23 (2.2)	401 (5.2)	391 (2.5)	13 (1.6)	19 (2.0)	13 (1.5)	18 (1.9)	16 (1.7)
Hong Kong SAR	21 (3.6)	555 (8.9)	542 (4.6)	12 (2.9)	17 (3.4)	12 (3.1)	15 (3.1)	14 (2.8)
Oman	15 (2.2)	458 (6.2)	455 (3.1)	13 (2.2)	14 (2.1)	13 (2.0)	13 (2.1)	12 (1.9)
Lebanon	12 (2.6)	427 (13.9)	393 (5.7)	8 (2.3)	10 (2.6)	10 (2.6)	9 (2.6)	10 (2.6)
Malaysia	10 (1.8)	493 (8.7)	467 (4.8)	5 (1.3)	9 (1.8)	3 (0.9)	7 (1.4)	4 (1.2)
South Africa (9)	9 (1.7)	419 (17.4)	352 (5.9)	5 (1.5)	6 (1.4)	5 (1.5)	5 (1.4)	5 (1.6)
Botswana (9)	7 (2.4)	368 (10.1)	396 (3.0)	2 (1.3)	5 (1.9)	2 (1.1)	4 (1.7)	2 (1.1)
Malta	7 (0.3)	477 (4.5)	481 (1.7)	5 (0.3)	5 (0.2)	5 (0.3)	5 (0.3)	5 (0.2)
International Avg.	42 (0.5)	493 (1.0)	483 (0.8)	30 (0.5)	37 (0.5)	28 (0.5)	29 (0.5)	29 (0.5)

Figure 9.10 shows that Malta and Botswana have the lowest percentage (7%) of science teachers who allow their students to use computers/tablets during the science lessons. This is significantly lower than the international average (42%). Moreover, only around 60% of these 42 science teachers use these computers/tablets at least once monthly for the five activities displayed in Table 9.14.

Table 9.14: Computer use to practice, process and analyze data during Science lessons

If computers are available, how often do the students do these activities on computers during lessons?	Almost every day	Once or twice a week	Once or twice a month	Almost never
Practice skills and procedures	2.4%	19.0%	38.1%	40.5%
Look up ideas and information	0.0%	40.5%	26.2%	33.3%
Do scientific procedures or experiments	2.4%	14.3%	42.9%	40.5%
Study natural phenomena through simulations	4.8%	40.5%	23.8%	31.0%
Process and analyze data	0.0%	28.6%	33.3%	38.1%

9.7 Student Internet use for Mathematics and Science schoolwork

To investigate students' Internet use for schoolwork, the students were asked whether they use the Internet for the six tasks described in Table 9.15.

Table 9.15: Student Internet use by Maltese students for Mathematics and Science schoolwork

Do you use the Internet to do any of the following tasks for schoolwork?	Yes	No
Access the textbook or other course materials	44.9%	55.1%
Access assignments posted online by my teacher	65.6%	34.4%
Collaborate with classmates on assignments or projects	80.4%	19.6%
Communicate with the teacher	34.6%	65.4%
Find information, articles, or tutorials to aid in understanding mathematics	58.0%	42.0%
Find information, articles, or tutorials to aid in understanding science	60.6%	39.4%

The proportion of Maltese students using the Internet to access assignments posted online by teachers (65%) and collaborate with classmates on assignments or projects (80%) are significantly higher than the corresponding international means (53% and 69%). On the other hand, the proportion of Maltese students using the Internet to access the textbook or other course materials (45%) is significantly lower than the international average (56%). The Maltese student proportions using the Internet to communicate with the teacher (35%), find information, articles, or tutorials to aid in understanding mathematics (58%) and find information, articles, or tutorials to aid in understanding science (60%) are comparable to the international averages (36%, 57% and 61% respectively). Thailand (81%), Georgia (76%), Chinese Taipei (74%) and United Arab Emirates (70%) had the largest proportions of students using the Internet to access the textbook or other course materials. Singapore (90%), Norway (86%), Lithuania (83%) and Sweden (81%) had the largest proportion of students using the Internet to access assignments posted online by my teacher. Thailand (88%),

Singapore (84%), Lithuania (84%) and United Arab Emirates (83%) had the largest proportions of students using the Internet to collaborate with classmates on assignments or projects. Morocco (64%), Saudi Arabia (57%), Egypt (56%) and Jordan (49%) had the largest proportions of students using the Internet to communicate with the teacher. On the other hand, Thailand, Oman, Russia, United Arab Emirates and Norway had the largest proportions of students using the Internet to find information.

Figure 9.11: Student use of Internet for Schoolwork

Country	Percent of Students Who Use the Internet to Do the Following Tasks					
	Access the Textbook or Other Course Materials	Access Assignments Posted Online by the Teacher	Collaborate with Classmates on Assignments or Projects	Communicate with the Teacher	Find Information, Articles, or Tutorials to Aid in Understanding Mathematics	Find Information, Articles, or Tutorials to Aid in Understanding Science
Australia	55 (1.4)	66 (1.2)	63 (0.8)	46 (1.1)	57 (1.0)	57 (0.9)
Bahrain	56 (1.0)	43 (1.1)	77 (0.8)	41 (1.1)	58 (0.8)	62 (0.9)
Botswana (9)	46 (0.8)	37 (1.0)	58 (1.1)	36 (0.8)	54 (0.8)	58 (0.8)
Canada	45 (1.5)	58 (2.0)	76 (1.0)	32 (1.2)	56 (1.2)	52 (1.2)
Chile	62 (1.0)	37 (1.4)	79 (0.9)	25 (1.2)	60 (1.0)	59 (1.1)
Chinese Taipei	74 (0.9)	50 (1.1)	72 (1.0)	28 (1.0)	38 (0.8)	46 (0.8)
Egypt	57 (1.1)	34 (1.0)	58 (1.0)	56 (1.2)	64 (1.0)	66 (1.0)
England	54 (1.5)	71 (1.4)	53 (1.4)	33 (1.9)	66 (1.1)	64 (1.1)
Georgia	76 (1.3)	44 (1.5)	73 (1.3)	31 (1.4)	47 (1.2)	65 (1.0)
Hong Kong SAR	51 (1.3)	64 (1.9)	76 (1.3)	33 (1.2)	61 (1.1)	65 (1.1)
Hungary	40 (1.1)	58 (1.2)	76 (1.1)	26 (1.3)	41 (1.1)	49 (1.0)
Iran, Islamic Rep. of	60 (1.4)	40 (1.1)	56 (1.2)	31 (1.0)	52 (1.2)	57 (1.1)
Ireland	34 (1.2)	35 (2.6)	50 (1.2)	12 (1.2)	44 (1.0)	39 (1.0)
Israel	64 (1.2)	68 (1.4)	60 (1.2)	32 (1.3)	55 (0.9)	60 (0.9)
Italy	50 (1.1)	34 (2.1)	75 (1.1)	27 (1.5)	41 (1.0)	39 (1.1)
Japan	23 (0.8)	16 (0.9)	28 (1.0)	5 (0.5)	30 (0.8)	32 (0.8)
Jordan	65 (1.1)	42 (1.2)	70 (1.3)	49 (1.2)	61 (1.0)	65 (1.0)
Kazakhstan	65 (1.1)	39 (1.5)	76 (0.9)	24 (1.3)	66 (0.9)	71 (0.9)
Korea, Rep. of	51 (1.0)	43 (1.3)	69 (1.1)	13 (0.7)	45 (0.9)	49 (0.9)
Kuwait	x x	x x	x x	x x	x x	x x
Lebanon	57 (1.3)	43 (1.7)	77 (1.5)	42 (1.7)	58 (1.3)	62 (1.4)
Lithuania	52 (1.0)	83 (1.0)	84 (0.7)	29 (1.1)	62 (1.2)	74 (0.9)
Malaysia	60 (1.1)	27 (1.1)	80 (1.0)	45 (1.2)	63 (1.1)	73 (1.2)
Malta	45 (0.8)	65 (0.6)	80 (0.6)	35 (0.8)	58 (0.8)	60 (0.7)
Morocco	47 (1.1)	64 (1.1)	36 (1.2)	64 (1.1)	41 (1.2)	41 (1.1)
New Zealand	48 (1.4)	61 (2.2)	60 (1.5)	38 (1.8)	59 (1.0)	58 (1.0)
Norway (9)	52 (1.3)	86 (1.2)	81 (1.1)	34 (1.7)	64 (1.1)	74 (0.9)
Oman	68 (0.9)	47 (1.0)	80 (0.7)	39 (1.0)	71 (1.0)	75 (1.0)
Qatar	59 (1.0)	61 (0.8)	66 (0.7)	43 (0.9)	61 (0.9)	64 (0.8)
Russian Federation	68 (1.0)	49 (1.9)	82 (0.9)	29 (1.5)	72 (1.1)	74 (0.9)
Saudi Arabia	44 (1.3)	55 (1.8)	39 (1.9)	57 (1.8)	42 (1.4)	46 (1.5)
Singapore	57 (0.7)	90 (0.5)	84 (0.7)	49 (0.6)	61 (0.7)	71 (0.7)
Slovenia	68 (1.6)	62 (1.7)	70 (1.2)	27 (1.3)	53 (1.2)	64 (1.0)
South Africa (9)	59 (1.1)	40 (1.3)	72 (1.1)	43 (1.4)	63 (1.0)	63 (1.0)
Sweden	67 (1.4)	81 (1.7)	71 (1.5)	47 (1.7)	54 (1.3)	72 (1.2)
Thailand	81 (0.9)	56 (1.7)	88 (0.7)	46 (1.5)	70 (1.0)	76 (0.9)
Turkey	54 (0.9)	24 (0.8)	75 (0.9)	19 (0.7)	66 (1.0)	66 (0.9)
United Arab Emirates	70 (0.6)	69 (0.9)	83 (0.6)	44 (0.8)	69 (0.5)	75 (0.5)
United States	52 (1.4)	64 (1.7)	61 (1.0)	40 (1.4)	63 (0.8)	57 (1.0)
International Avg.	56 (0.2)	53 (0.2)	69 (0.2)	36 (0.2)	57 (0.2)	61 (0.2)

9.8 Frequency of student absences

The proportion of Maltese students who are never or almost never absent from school (66%) is significantly larger than the international average (61%), while the proportions of Maltese students who are absent once every two weeks (6%) or at least once a week (5%) are lower than the corresponding international means (8% and 8% respectively).

Figure 9.12: Absenteeism from School and Attainment in Mathematics

Country	Never or Almost Never		Once a Month		Once Every Two Weeks		Once a Week or More	
	Percent of Students	Average Achievement	Percent of Students	Average Achievement	Percent of Students	Average Achievement	Percent of Students	Average Achievement
Korea, Rep. of	96 (0.3)	609 (2.6)	3 (0.2)	520 (9.1)	1 (0.1)	~ ~	0 (0.1)	~ ~
Chinese Taipei	89 (0.6)	605 (2.3)	8 (0.5)	575 (6.8)	1 (0.2)	~ ~	2 (0.2)	~ ~
Japan	87 (0.6)	593 (2.3)	8 (0.5)	564 (4.7)	3 (0.3)	519 (11.4)	2 (0.2)	~ ~
Hong Kong SAR	87 (0.8)	600 (4.5)	9 (0.5)	576 (5.4)	2 (0.3)	~ ~	2 (0.3)	~ ~
Singapore	82 (0.7)	633 (2.8)	12 (0.5)	587 (5.6)	3 (0.2)	552 (7.4)	3 (0.3)	505 (9.6)
Thailand	71 (1.0)	446 (5.1)	13 (0.6)	409 (5.3)	6 (0.4)	397 (6.1)	9 (0.6)	372 (5.7)
Morocco	70 (0.6)	395 (2.1)	17 (0.4)	368 (3.4)	5 (0.3)	362 (4.8)	8 (0.3)	353 (4.4)
Iran, Islamic Rep. of	70 (1.0)	447 (4.7)	22 (0.9)	423 (5.7)	4 (0.3)	391 (8.4)	4 (0.3)	366 (10.5)
Norway (9)	69 (0.9)	519 (2.3)	22 (0.8)	501 (3.3)	6 (0.4)	504 (4.8)	2 (0.3)	~ ~
England	69 (1.0)	531 (4.3)	24 (0.8)	505 (5.1)	5 (0.4)	489 (7.8)	3 (0.3)	440 (10.0)
South Africa (9)	66 (1.0)	387 (4.9)	17 (0.6)	368 (5.2)	5 (0.3)	337 (7.6)	12 (0.6)	323 (3.7)
Lebanon	66 (1.2)	455 (3.7)	18 (0.7)	436 (4.9)	6 (0.6)	413 (6.2)	10 (0.6)	401 (5.7)
Malta	66 (0.9)	517 (1.5)	23 (0.7)	473 (2.5)	6 (0.4)	438 (5.6)	5 (0.4)	393 (6.8)
Sweden	65 (1.1)	512 (2.6)	23 (0.9)	491 (4.1)	8 (0.6)	484 (6.0)	5 (0.6)	442 (8.6)
Botswana (9)	64 (0.8)	412 (2.2)	19 (0.6)	377 (3.1)	5 (0.3)	301 (5.6)	13 (0.4)	348 (3.6)
Ireland	63 (0.9)	535 (2.8)	27 (0.8)	516 (3.4)	7 (0.4)	494 (6.2)	3 (0.3)	444 (7.8)
United Arab Emirates	62 (0.6)	481 (2.1)	21 (0.4)	465 (2.8)	8 (0.3)	430 (3.5)	9 (0.3)	389 (3.4)
Lithuania	62 (1.1)	515 (3.2)	25 (0.9)	513 (3.8)	9 (0.6)	506 (5.7)	4 (0.4)	458 (9.4)
United States	62 (0.8)	528 (3.3)	26 (0.6)	516 (3.2)	8 (0.3)	498 (4.0)	4 (0.3)	441 (6.0)
Chile	60 (1.2)	435 (3.5)	21 (0.8)	430 (4.5)	10 (0.5)	428 (5.7)	8 (0.6)	371 (6.3)
Canada	60 (0.8)	537 (2.3)	27 (0.7)	524 (2.4)	9 (0.4)	511 (3.9)	4 (0.3)	470 (7.1)
Australia	59 (0.8)	519 (3.3)	28 (0.8)	501 (3.3)	9 (0.4)	488 (3.8)	5 (0.3)	428 (6.0)
Russian Federation	58 (1.2)	542 (4.6)	23 (0.9)	539 (5.3)	12 (0.7)	532 (6.9)	6 (0.5)	504 (9.8)
Turkey	58 (1.0)	485 (5.0)	27 (0.7)	438 (4.9)	9 (0.5)	417 (6.6)	6 (0.4)	358 (7.6)
Oman	57 (0.9)	419 (2.5)	25 (0.7)	398 (3.7)	6 (0.4)	363 (6.9)	12 (0.5)	361 (3.6)
Kazakhstan	57 (1.3)	537 (5.6)	30 (1.2)	519 (5.7)	9 (0.6)	511 (9.2)	5 (0.4)	507 (10.4)
Slovenia	57 (1.0)	521 (2.6)	32 (0.9)	517 (2.4)	8 (0.5)	502 (5.1)	3 (0.4)	477 (7.8)
Italy	55 (1.0)	505 (2.9)	27 (0.8)	495 (3.4)	13 (0.7)	477 (4.4)	5 (0.5)	424 (8.1)
Jordan	52 (1.0)	409 (3.3)	30 (0.8)	378 (3.6)	9 (0.4)	358 (6.0)	9 (0.5)	317 (6.0)
Israel	50 (1.0)	530 (4.3)	30 (0.8)	513 (4.4)	12 (0.5)	489 (6.4)	8 (0.6)	433 (7.8)
Qatar	47 (0.8)	475 (3.8)	31 (0.7)	428 (3.5)	11 (0.5)	386 (5.1)	11 (0.4)	352 (4.8)
Bahrain	45 (0.8)	475 (2.6)	32 (0.7)	453 (1.8)	12 (0.5)	422 (4.0)	12 (0.4)	403 (3.4)
Malaysia	45 (1.2)	495 (3.7)	26 (0.6)	465 (4.1)	11 (0.6)	435 (4.7)	18 (0.8)	414 (4.3)
Hungary	43 (0.9)	540 (3.8)	45 (0.9)	508 (4.5)	9 (0.5)	473 (6.5)	4 (0.4)	394 (10.2)
Egypt	40 (1.2)	411 (4.8)	20 (0.6)	390 (5.6)	15 (0.7)	379 (5.0)	24 (1.0)	376 (5.3)
Kuwait	37 (1.4)	429 (7.3)	28 (1.0)	400 (4.9)	18 (0.7)	359 (5.6)	18 (1.0)	339 (5.8)
Georgia	33 (1.2)	476 (4.4)	38 (1.1)	455 (3.8)	19 (0.9)	447 (5.7)	11 (0.7)	393 (6.8)
Saudi Arabia	32 (1.3)	396 (6.3)	28 (0.8)	367 (4.7)	20 (0.8)	359 (5.4)	20 (1.2)	332 (5.9)
New Zealand	--	--	--	--	--	--	--	--
International Avg.	61 (0.2)	496 (0.6)	23 (0.1)	471 (0.7)	8 (0.1)	442 (1.0)	8 (0.1)	404 (1.2)

Figure 9.13: Absenteeism from School and Attainment in Science

Country	Never or Almost Never		Once a Month		Once Every Two Weeks		Once a Week or More	
	Percent of Students	Average Achievement	Percent of Students	Average Achievement	Percent of Students	Average Achievement	Percent of Students	Average Achievement
Korea, Rep. of	96 (0.3)	558 (2.2)	3 (0.2)	486 (8.7)	1 (0.1)	~ ~	0 (0.1)	~ ~
Chinese Taipei	89 (0.6)	574 (1.9)	8 (0.5)	551 (5.9)	1 (0.2)	~ ~	2 (0.2)	~ ~
Japan	87 (0.6)	575 (1.8)	8 (0.5)	558 (4.0)	3 (0.3)	526 (9.2)	2 (0.2)	~ ~
Hong Kong SAR	87 (0.8)	550 (3.8)	9 (0.5)	538 (4.5)	2 (0.3)	~ ~	2 (0.3)	~ ~
Singapore	82 (0.7)	609 (2.8)	12 (0.5)	568 (5.3)	3 (0.2)	518 (8.9)	3 (0.3)	472 (10.0)
Thailand	71 (1.0)	471 (4.4)	13 (0.6)	436 (5.1)	6 (0.4)	421 (6.1)	9 (0.6)	395 (5.3)
Morocco	70 (0.6)	405 (2.4)	17 (0.4)	376 (3.2)	5 (0.3)	362 (6.9)	8 (0.3)	354 (5.7)
Iran, Islamic Rep. of	70 (1.0)	467 (4.0)	22 (0.9)	444 (5.2)	4 (0.3)	413 (8.5)	4 (0.3)	386 (8.0)
Norway (9)	69 (0.9)	516 (2.7)	22 (0.8)	501 (4.3)	6 (0.4)	500 (5.7)	2 (0.3)	~ ~
England	69 (1.0)	549 (3.8)	24 (0.8)	525 (4.9)	5 (0.4)	505 (7.8)	3 (0.3)	444 (9.5)
South Africa (9)	66 (1.0)	376 (5.9)	17 (0.6)	353 (7.2)	5 (0.3)	312 (9.4)	12 (0.6)	293 (4.3)
Lebanon	66 (1.2)	418 (5.2)	18 (0.7)	386 (6.9)	6 (0.6)	354 (10.5)	10 (0.6)	333 (7.4)
Malta	66 (0.9)	508 (2.1)	23 (0.7)	461 (3.4)	6 (0.4)	419 (7.1)	5 (0.4)	365 (8.1)
Sweden	65 (1.1)	535 (3.2)	23 (0.9)	512 (5.2)	8 (0.6)	507 (6.1)	5 (0.6)	457 (9.4)
Botswana (9)	64 (0.8)	422 (2.8)	19 (0.6)	374 (4.3)	5 (0.3)	270 (8.6)	13 (0.4)	329 (5.2)
Ireland	63 (0.9)	543 (2.9)	27 (0.8)	520 (3.8)	7 (0.4)	497 (6.2)	3 (0.3)	445 (8.5)
United Arab Emirates	62 (0.6)	495 (2.3)	21 (0.4)	477 (3.3)	8 (0.3)	436 (4.5)	9 (0.3)	394 (3.9)
Lithuania	62 (1.1)	523 (3.2)	25 (0.9)	521 (3.9)	9 (0.6)	514 (5.4)	4 (0.4)	466 (8.7)
United States	62 (0.8)	539 (2.9)	26 (0.6)	529 (3.1)	8 (0.3)	512 (3.9)	4 (0.3)	447 (6.3)
Chile	60 (1.2)	461 (3.2)	21 (0.8)	456 (4.4)	10 (0.5)	459 (4.7)	8 (0.6)	401 (6.5)
Canada	60 (0.8)	534 (2.3)	27 (0.7)	526 (2.4)	9 (0.4)	517 (3.4)	4 (0.3)	472 (6.5)
Australia	59 (0.8)	525 (2.6)	28 (0.8)	510 (3.4)	9 (0.4)	495 (3.8)	5 (0.3)	438 (6.1)
Russian Federation	58 (1.2)	550 (4.5)	23 (0.9)	543 (4.6)	12 (0.7)	538 (5.9)	6 (0.5)	506 (8.9)
Turkey	58 (1.0)	519 (4.1)	27 (0.7)	478 (4.0)	9 (0.5)	452 (6.2)	6 (0.4)	400 (7.4)
Oman	57 (0.9)	472 (2.5)	25 (0.7)	451 (3.9)	6 (0.4)	405 (7.1)	12 (0.5)	409 (4.2)
Kazakhstan	57 (1.3)	541 (4.8)	30 (1.2)	527 (5.1)	9 (0.6)	510 (7.8)	5 (0.4)	503 (10.5)
Slovenia	57 (1.0)	557 (2.9)	32 (0.9)	552 (3.0)	8 (0.5)	531 (5.6)	3 (0.4)	505 (9.9)
Italy	55 (1.0)	510 (2.8)	27 (0.8)	500 (3.2)	13 (0.7)	476 (4.4)	5 (0.5)	431 (8.2)
Jordan	52 (1.0)	453 (3.2)	30 (0.8)	421 (3.9)	9 (0.4)	391 (6.4)	9 (0.5)	347 (7.3)
Israel	50 (1.0)	528 (3.9)	30 (0.8)	508 (4.2)	12 (0.5)	486 (6.2)	8 (0.6)	422 (8.4)
Qatar	47 (0.8)	497 (3.7)	31 (0.7)	452 (3.3)	11 (0.5)	399 (5.2)	11 (0.4)	355 (6.7)
Bahrain	45 (0.8)	496 (2.8)	32 (0.7)	464 (2.9)	12 (0.5)	427 (4.8)	12 (0.4)	394 (5.4)
Malaysia	45 (1.2)	498 (4.0)	26 (0.6)	473 (4.8)	11 (0.6)	445 (6.3)	18 (0.8)	420 (5.6)
Hungary	43 (0.9)	553 (3.2)	45 (0.9)	520 (4.2)	9 (0.5)	485 (5.9)	4 (0.4)	426 (8.8)
Egypt	40 (1.2)	390 (5.1)	20 (0.6)	368 (5.5)	15 (0.7)	360 (5.9)	24 (1.0)	353 (5.8)
Kuwait	37 (1.4)	460 (7.3)	28 (1.0)	416 (5.7)	18 (0.7)	376 (6.2)	18 (1.0)	338 (7.7)
Georgia	33 (1.2)	466 (4.2)	38 (1.1)	446 (3.2)	19 (0.9)	435 (4.8)	11 (0.7)	384 (5.7)
Saudi Arabia	32 (1.3)	424 (6.3)	28 (0.8)	399 (4.6)	20 (0.8)	385 (5.2)	20 (1.2)	361 (6.1)
New Zealand	--	--	--	--	--	--	--	--
International Avg.	61 (0.2)	502 (0.6)	23 (0.1)	477 (0.7)	8 (0.1)	447 (1.1)	8 (0.1)	407 (1.3)

Figures 9.12 and 9.13 clearly show a very strong relationship between absenteeism and attainment in Mathematics and Science. Students who are regularly absent from school have significantly lower mean scores in Mathematics and Science than their counterparts who are rarely absent. Maltese students who are rarely absent, are absent once a month, are absent once every fortnight and are absent at least once every week are respectively scoring 517, 473, 438 and 393 in Mathematics and 508, 461, 419 and 365 in Science.

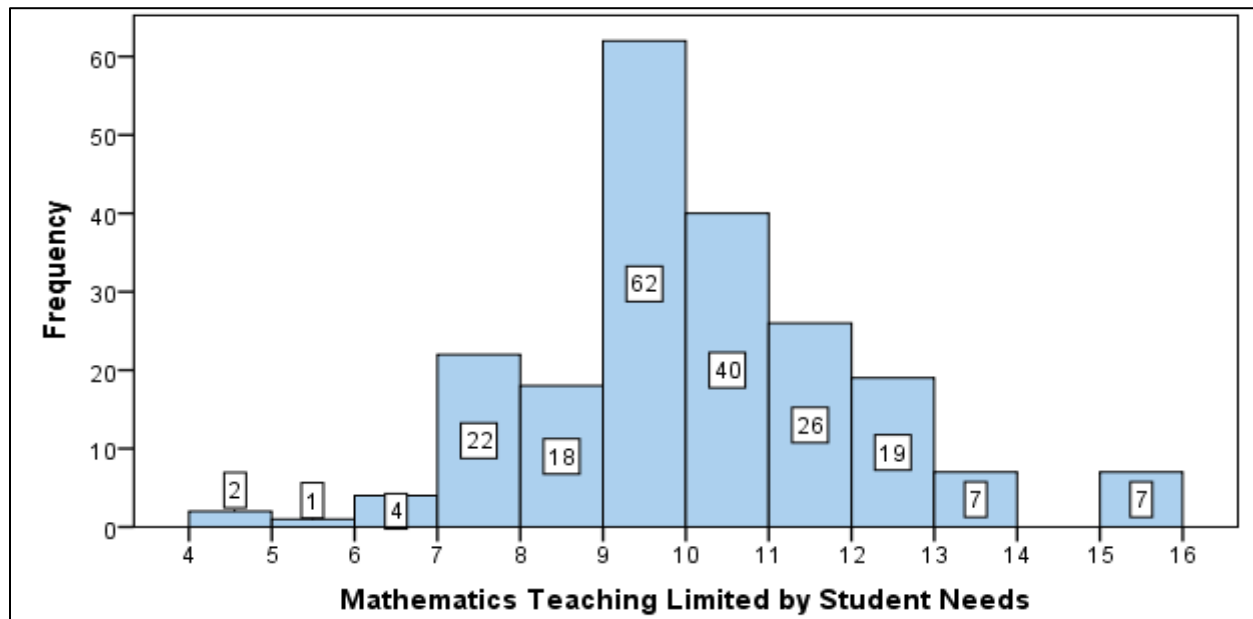
9.9 Teaching limitations caused by students' needs

A scale score measuring teaching limitations in Mathematics caused by students' needs was generated by using the mathematics teachers' responses on six items related to students' needs, which are displayed in Table 9.16. Students with teachers who felt 'Not Limited' by student needs had a score on the scale of at least 11.4, which corresponds to their teachers feeling 'not at all' limited by three of the six needs and to 'some' extent limited by the other three needs, on average. Students with teachers who felt 'Very Limited' by student needs had a score no higher than 7.4, which corresponds to their teachers reporting feeling limited 'a lot' by three of the six needs and to 'some' extent limited by the other three needs, on average. All other students who scored between 7.4 and 11.4 had teachers who felt 'Somewhat Limited' by student needs.

Table 9.16: Mathematics teaching limited by Student Needs (reported by Maltese teachers)

In your view, to what extent do the following limit how you teach this class?	Not at all	Some	A lot
Students lacking prerequisite knowledge or skills	7.2%	54.3%	38.5%
Students suffering from lack of basic nutrition	73.1%	23.6%	3.4%
Students suffering from not enough sleep	46.6%	50.0%	3.4%
Disruptive students	24.0%	56.3%	19.7%
Uninterested students	17.3%	59.1%	23.6%
Students with mental, emotional, or psychological disabilities	42.8%	49.5%	7.7%

Figure 9.14: Score distribution of Mathematics teaching limitations caused by Maltese students' needs

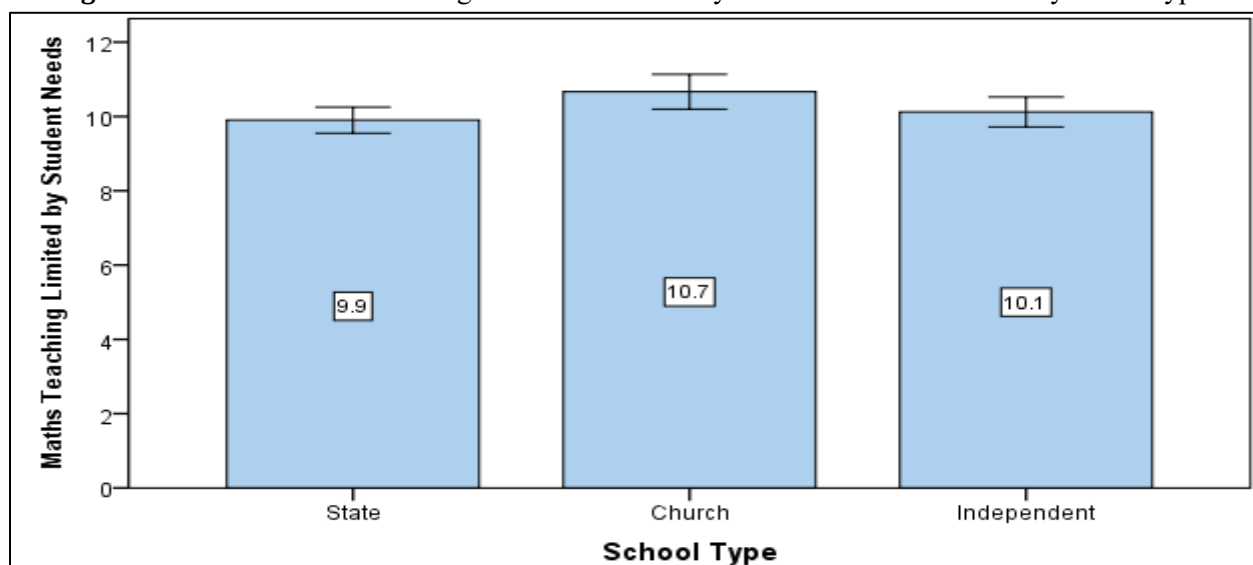


According to Mathematics teachers, there are larger proportions of Maltese students who lack considerably prerequisite skills and knowledge (38.5%), who are uninterested (23.6%) and who are very disruptive (19.7%) compared to other needs – lack of basic nutrition (3.4%), lack of sleep (3.4%) and mental/emotional/psychological disability (7.7%). Figure 9.14 shows the score distribution of Mathematics teaching limitations caused by Maltese students' needs.

Figure 9.15: Mathematics teaching limitations caused by students' needs clustered by country

Country	Not Limited		Somewhat Limited		Very Limited		Average Scale Score
	Percent of Students	Average Achievement	Percent of Students	Average Achievement	Percent of Students	Average Achievement	
Japan	76 (3.1)	593 (2.6)	24 (3.1)	568 (4.1)	0 (0.0)	~ ~	12.5 (0.13)
Slovenia	53 (2.8)	528 (3.3)	43 (2.7)	503 (3.3)	3 (1.2)	510 (10.9)	11.3 (0.14)
Hungary	42 (3.5)	551 (4.7)	48 (3.5)	492 (5.1)	9 (2.3)	463 (17.3)	10.6 (0.15)
England	41 (4.0)	557 (7.0)	54 (4.1)	493 (6.4)	5 (1.6)	455 (14.5)	10.8 (0.17)
Kazakhstan	41 (4.2)	528 (8.0)	49 (3.9)	531 (7.6)	11 (2.5)	514 (16.4)	10.6 (0.21)
Ireland	41 (3.1)	546 (3.3)	53 (3.2)	514 (4.1)	6 (1.4)	449 (16.3)	10.7 (0.11)
Sweden	40 (3.7)	520 (3.8)	53 (3.7)	489 (3.9)	6 (2.1)	476 (9.2)	10.7 (0.18)
Singapore	38 (2.2)	646 (5.3)	58 (2.2)	606 (4.9)	4 (1.1)	576 (18.9)	10.7 (0.08)
Norway (9)	36 (4.2)	520 (4.2)	62 (4.2)	510 (2.9)	2 (1.0)	~ ~	10.7 (0.15)
United Arab Emirates	36 (2.0)	507 (4.8)	60 (2.1)	448 (3.5)	4 (0.9)	431 (18.8)	10.6 (0.08)
Hong Kong SAR	33 (4.4)	616 (5.9)	64 (4.7)	584 (6.7)	3 (1.5)	519 (52.0)	10.4 (0.14)
Malta	32 (0.1)	537 (1.9)	63 (0.1)	481 (1.4)	5 (0.1)	391 (4.8)	10.4 (0.01)
Lithuania	30 (3.8)	527 (7.9)	63 (4.0)	507 (3.2)	7 (1.8)	475 (9.6)	10.2 (0.14)
Israel	30 (2.6)	565 (6.3)	51 (3.5)	498 (6.7)	19 (2.2)	467 (11.3)	9.8 (0.11)
Qatar	29 (3.9)	498 (8.8)	59 (4.1)	419 (5.0)	11 (2.0)	392 (8.1)	10.2 (0.13)
Canada	29 (2.8)	552 (4.3)	63 (3.0)	524 (3.1)	8 (1.8)	500 (8.4)	10.2 (0.11)
New Zealand	29 (2.5)	540 (5.2)	67 (2.4)	477 (4.9)	5 (1.0)	433 (16.9)	10.3 (0.12)
Malaysia	29 (3.4)	506 (7.7)	60 (4.1)	458 (5.1)	12 (2.5)	413 (10.7)	9.9 (0.14)
Australia	28 (2.3)	563 (5.7)	64 (2.3)	493 (3.4)	8 (1.4)	458 (9.2)	10.3 (0.10)
Lebanon	27 (3.6)	436 (7.0)	68 (3.7)	442 (5.1)	5 (1.7)	466 (17.0)	10.2 (0.17)
Russian Federation	26 (4.2)	545 (7.8)	62 (4.4)	538 (5.8)	12 (2.3)	519 (8.9)	10.0 (0.18)
Korea, Rep. of	24 (3.2)	620 (6.3)	67 (3.2)	603 (2.8)	8 (2.2)	583 (9.7)	9.9 (0.16)
United States	23 (2.6)	553 (6.7)	68 (2.7)	512 (3.8)	8 (1.7)	471 (10.1)	9.9 (0.12)
Chinese Taipei	23 (3.4)	629 (8.0)	63 (3.9)	596 (2.8)	14 (2.5)	567 (10.2)	9.7 (0.15)
Italy	22 (3.4)	509 (5.2)	69 (3.6)	490 (3.2)	9 (2.3)	486 (11.7)	9.9 (0.14)
Oman	21 (2.8)	426 (6.9)	56 (3.4)	399 (3.5)	24 (2.6)	394 (5.8)	9.2 (0.12)
Georgia	20 (3.4)	460 (7.7)	75 (3.6)	454 (3.8)	5 (1.7)	415 (9.2)	9.8 (0.12)
Bahrain	18 (3.9)	481 (7.5)	68 (4.5)	450 (2.7)	14 (2.7)	446 (5.1)	9.6 (0.13)
Thailand	17 (3.1)	481 (14.0)	78 (3.6)	422 (4.4)	5 (1.8)	408 (23.5)	9.9 (0.12)
Kuwait	15 (3.2)	437 (16.8)	71 (3.8)	387 (6.3)	15 (2.7)	374 (6.9)	9.4 (0.14)
Botswana (9)	14 (3.3)	398 (7.3)	72 (3.9)	392 (2.6)	14 (3.3)	380 (7.9)	9.3 (0.15)
South Africa (9)	14 (2.8)	371 (16.1)	70 (3.8)	376 (5.5)	17 (2.8)	356 (9.9)	9.2 (0.13)
Chile	12 (2.8)	487 (9.9)	63 (4.4)	429 (5.0)	25 (4.1)	399 (6.2)	8.9 (0.18)
Jordan	11 (2.3)	404 (9.5)	70 (3.6)	389 (4.1)	19 (3.0)	367 (7.4)	9.1 (0.11)
Saudi Arabia	9 (2.4)	425 (18.8)	80 (3.7)	365 (4.4)	11 (3.2)	336 (11.8)	9.1 (0.13)
Egypt	8 (1.6)	409 (18.6)	76 (3.2)	393 (4.6)	17 (3.0)	378 (9.1)	9.1 (0.11)
Iran, Islamic Rep. of	7 (1.6)	504 (18.5)	62 (3.1)	436 (5.0)	31 (2.9)	425 (6.5)	8.5 (0.12)
Morocco	6 (1.5)	394 (12.7)	63 (3.2)	384 (2.8)	31 (3.0)	383 (4.2)	8.5 (0.09)
Turkey	5 (1.4)	527 (17.8)	70 (2.8)	462 (5.6)	25 (2.8)	433 (7.7)	8.7 (0.11)
International Avg.	27 (0.5)	510 (1.5)	62 (0.6)	475 (0.7)	11 (0.4)	446 (2.4)	

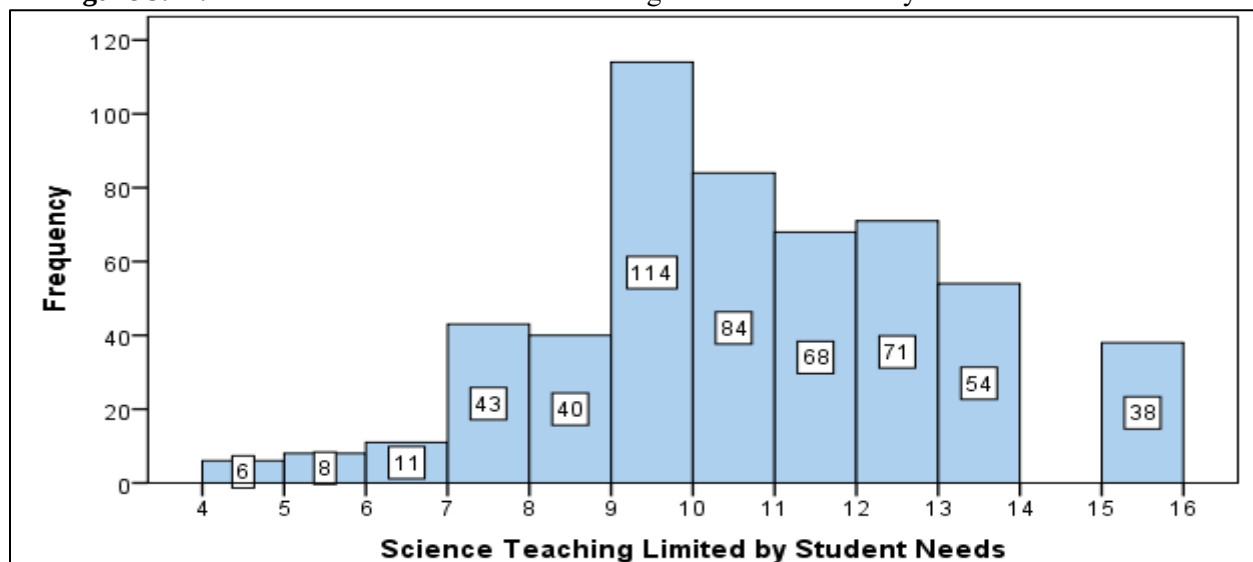
Figure 9.15 shows that the proportion of Maltese mathematics teachers who feel 'Not Limited' by students' needs (32%) is larger than the international average (27%); whereas the proportion of Maltese mathematics teachers who feel 'Very Limited' by students' needs (5%) is smaller than the international average (11%). There is a very strong relationship between teaching limitations caused by students' needs and attainment in Mathematics, where the larger the limitations the lower the attainment. Figure 9.16 shows that state school teachers feel significantly more limited in teaching Mathematics than church school teachers.

Figure 9.16: Mathematics teaching limitations caused by students' needs clustered by school type

A similar scale score was generated to measure the teaching limitations in Science caused by students' needs, using the science teachers' responses on six items displayed in Table 9.17.

Table 9.17: Science teaching limited by Student Needs (reported by Maltese teachers)

In your view, to what extent do the following limit how you teach this class?	Not at all	Some	A lot
Students lacking prerequisite knowledge or skills	15.3%	61.6%	23.1%
Students suffering from lack of basic nutrition	79.9%	15.8%	4.3%
Students suffering from not enough sleep	50.1%	41.3%	8.6%
Disruptive students	39.4%	40.5%	20.1%
Uninterested students	25.3%	50.7%	24.0%
Students with mental, emotional, or psychological disabilities	53.7%	39.7%	6.5%

Figure 9.17: Score distribution of Science teaching limitations caused by Maltese students' needs

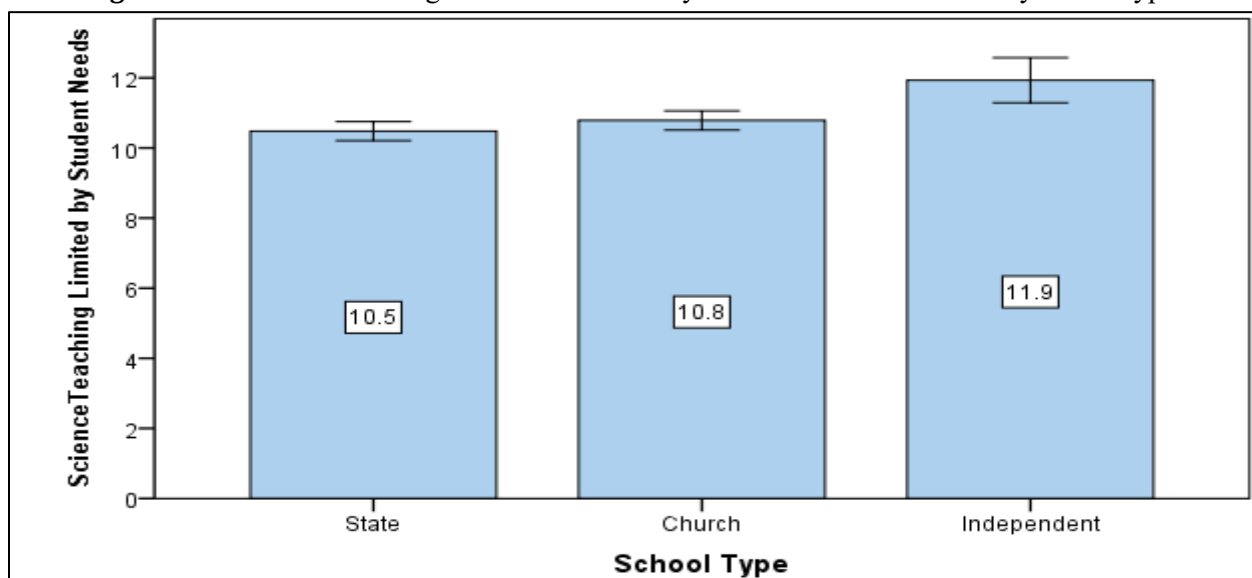
According to Science teachers, there are larger proportions of Maltese students who lack considerably prerequisite skills and knowledge (23.1%), who are uninterested (20.1%) and who are very disruptive (24.0%) compared to other needs – lack of basic nutrition (4.3%), lack of sleep (8.6%) and mental/emotional/psychological disability (6.5%). Figure 9.17 shows the score distribution of Science teaching limitations caused by Maltese students' needs.

Figure 9.18: Science teaching limitations caused by students' needs clustered by country

Country	Not Limited		Somewhat Limited		Very Limited		Average Scale Score
	Percent of Students	Average Achievement	Percent of Students	Average Achievement	Percent of Students	Average Achievement	
Japan	76 (3.4)	575 (2.1)	24 (3.4)	558 (3.0)	0 (0.0)	~ ~	12.5 (0.15)
Slovenia	46 (2.3)	558 (3.1)	50 (2.3)	546 (2.8)	4 (0.9)	543 (6.5)	11.0 (0.10)
Norway (9)	45 (4.0)	519 (4.5)	52 (4.0)	504 (3.2)	3 (1.2)	475 (10.2)	10.8 (0.14)
Singapore	44 (2.7)	629 (4.1)	55 (2.6)	572 (5.8)	1 (0.5)	~ ~	11.0 (0.09)
Hungary	42 (2.5)	551 (3.3)	50 (2.2)	512 (3.9)	8 (1.6)	481 (11.0)	10.8 (0.13)
England	42 (3.0)	575 (4.4)	54 (2.9)	517 (5.3)	5 (1.0)	466 (17.1)	10.7 (0.14)
Ireland	41 (3.2)	546 (3.4)	54 (3.3)	533 (3.7)	5 (1.3)	485 (12.9)	10.7 (0.11)
Kazakhstan	41 (3.1)	542 (6.2)	51 (2.8)	526 (5.1)	8 (1.4)	529 (14.1)	10.6 (0.16)
United Arab Emirates	41 (2.4)	514 (4.6)	55 (2.4)	454 (4.2)	4 (0.9)	443 (19.8)	10.8 (0.09)
Malta	40 (0.5)	506 (2.4)	52 (0.5)	468 (1.9)	8 (0.2)	423 (4.7)	10.6 (0.02)
Hong Kong SAR	38 (5.0)	565 (5.5)	58 (4.9)	533 (5.3)	4 (1.7)	531 (31.3)	10.6 (0.17)
New Zealand	37 (2.9)	552 (5.5)	58 (3.1)	502 (4.7)	5 (1.4)	419 (18.7)	10.5 (0.10)
Sweden	35 (3.6)	537 (5.3)	62 (3.5)	516 (4.3)	3 (1.1)	489 (17.3)	10.6 (0.15)
Australia	33 (3.1)	540 (5.1)	61 (3.0)	507 (3.3)	6 (1.5)	467 (10.9)	10.5 (0.15)
Russian Federation	30 (2.3)	554 (6.3)	59 (2.9)	540 (4.7)	10 (1.4)	540 (6.2)	10.0 (0.08)
Canada	30 (3.4)	541 (5.2)	64 (3.9)	523 (3.0)	7 (1.6)	505 (7.9)	10.1 (0.13)
Chinese Taipei	30 (3.4)	593 (4.7)	60 (3.8)	562 (2.7)	10 (2.3)	547 (7.3)	10.0 (0.15)
Lebanon	29 (3.9)	393 (8.3)	67 (4.0)	399 (6.8)	4 (1.1)	415 (25.6)	10.1 (0.12)
Lithuania	26 (2.3)	536 (4.4)	63 (2.3)	516 (3.1)	10 (1.3)	496 (6.2)	10.0 (0.10)
Israel	25 (2.5)	553 (9.9)	57 (3.2)	503 (5.5)	18 (2.4)	462 (9.9)	9.7 (0.12)
Qatar	25 (3.0)	506 (6.2)	67 (3.3)	444 (5.5)	8 (2.0)	398 (15.8)	10.1 (0.11)
Italy	24 (3.4)	508 (6.1)	65 (3.9)	495 (3.2)	11 (2.4)	495 (11.2)	10.0 (0.13)
Oman	22 (3.0)	473 (5.0)	58 (3.5)	454 (4.0)	20 (2.1)	439 (6.9)	9.6 (0.13)
Korea, Rep. of	22 (3.6)	561 (5.2)	64 (3.7)	555 (2.5)	14 (2.5)	548 (4.0)	9.8 (0.17)
Thailand	21 (3.1)	485 (8.0)	74 (2.9)	450 (5.1)	5 (1.8)	424 (17.0)	10.0 (0.12)
Malaysia	20 (2.6)	522 (7.0)	72 (3.0)	460 (5.5)	8 (2.1)	414 (21.6)	9.8 (0.11)
Georgia	19 (1.5)	453 (4.1)	76 (1.7)	442 (3.4)	6 (1.1)	438 (7.0)	9.8 (0.07)
Saudi Arabia	19 (3.2)	420 (13.9)	71 (3.9)	390 (5.2)	10 (2.5)	396 (9.2)	9.5 (0.13)
United States	18 (2.2)	556 (6.6)	74 (2.4)	532 (3.4)	9 (1.5)	493 (13.7)	9.7 (0.10)
Kuwait	18 (2.5)	426 (15.6)	75 (3.1)	406 (6.4)	8 (2.0)	400 (10.4)	9.8 (0.12)
Bahrain	15 (2.0)	503 (11.8)	73 (3.0)	458 (3.3)	12 (2.4)	453 (8.2)	9.6 (0.10)
Egypt	14 (2.6)	382 (12.0)	71 (3.6)	372 (5.1)	15 (2.6)	353 (14.4)	9.3 (0.12)
Iran, Islamic Rep. of	13 (2.3)	490 (12.4)	65 (3.7)	456 (4.8)	22 (2.9)	440 (7.6)	9.0 (0.12)
Chile	12 (2.8)	502 (12.7)	67 (4.5)	462 (4.5)	21 (3.7)	413 (5.5)	8.9 (0.14)
Jordan	12 (2.4)	469 (9.6)	76 (3.4)	424 (3.7)	12 (2.4)	400 (9.9)	9.4 (0.11)
Botswana (9)	11 (2.7)	413 (12.1)	79 (3.7)	392 (3.4)	9 (2.7)	382 (8.4)	9.4 (0.12)
South Africa (9)	11 (2.0)	410 (24.2)	72 (3.0)	353 (7.0)	17 (2.5)	346 (11.3)	9.2 (0.10)
Turkey	11 (2.2)	542 (11.3)	64 (3.5)	497 (4.8)	25 (2.8)	462 (6.4)	8.9 (0.12)
Morocco	8 (1.1)	425 (8.7)	68 (2.1)	393 (2.8)	24 (2.0)	384 (3.2)	8.8 (0.07)
International Avg.	28 (0.5)	511 (1.4)	62 (0.5)	480 (0.7)	10 (0.3)	454 (2.2)	

Figure 9.18 shows that the proportion of Maltese science teachers who feel ‘Not Limited’ by students’ needs (40%) is larger than the international average (28%); whereas the proportion of Maltese science teachers who feel ‘Very Limited’ by students’ needs (8%) is smaller than the international average (10%). There is a very strong relationship between teaching limitations caused by students’ needs and attainment in Science, where the larger the limitations the lower the attainment. Figure 9.19 shows that state school and church school teachers feel significantly more limited in teaching Science than independent school teachers.

Figure 9.19: Science teaching limitations caused by students’ needs clustered by school type



9.10 Duration to complete Mathematics and Science Homework

Table 9.18: Frequency of homework given by Maltese teachers for each subject

How often does your teacher give you homework in each of the following subjects?	Everyday	3-4 times a week	1-2 times a week	Less than once a week	Never
Mathematics	72.6%	19.9%	4.0%	1.8%	1.6%
Biology	3.5%	10.2%	28.0%	22.4%	35.8%
Geography	6.5%	7.2%	27.3%	34.3%	24.6%
Chemistry	3.6%	8.9%	21.5%	16.5%	49.5%
Physics	6.2%	20.7%	38.7%	25.2%	9.2%

Table 9.19: Duration of homework given by Maltese teachers for each subject

How many minutes do you usually spend on your homework?	No homework	1-15 minutes	16-30 minutes	31-60 minutes	61-90 minutes	More than 90 minutes
Mathematics	2.4%	32.0%	43.3%	16.4%	3.9%	2.0%
Biology	6.9%	18.0%	35.4%	27.2%	7.9%	4.5%
Geography	8.3%	49.4%	26.2%	10.6%	3.3%	2.1%
Chemistry	10.8%	17.7%	36.4%	24.7%	6.4%	4.0%
Physics	3.3%	26.9%	39.9%	22.4%	5.1%	2.4%

The weekly time spent on homework was calculated by multiplying the weekly frequency of homework and the duration to complete it. The frequency was set 0 for 'Never', 0.5 for 'Less than once weekly', 1.5 for '1-2 times weekly', 3.5 for '3-4 times weekly' and 5 for 'Everyday'. The duration was set to 0 for 'Never', 8 for '1-15 minutes', 23 for '16-30 minutes', 45 for '31-60 minutes', 75 for '61-90 minutes' and 105 for 'More than 90 minutes'. For example, the weekly time spent on homework, of a particular subject, which is given daily and requires 16-30 minutes to complete it is $5 \times 23 = 115$ minutes. Tables 9.18 and 9.19 show the weekly frequency of homework given by Maltese teachers for each subject and the duration to complete it. It is evident that Mathematics homework is more prevalent than Science homework.

Figure 9.20: Duration to complete Mathematics Homework and Attainment in Mathematics

Country	3 Hours or More		More than 45 Minutes but Less than 3 Hours		45 Minutes or Less	
	Percent of Students	Average Achievement	Percent of Students	Average Achievement	Percent of Students	Average Achievement
Russian Federation	43 (1.3)	532 (4.7)	43 (1.1)	543 (4.7)	14 (0.9)	543 (7.4)
Kazakhstan	41 (1.2)	536 (6.3)	40 (0.9)	531 (5.9)	19 (1.0)	509 (7.7)
South Africa (9)	34 (1.1)	382 (5.0)	38 (0.8)	389 (5.3)	28 (0.9)	348 (5.0)
Georgia	28 (1.3)	470 (5.5)	39 (1.1)	470 (4.0)	32 (1.2)	435 (4.5)
Italy	23 (1.0)	488 (3.6)	54 (1.0)	502 (2.8)	23 (1.1)	486 (4.4)
Thailand	23 (1.2)	454 (5.1)	49 (1.0)	439 (5.0)	28 (1.4)	402 (5.3)
Singapore	22 (0.8)	633 (3.1)	55 (0.9)	631 (3.0)	23 (0.9)	586 (5.7)
Botswana (9)	22 (0.9)	397 (3.3)	39 (0.7)	410 (2.4)	39 (1.1)	376 (2.7)
Slovenia	21 (1.2)	505 (4.0)	44 (1.1)	518 (2.6)	35 (1.5)	524 (2.9)
Hong Kong SAR	21 (1.4)	596 (4.7)	45 (1.6)	604 (4.6)	34 (1.8)	582 (7.0)
Israel	20 (1.2)	549 (4.1)	38 (0.9)	526 (3.8)	42 (1.4)	484 (5.6)
Canada	19 (1.0)	529 (3.1)	42 (1.1)	534 (2.4)	39 (1.4)	524 (2.7)
Lithuania	19 (1.1)	501 (5.3)	45 (1.2)	512 (3.6)	36 (1.4)	517 (3.5)
Ireland	19 (1.0)	531 (4.2)	49 (1.0)	533 (2.6)	32 (1.2)	507 (4.5)
Malta	18 (0.6)	513 (2.8)	44 (0.8)	516 (1.8)	38 (0.7)	472 (2.2)
United States	18 (1.0)	547 (5.0)	36 (0.9)	530 (3.2)	46 (1.5)	502 (3.2)
Malaysia	17 (0.7)	467 (3.7)	51 (1.0)	478 (3.4)	31 (1.0)	452 (5.2)
Chinese Taipei	15 (1.1)	608 (6.0)	44 (1.0)	613 (2.7)	41 (1.4)	582 (3.4)
Lebanon	14 (1.0)	436 (5.4)	32 (1.3)	456 (4.8)	54 (1.5)	442 (4.0)
Iran, Islamic Rep. of	13 (0.6)	448 (7.0)	46 (0.9)	452 (4.8)	42 (1.1)	418 (4.8)
Turkey	12 (1.0)	453 (8.1)	42 (1.4)	470 (5.9)	46 (1.8)	454 (5.1)
Morocco	11 (0.5)	381 (4.0)	29 (0.7)	397 (3.0)	60 (0.8)	385 (2.3)
Hungary	11 (0.7)	513 (5.5)	38 (1.1)	523 (4.6)	51 (1.5)	510 (4.7)
Qatar	10 (0.6)	451 (6.3)	32 (0.9)	463 (4.1)	58 (0.8)	424 (3.3)
Egypt	10 (0.5)	380 (6.2)	24 (0.8)	406 (4.7)	66 (1.0)	397 (4.3)
United Arab Emirates	10 (0.5)	463 (4.9)	31 (0.8)	487 (3.2)	59 (1.0)	457 (2.3)
Australia	9 (0.8)	530 (5.6)	35 (1.2)	527 (3.4)	56 (1.6)	491 (3.7)
Norway (9)	9 (1.0)	492 (4.2)	50 (1.3)	514 (2.7)	41 (1.5)	515 (3.0)
Jordan	9 (0.5)	357 (5.6)	30 (0.8)	394 (3.4)	62 (0.8)	391 (3.5)
Bahrain	8 (0.6)	440 (7.3)	22 (0.8)	456 (3.9)	70 (1.0)	458 (1.7)
Saudi Arabia	7 (0.5)	335 (8.8)	17 (0.9)	374 (8.6)	76 (1.1)	372 (4.5)
Oman	6 (0.4)	380 (7.9)	17 (0.6)	405 (4.5)	78 (0.7)	408 (2.5)
Kuwait	6 (0.8)	375 (12.7)	18 (0.9)	404 (9.3)	76 (1.2)	392 (4.4)
Chile	4 (0.5)	425 (6.1)	28 (1.4)	432 (4.2)	67 (1.6)	428 (3.5)
New Zealand	4 (0.4)	500 (8.8)	28 (1.3)	517 (3.9)	68 (1.5)	485 (3.3)
Japan	3 (0.5)	588 (15.1)	25 (1.4)	583 (3.8)	72 (1.6)	592 (2.5)
Korea, Rep. of	3 (0.3)	604 (11.3)	16 (0.9)	600 (4.3)	81 (1.0)	607 (2.8)
Sweden	2 (0.3)	~ ~	19 (1.2)	486 (4.7)	80 (1.4)	508 (2.7)
England	1 (0.2)	~ ~	26 (1.1)	539 (5.0)	73 (1.2)	514 (4.3)
International Avg.	15 (0.1)	481 (1.1)	36 (0.2)	491 (0.7)	49 (0.2)	474 (0.7)

Figure 9.21: Duration to complete Science Homework and Attainment in Science

<i>Weekly Time Students Spend on Assigned Biology Homework</i>						
Biology	3 Hours or More		More than 45 Minutes but Less than 3 Hours		45 Minutes or Less	
Country	Percent of Students	Average Achievement	Percent of Students	Average Achievement	Percent of Students	Average Achievement
Kazakhstan	22 (1.1)	534 (6.1)	42 (1.0)	537 (5.2)	36 (1.2)	531 (5.0)
Russian Federation	11 (0.8)	534 (8.2)	35 (0.9)	536 (4.3)	54 (1.2)	553 (4.4)
Georgia	8 (0.7)	435 (6.8)	29 (1.2)	457 (4.8)	63 (1.6)	449 (3.3)
Lithuania	5 (0.4)	497 (8.0)	20 (1.0)	508 (3.9)	76 (1.2)	524 (3.0)
Morocco	3 (0.3)	376 (7.3)	20 (0.5)	390 (3.9)	77 (0.7)	401 (2.5)
Lebanon	3 (0.3)	385 (11.4)	16 (0.9)	394 (8.1)	81 (1.0)	405 (5.3)
Malta	3 (0.3)	490 (13.5)	20 (0.9)	529 (5.1)	78 (0.9)	490 (2.7)
Hungary	2 (0.2)	~ ~	14 (0.8)	510 (5.8)	84 (0.9)	533 (3.5)
Sweden	1 (0.2)	~ ~	16 (1.2)	518 (7.1)	83 (1.3)	528 (3.2)
Slovenia	1 (0.2)	~ ~	7 (0.7)	526 (5.8)	92 (0.8)	555 (2.4)
International Avg.	6 (0.2)	465 (3.4)	22 (0.3)	490 (1.8)	72 (0.3)	497 (1.2)
<i>Weekly Time Students Spend on Assigned Chemistry Homework</i>						
Chemistry	3 Hours or More		More than 45 Minutes but Less than 3 Hours		45 Minutes or Less	
Country	Percent of Students	Average Achievement	Percent of Students	Average Achievement	Percent of Students	Average Achievement
Kazakhstan	28 (1.3)	536 (6.1)	42 (1.1)	539 (4.8)	30 (1.0)	527 (5.3)
Russian Federation	19 (0.9)	538 (6.2)	45 (1.0)	544 (4.7)	36 (1.3)	550 (4.4)
Georgia	12 (0.8)	438 (5.7)	34 (1.1)	457 (3.9)	54 (1.4)	449 (4.0)
Lithuania	10 (0.8)	498 (5.9)	31 (1.1)	511 (3.8)	59 (1.5)	528 (3.1)
Morocco	4 (0.3)	378 (6.8)	20 (0.6)	389 (3.7)	76 (0.6)	400 (2.6)
Lebanon	3 (0.4)	370 (12.2)	20 (0.9)	399 (7.0)	77 (1.0)	404 (5.4)
Hungary	3 (0.3)	502 (8.4)	17 (1.0)	519 (4.7)	80 (1.2)	532 (3.6)
Slovenia	3 (0.4)	522 (9.0)	14 (1.0)	537 (4.6)	84 (1.2)	556 (2.5)
Malta	2 (0.3)	~ ~	15 (0.8)	567 (4.8)	82 (0.8)	486 (2.7)
Sweden	1 (0.4)	~ ~	16 (1.1)	517 (6.4)	83 (1.4)	529 (3.4)
International Avg.	9 (0.2)	473 (2.8)	25 (0.3)	498 (1.6)	66 (0.4)	496 (1.2)
<i>Weekly Time Students Spend on Assigned Physics Homework</i>						
Physics	3 Hours or More		More than 45 Minutes but Less than 3 Hours		45 Minutes or Less	
Country	Percent of Students	Average Achievement	Percent of Students	Average Achievement	Percent of Students	Average Achievement
Kazakhstan	28 (1.2)	537 (6.5)	41 (1.0)	539 (4.5)	31 (0.9)	526 (5.7)
Russian Federation	18 (1.1)	535 (7.0)	44 (0.7)	545 (4.5)	38 (1.4)	549 (4.0)
Georgia	15 (0.7)	451 (4.5)	36 (1.0)	455 (4.5)	49 (1.3)	444 (3.9)
Lithuania	10 (0.9)	502 (5.7)	29 (1.3)	514 (4.6)	61 (1.8)	526 (3.1)
Slovenia	5 (0.5)	522 (7.4)	20 (1.2)	541 (4.4)	75 (1.5)	558 (2.4)
Morocco	4 (0.2)	374 (6.6)	21 (0.6)	393 (3.5)	75 (0.6)	400 (2.5)
Malta	4 (0.3)	455 (9.1)	27 (0.8)	499 (3.5)	70 (0.9)	485 (2.0)
Lebanon	4 (0.4)	369 (15.3)	20 (1.0)	397 (6.9)	76 (1.1)	405 (5.4)
Hungary	3 (0.3)	492 (8.2)	16 (1.0)	511 (6.0)	81 (1.2)	533 (3.4)
Sweden	1 (0.2)	~ ~	16 (1.1)	516 (6.4)	83 (1.1)	529 (3.3)
International Avg.	9 (0.2)	471 (2.8)	27 (0.3)	491 (1.6)	64 (0.4)	495 (1.2)
<i>Weekly Time Students Spend on Assigned Earth Science Homework</i>						
Earth Science	3 Hours or More		More than 45 Minutes but Less than 3 Hours		45 Minutes or Less	
Country	Percent of Students	Average Achievement	Percent of Students	Average Achievement	Percent of Students	Average Achievement
Kazakhstan	22 (1.2)	531 (5.6)	39 (1.0)	538 (5.2)	39 (1.1)	533 (5.1)
Russian Federation	10 (0.6)	532 (7.3)	33 (1.1)	536 (4.7)	57 (1.3)	553 (4.4)
Lithuania	8 (0.6)	516 (6.1)	28 (1.0)	514 (3.6)	64 (1.3)	523 (3.2)
Georgia	8 (0.7)	438 (7.0)	24 (0.9)	450 (4.0)	68 (1.2)	452 (3.7)
Morocco	4 (0.3)	376 (7.6)	20 (0.5)	392 (3.6)	77 (0.6)	401 (2.5)
Hungary	2 (0.3)	~ ~	15 (1.0)	513 (6.1)	83 (1.1)	532 (3.5)
Malta	2 (0.3)	~ ~	9 (0.5)	475 (6.0)	89 (0.6)	482 (1.9)
Slovenia	1 (0.2)	~ ~	6 (0.7)	528 (6.3)	93 (0.8)	554 (2.5)
Lebanon	--	--	--	--	--	--
Sweden	--	--	--	--	--	--
International Avg.	7 (0.2)	479 (3.0)	22 (0.3)	493 (1.8)	71 (0.4)	504 (1.2)

Compared to international averages, Figures 9.20 and 9.21 show that Maltese teachers tend to give more homework in Mathematics but less homework in Biology, Chemistry, Physics and Geography. Attainment in Mathematics and Science is not related to the time spent on homework.

Table 9.20: Weekly time spent on Mathematics homework clustered by school type

			School Type		
			State	Church	Independent
Weekly Time Spent on Mathematics Homework	3 Hours or More	Count	267	338	50
		Percentage	14.6%	24.6%	13.1%
	More than 45 minutes but Less than 3 Hours	Count	728	672	183
		Percentage	39.7%	48.9%	47.8%
	45 Minutes or Less	Count	838	364	150
		Percentage	45.7%	26.5%	39.2%

$$\chi^2(4) = 143.36, p < 0.001$$

Table 9.21: Weekly time spent on Biology homework clustered by school type

			School Type		
			State	Church	Independent
Weekly Time Spent on Biology Homework	3 Hours or More	Count	18	42	0
		Percentage	1.7%	4.3%	0.0%
	More than 45 minutes but Less than 3 Hours	Count	135	258	62
		Percentage	13.1%	26.4%	22.1%
	45 Minutes or Less	Count	881	677	219
		Percentage	85.2%	69.3%	77.9%

$$\chi^2(4) = 83.25, p < 0.001$$

Table 9.22: Weekly time spent on Chemistry homework clustered by school type

			School Type		
			State	Church	Independent
Weekly Time Spent on Chemistry Homework	3 Hours or More	Count	25	16	2
		Percentage	2.6%	2.0%	0.8%
	More than 45 minutes but Less than 3 Hours	Count	100	166	43
		Percentage	10.4%	21.0%	17.8%
	45 Minutes or Less	Count	838	609	197
		Percentage	87.0%	77.0%	81.4%

$$\chi^2(4) = 40.71, p < 0.001$$

Table 9.23: Weekly time spent on Physics homework clustered by school type

			School Type		
			State	Church	Independent
Weekly Time Spent on Physics Homework	3 Hours or More	Count	73	47	4
		Percentage	4.0%	3.9%	1.2%
	More than 45 minutes but Less than 3 Hours	Count	432	386	82
		Percentage	23.8%	31.8%	24.4%
	45 Minutes or Less	Count	1311	782	250
		Percentage	72.2%	64.4%	74.4%

$$\chi^2(4) = 32.10, p < 0.001$$

Table 9.24: Weekly time spent on Geography homework clustered by school type

			School Type		
			State	Church	Independent
Weekly Time Spent on Geography Homework	3 Hours or More	Count	35	12	3
		Percentage	2.0%	1.5%	1.3%
	More than 45 minutes but Less than 3 Hours	Count	172	59	31
		Percentage	9.9%	7.2%	13.7%
	45 Minutes or Less	Count	1526	751	193
		Percentage	88.1%	91.4%	85.0%

$\chi^2(4) = 11.55$, $p = 0.021$

Tables 9.20 to 9.24 show that church school teachers give significantly more homework in Mathematics, Biology, Chemistry, Physics but less in Geography compared to state and independent school teachers.

10

Attitudes to Mathematics and Science

10.1 Introduction

Engaging teaching and students' positive attitudes towards learning mathematics and science are essential for a good attainment in these subjects. To assess the extent of this positive attitude towards Mathematics and Science and how it affects achievement in these subjects, the questionnaire asked students to rate teaching engagement, their aptitude and enjoyment to learn, their confidence in Mathematics and Science and how much they value these subjects. Students' responses, which are summarised in this chapter, were used to generate a scale score for each latent variable and these scores are compared between all participating countries. Moreover these scores are compared between school types and gender groups for the local data.

10.2 Students' views in engaging teaching during lessons

To assess how much teachers engage students in teaching Mathematics and the sciences, a scale score was generated for each subject by using students' responses to how much they agreed with ten statements, displayed in Tables 10.1 to 10.5. The proportions of Maltese students agreeing a lot with the ten statements is almost always larger than the other three categories and this applies to all subjects; however, these evaluations are most positive for Biology and Chemistry and least positive for Geography.

Table 10.1: Engaging teaching in Mathematics lessons (Malta)

How much do you agree with these statements about your mathematics lessons?	Agree a lot	Agree a little	Disagree a little	Disagree a lot
I know what my teacher expects me to do	49.3%	38.6%	8.0%	4.2%
My teacher is easy to understand	42.9%	31.5%	17.4%	8.3%
I am interested in what my teacher says	39.1%	36.2%	17.4%	7.3%
My teacher gives me interesting things to do	24.9%	32.8%	28.5%	13.9%
My teacher has clear answers to my questions	43.7%	31.9%	15.9%	8.5%
My teacher is good at explaining mathematics	52.4%	26.4%	13.7%	7.5%
My teacher lets me show what I have learned	31.6%	34.8%	22.0%	11.6%
My teacher does a variety of things to help us learn	44.3%	30.0%	17.0%	8.6%
My teacher tells me how to do better when I make mistakes	53.3%	30.9%	10.4%	5.4%
My teacher listens to what I have to say	54.3%	27.5%	11.4%	6.8%

Two threshold values were computed for each subject, where students scoring below the lower threshold value experienced teaching that was less than engaging; students scoring between the two threshold values experienced engaging teaching and students scoring above the upper threshold value experienced very engaging teaching. The threshold values were 8.2 and 10.4 for Mathematics, 7.7 and 10.0 for Biology, 8.1 and 10.2 for Chemistry, 8.1 and 10.3 for Physics, 8.0 and 10.2 for Geography.

Table 10.2: Engaging teaching in Biology lessons (Malta)

How much do you agree with these statements about your biology lessons?	Agree a lot	Agree a little	Disagree a little	Disagree a lot
I know what my teacher expects me to do	60.2%	31.3%	6.1%	2.4%
My teacher is easy to understand	57.0%	24.8%	12.6%	5.6%
I am interested in what my teacher says	63.9%	23.6%	8.7%	3.8%
My teacher gives me interesting things to do	51.4%	28.4%	15.0%	5.3%
My teacher has clear answers to my questions	58.5%	24.4%	12.8%	4.2%
My teacher is good at explaining biology	64.5%	21.4%	9.5%	4.6%
My teacher lets me show what I have learned	45.3%	33.8%	15.8%	5.2%
My teacher does a variety of things to help us learn	55.7%	29.5%	10.7%	4.1%
My teacher tells me how to do better when I make mistakes	59.9%	27.2%	9.7%	3.3%
My teacher listens to what I have to say	63.5%	25.1%	7.6%	3.8%

Table 10.3: Engaging teaching in Chemistry lessons (Malta)

How much do you agree with these statements about your chemistry lessons?	Agree a lot	Agree a little	Disagree a little	Disagree a lot
I know what my teacher expects me to do	60.9%	27.9%	8.3%	2.9%
My teacher is easy to understand	52.1%	27.5%	13.2%	7.2%
I am interested in what my teacher says	59.5%	24.4%	10.4%	5.7%
My teacher gives me interesting things to do	50.6%	27.5%	13.9%	8.0%
My teacher has clear answers to my questions	56.8%	25.1%	12.3%	5.8%
My teacher is good at explaining chemistry	62.0%	20.6%	10.7%	6.7%
My teacher lets me show what I have learned	45.8%	28.5%	18.0%	7.6%
My teacher does a variety of things to help us learn	52.1%	28.4%	13.1%	6.4%
My teacher tells me how to do better when I make mistakes	59.8%	27.0%	9.1%	4.1%
My teacher listens to what I have to say	62.3%	24.7%	8.2%	4.8%

Table 10.4: Engaging teaching in Physics lessons (Malta)

How much do you agree with these statements about your physics lessons?	Agree a lot	Agree a little	Disagree a little	Disagree a lot
I know what my teacher expects me to do	55.1%	32.0%	7.9%	5.0%
My teacher is easy to understand	50.0%	29.8%	12.4%	7.8%
I am interested in what my teacher says	52.3%	28.5%	12.4%	6.8%
My teacher gives me interesting things to do	45.2%	29.9%	16.8%	8.1%
My teacher has clear answers to my questions	52.3%	27.8%	13.1%	6.8%
My teacher is good at explaining physics	56.4%	25.1%	10.7%	7.8%
My teacher lets me show what I have learned	40.9%	33.2%	17.0%	8.9%
My teacher does a variety of things to help us learn	51.6%	29.3%	12.1%	7.0%
My teacher tells me how to do better when I make mistakes	54.5%	30.6%	9.2%	5.8%
My teacher listens to what I have to say	57.8%	27.0%	9.0%	6.2%

Table 10.5: Engaging teaching in Geography lessons (Malta)

How much do you agree with these statements about your geography lessons?	Agree a lot	Agree a little	Disagree a little	Disagree a lot
I know what my teacher expects me to do	41.8%	33.7%	14.2%	10.4%
My teacher is easy to understand	42.5%	31.5%	14.6%	11.3%
I am interested in what my teacher says	38.5%	32.8%	16.6%	12.2%
My teacher gives me interesting things to do	30.0%	27.3%	25.1%	17.6%
My teacher has clear answers to my questions	43.1%	31.6%	14.7%	10.6%
My teacher is good at explaining geography	48.7%	30.9%	11.3%	9.1%
My teacher lets me show what I have learned	31.3%	29.4%	23.8%	15.5%
My teacher does a variety of things to help us learn	39.2%	28.4%	19.5%	12.9%
My teacher tells me how to do better when I make mistakes	39.6%	32.0%	17.0%	11.4%
My teacher listens to what I have to say	47.1%	30.1%	12.3%	10.6%

Figure 10.1: Engaging students in teaching during Mathematics lessons

Country	Very Engaging Teaching		Engaging Teaching		Less than Engaging Teaching		Average Scale Score
	Percent of Students	Average Achievement	Percent of Students	Average Achievement	Percent of Students	Average Achievement	
Jordan	68 (1.2)	394 (3.3)	25 (0.9)	377 (4.3)	7 (0.5)	361 (6.1)	11.1 (0.05)
Egypt	65 (1.4)	404 (4.1)	27 (1.0)	378 (5.9)	8 (0.6)	369 (8.0)	11.0 (0.07)
Lebanon	64 (1.6)	450 (3.7)	25 (1.2)	436 (5.3)	11 (0.9)	426 (6.1)	11.0 (0.08)
Morocco	62 (1.3)	390 (2.3)	29 (0.8)	376 (3.0)	10 (0.7)	384 (4.4)	10.7 (0.05)
South Africa (9)	61 (1.2)	378 (4.7)	31 (0.9)	367 (5.3)	8 (0.6)	376 (7.1)	10.7 (0.05)
Turkey	60 (1.4)	470 (5.1)	31 (1.0)	438 (5.4)	10 (0.8)	445 (8.1)	10.6 (0.06)
Botswana (9)	60 (1.4)	408 (1.8)	31 (0.9)	374 (3.5)	10 (0.9)	378 (6.3)	10.7 (0.06)
Oman	59 (1.2)	416 (2.7)	34 (1.0)	391 (3.1)	8 (0.5)	370 (5.5)	10.6 (0.04)
Iran, Islamic Rep. of	55 (1.6)	442 (4.8)	33 (1.0)	435 (5.3)	12 (0.9)	418 (7.1)	10.5 (0.07)
Georgia	52 (1.2)	467 (3.6)	40 (0.9)	444 (4.3)	8 (0.7)	425 (9.2)	10.6 (0.05)
Saudi Arabia	50 (1.7)	376 (4.8)	35 (1.1)	366 (5.5)	15 (1.0)	349 (6.4)	10.2 (0.07)
Kazakhstan	49 (1.7)	542 (5.6)	47 (1.6)	516 (6.2)	4 (0.4)	499 (8.4)	10.6 (0.06)
Kuwait	49 (1.6)	398 (5.3)	37 (1.1)	391 (5.5)	15 (1.0)	384 (9.3)	10.2 (0.06)
Chile	48 (1.8)	435 (3.9)	33 (1.0)	425 (3.7)	19 (1.5)	415 (5.6)	10.1 (0.09)
Canada	46 (1.2)	534 (2.2)	40 (0.7)	530 (2.5)	14 (1.0)	509 (3.9)	10.2 (0.05)
Israel	45 (1.3)	513 (5.3)	36 (0.8)	515 (4.2)	20 (0.9)	504 (4.9)	10.0 (0.06)
United Arab Emirates	45 (0.9)	484 (2.6)	41 (0.7)	455 (2.4)	14 (0.6)	438 (3.7)	10.2 (0.04)
Russian Federation	44 (1.2)	548 (5.5)	46 (1.1)	533 (4.7)	11 (0.8)	519 (5.6)	10.2 (0.05)
Qatar	43 (1.3)	459 (3.7)	37 (0.8)	432 (3.5)	19 (1.0)	406 (4.4)	10.0 (0.06)
Thailand	43 (1.1)	431 (4.8)	48 (0.9)	432 (5.1)	9 (0.6)	430 (9.4)	10.1 (0.04)
United States	43 (1.2)	530 (3.5)	36 (0.7)	515 (3.3)	21 (1.0)	504 (4.0)	10.0 (0.06)
Bahrain	42 (1.5)	466 (2.3)	37 (1.0)	452 (2.2)	21 (1.2)	438 (2.9)	9.9 (0.07)
Malta	41 (0.7)	505 (2.1)	37 (0.8)	496 (2.2)	22 (0.6)	478 (2.8)	9.8 (0.03)
Malaysia	40 (1.2)	472 (4.1)	50 (0.9)	466 (3.9)	11 (0.8)	438 (5.9)	10.0 (0.05)
Lithuania	39 (1.7)	523 (3.7)	45 (1.1)	505 (3.1)	17 (1.5)	502 (4.3)	9.9 (0.07)
England	38 (1.7)	532 (5.4)	42 (1.0)	518 (4.8)	20 (1.4)	501 (6.0)	9.8 (0.08)
Ireland	37 (1.4)	528 (3.3)	41 (1.0)	523 (3.4)	22 (1.1)	517 (3.8)	9.7 (0.06)
Hungary	34 (1.6)	530 (6.5)	46 (1.1)	507 (3.9)	20 (1.3)	505 (5.3)	9.6 (0.07)
Australia	34 (1.3)	521 (3.7)	42 (0.7)	506 (3.2)	24 (1.3)	485 (4.6)	9.5 (0.07)
Singapore	33 (1.0)	633 (3.6)	52 (0.8)	620 (3.4)	16 (0.8)	596 (6.3)	9.7 (0.04)
Norway (9)	33 (1.3)	526 (3.0)	44 (1.0)	510 (2.8)	23 (1.4)	496 (3.1)	9.5 (0.06)
New Zealand	32 (1.5)	506 (4.9)	44 (0.9)	495 (3.9)	24 (1.3)	475 (3.5)	9.5 (0.07)
Italy	31 (1.3)	500 (3.5)	50 (1.0)	495 (3.0)	19 (1.2)	482 (4.6)	9.6 (0.05)
Sweden	31 (1.6)	517 (3.5)	49 (1.2)	500 (3.0)	20 (1.5)	481 (4.1)	9.5 (0.07)
Hong Kong SAR	26 (1.3)	606 (4.9)	49 (0.9)	595 (4.3)	24 (1.5)	581 (8.1)	9.3 (0.08)
Chinese Taipei	23 (1.2)	629 (3.3)	52 (1.0)	602 (2.6)	25 (1.6)	565 (5.2)	9.2 (0.07)
Slovenia	20 (1.0)	538 (4.8)	59 (1.3)	515 (2.3)	21 (1.2)	500 (3.1)	9.2 (0.05)
Japan	10 (0.7)	610 (5.0)	50 (1.2)	594 (2.7)	40 (1.6)	572 (3.0)	8.5 (0.05)
Korea, Rep. of	8 (0.5)	642 (5.0)	52 (1.2)	614 (3.2)	40 (1.4)	589 (2.7)	8.4 (0.04)
International Avg.	43 (0.2)	494 (0.7)	41 (0.2)	478 (0.6)	17 (0.2)	464 (0.9)	

Figure 10.2: Engaging students in teaching during Science lessons

<i>Engaging Teaching in Biology</i>							
Biology	Very Engaging Teaching		Engaging Teaching		Less than Engaging Teaching		Average Scale Score
Country	Percent of Students	Average Achievement	Percent of Students	Average Achievement	Percent of Students	Average Achievement	
Morocco	65 (1.3)	399 (2.6)	26 (0.9)	387 (3.8)	9 (0.7)	395 (4.7)	10.5 (0.06)
Lebanon	65 (1.5)	417 (5.0)	25 (1.2)	389 (7.2)	10 (0.8)	371 (10.6)	10.7 (0.07)
Georgia	60 (1.2)	457 (3.2)	35 (1.0)	434 (4.3)	4 (0.5)	416 (9.8)	10.7 (0.05)
Malta	59 (1.4)	548 (3.0)	27 (1.3)	518 (5.8)	13 (1.0)	490 (7.2)	10.3 (0.06)
Russian Federation	53 (1.6)	547 (4.6)	39 (1.3)	543 (4.7)	8 (0.7)	539 (5.9)	10.2 (0.06)
Kazakhstan	53 (1.7)	543 (4.7)	44 (1.5)	524 (5.5)	3 (0.5)	516 (10.1)	10.4 (0.07)
Hungary	45 (1.4)	533 (4.2)	42 (1.1)	520 (3.9)	13 (1.0)	535 (7.7)	9.8 (0.06)
Lithuania	41 (1.5)	516 (4.0)	42 (1.0)	519 (2.7)	17 (1.4)	529 (5.5)	9.5 (0.08)
Sweden	30 (1.5)	534 (4.9)	49 (1.2)	527 (3.8)	21 (1.6)	513 (4.8)	9.1 (0.07)
Slovenia	25 (1.4)	555 (3.5)	54 (1.1)	551 (2.8)	21 (1.6)	551 (3.4)	9.0 (0.08)
International Avg.	50 (0.5)	505 (1.3)	38 (0.4)	491 (1.5)	12 (0.3)	485 (2.3)	
<i>Engaging Teaching in Chemistry</i>							
Chemistry	Very Engaging Teaching		Engaging Teaching		Less than Engaging Teaching		Average Scale Score
Country	Percent of Students	Average Achievement	Percent of Students	Average Achievement	Percent of Students	Average Achievement	
Lebanon	66 (1.7)	415 (4.7)	22 (1.1)	380 (8.1)	12 (1.2)	377 (11.8)	10.8 (0.09)
Morocco	60 (1.2)	401 (3.0)	29 (0.9)	389 (3.5)	11 (0.6)	389 (4.5)	10.5 (0.05)
Malta	55 (1.6)	578 (3.6)	29 (1.5)	558 (6.0)	16 (1.2)	542 (8.5)	10.4 (0.07)
Georgia	54 (1.5)	459 (3.7)	36 (1.3)	436 (4.0)	10 (0.9)	420 (6.4)	10.5 (0.06)
Russian Federation	50 (2.0)	552 (4.5)	36 (1.1)	541 (4.9)	14 (1.4)	527 (5.3)	10.2 (0.09)
Kazakhstan	49 (1.4)	547 (5.1)	46 (1.2)	523 (5.2)	5 (0.5)	514 (7.8)	10.4 (0.05)
Lithuania	41 (1.8)	525 (3.3)	36 (1.0)	512 (2.9)	23 (1.8)	520 (6.3)	9.7 (0.10)
Hungary	32 (1.4)	534 (5.3)	42 (1.1)	522 (3.9)	27 (1.4)	530 (4.6)	9.3 (0.07)
Sweden	27 (1.6)	536 (5.1)	49 (1.1)	529 (3.7)	23 (1.6)	513 (4.8)	9.3 (0.07)
Slovenia	26 (1.2)	570 (3.6)	52 (1.1)	551 (2.8)	22 (1.3)	534 (3.7)	9.3 (0.06)
International Avg.	46 (0.5)	512 (1.3)	38 (0.4)	494 (1.5)	16 (0.4)	487 (2.1)	
<i>Engaging Teaching in Physics</i>							
Physics	Very Engaging Teaching		Engaging Teaching		Less than Engaging Teaching		Average Scale Score
Country	Percent of Students	Average Achievement	Percent of Students	Average Achievement	Percent of Students	Average Achievement	
Lebanon	64 (1.6)	416 (4.7)	23 (0.9)	384 (7.3)	13 (1.2)	386 (12.0)	10.7 (0.08)
Morocco	61 (1.2)	402 (2.5)	29 (0.8)	385 (3.8)	11 (0.6)	395 (4.7)	10.6 (0.05)
Malta	51 (1.0)	513 (2.4)	32 (0.9)	487 (3.8)	17 (0.7)	454 (4.7)	10.2 (0.04)
Georgia	51 (1.3)	458 (3.2)	37 (0.9)	436 (4.9)	13 (1.3)	438 (5.7)	10.4 (0.07)
Russian Federation	49 (1.4)	553 (4.7)	39 (0.9)	541 (4.5)	12 (1.0)	524 (5.1)	10.3 (0.07)
Kazakhstan	48 (1.5)	548 (4.9)	48 (1.5)	523 (5.3)	5 (0.5)	518 (7.5)	10.4 (0.05)
Lithuania	36 (1.8)	530 (4.7)	39 (1.0)	513 (3.3)	25 (1.9)	512 (4.6)	9.6 (0.10)
Hungary	36 (1.6)	538 (4.5)	42 (1.1)	520 (4.1)	22 (1.4)	527 (5.4)	9.6 (0.07)
Sweden	28 (1.5)	535 (5.2)	49 (1.1)	529 (3.6)	23 (1.5)	513 (5.5)	9.4 (0.07)
Slovenia	21 (1.1)	568 (4.3)	51 (1.0)	549 (2.9)	28 (1.6)	544 (3.3)	9.0 (0.07)
International Avg.	44 (0.5)	506 (1.3)	39 (0.3)	487 (1.4)	17 (0.4)	481 (2.0)	
<i>Engaging Teaching in Earth Science</i>							
Earth Science	Very Engaging Teaching		Engaging Teaching		Less than Engaging Teaching		Average Scale Score
Country	Percent of Students	Average Achievement	Percent of Students	Average Achievement	Percent of Students	Average Achievement	
Morocco	61 (1.2)	400 (2.9)	30 (0.9)	388 (3.2)	10 (0.8)	393 (4.9)	10.5 (0.05)
Georgia	58 (1.2)	455 (3.6)	35 (1.1)	439 (3.9)	7 (0.5)	408 (9.1)	10.6 (0.05)
Kazakhstan	49 (1.4)	544 (4.7)	47 (1.3)	525 (5.7)	4 (0.4)	532 (11.2)	10.5 (0.05)
Russian Federation	48 (1.7)	546 (4.8)	40 (1.1)	546 (4.7)	12 (1.2)	536 (6.1)	10.2 (0.08)
Lithuania	46 (1.6)	526 (4.2)	37 (1.1)	513 (3.0)	17 (1.4)	516 (4.5)	9.9 (0.08)
Malta	36 (0.9)	492 (3.9)	37 (0.8)	477 (3.5)	27 (0.9)	465 (3.9)	9.4 (0.05)
Hungary	36 (1.6)	532 (4.8)	43 (1.0)	523 (4.0)	21 (1.6)	531 (5.2)	9.5 (0.08)
Slovenia	26 (1.4)	555 (4.1)	53 (1.0)	552 (2.7)	21 (1.6)	546 (3.3)	9.2 (0.08)
Lebanon	--	--	--	--	--	--	--
Sweden	--	--	--	--	--	--	--
International Avg.	45 (0.5)	506 (1.5)	40 (0.4)	496 (1.4)	15 (0.4)	491 (2.3)	

The proportions of Maltese students who experienced very engaging teaching in Biology (59%), Chemistry (55%) and Physics (51%) were higher than the international averages (50%, 46% and 44% respectively); while the proportions of Maltese students who experienced very engaging teaching in Mathematics (41%) and Geography (36%) were lower than the international averages (43% and 45% respectively). The scale scores that measures engaging teaching in Maltese schools exceed the international average in Chemistry (10.4), Biology (10.3) and Physics (10.2), but not in Mathematics (9.8) and Geography (9.4). Although there exists a positive relationship between students' attainment and the degree of engaging teaching, this relationship is rather weak.

Table 10.6: Engaging teaching in Mathematics and Science subjects clustered by school type

Engaging teaching in	School Type	Sample Size	Mean	Std. Deviation	P-value
Mathematics Lessons	State	1942	9.75	2.111	0.111
	Church	1419	9.90	2.061	
	Independent	403	9.83	2.002	
Biology Lessons	State	398	10.19	2.148	0.015
	Church	836	10.29	2.114	
	Independent	236	10.67	1.926	
Chemistry Lessons	State	234	10.54	2.197	0.356
	Church	513	10.31	2.006	
	Independent	149	10.31	2.153	
Physics Lessons	State	1672	10.04	2.147	0.000
	Church	1094	10.34	1.968	
	Independent	297	10.46	1.860	
Geography Lessons	State	1571	9.09	2.212	0.000
	Church	540	9.97	2.082	
	Independent	117	10.62	2.001	

Table 10.7: Engaging teaching in Mathematics and Science subjects clustered by gender

Engaging teaching in	Gender	Sample Size	Mean	Std. Deviation	P-value
Mathematics Lessons	Female	1871	9.71	2.087	0.002
	Male	1893	9.92	2.071	
Biology Lessons	Female	854	10.45	1.979	0.006
	Male	616	10.15	2.244	
Chemistry Lessons	Female	428	10.33	2.001	0.592
	Male	468	10.40	2.155	
Physics Lessons	Female	1481	10.05	2.076	0.001
	Male	1582	10.31	2.046	
Geography Lessons	Female	1069	9.15	2.111	0.000
	Male	1159	9.60	2.297	

Table 10.6 shows that the mean 'Engaging Teaching' scores of students attending independent schools are significantly higher in Biology, Physics and Geography; however mean engaging teaching scores in Mathematics and Chemistry do not differ significantly between the school types. Table 10.7 shows that the mean engaging teaching scores of male students are significantly higher in Mathematics, Physics and Earth Science. On the other hand, the mean engaging teaching score of female students is significantly higher in Biology, while the mean engaging teaching scores in Chemistry vary marginally between the two gender groups.

10.3 Students like learning Mathematics and Science subjects

To assess how much students like Mathematics and the Science subjects, a scale score was generated for each subject by using students' responses to how much they agreed with nine statements, displayed in Tables 10.8 to 10.12. Two threshold values were computed for each subject, where students scoring below the lower threshold value did not like learning the subject; students scoring between the two threshold values did like learning the subject and students scoring above the upper threshold value did like very much learning the subject. The threshold values were 9.4 and 11.4 for Mathematics, 8.3 and 10.7 for Biology, 9.0 and 11.1 for Chemistry, 8.9 and 11.0 for Physics, 8.6 and 10.9 for Geography.

Table 10.8: Maltese students like learning Mathematics

How much do you agree with these statements about learning mathematics?	Agree a lot	Agree a little	Disagree a little	Disagree a lot
I enjoy learning mathematics	27.5%	35.4%	21.4%	15.6%
I wish I did not have to study mathematics	25.7%	22.4%	23.9%	27.9%
Mathematics is boring	19.9%	30.7%	27.1%	22.4%
I learn many interesting things in mathematics	28.9%	38.1%	21.8%	11.1%
I like mathematics	27.4%	30.6%	21.5%	20.5%
I like any schoolwork that involves numbers	16.2%	28.1%	31.6%	24.1%
I like to solve mathematics problems	18.0%	25.0%	24.4%	32.5%
I look forward to mathematics class	17.2%	28.9%	29.2%	24.7%
Mathematics is one of my favourite subjects	22.5%	20.1%	22.8%	34.6%

Table 10.9: Maltese students like learning Biology

How much do you agree with these statements about learning biology?	Agree a lot	Agree a little	Disagree a little	Disagree a lot
I enjoy learning biology	60.5%	27.2%	7.4%	4.8%
I wish I did not have to study biology	9.4%	14.1%	24.9%	51.6%
Biology is boring	7.1%	13.5%	25.5%	53.9%
I learn many interesting things in biology	72.2%	21.0%	4.0%	2.7%
I like biology	63.9%	22.5%	8.4%	5.3%
I look forward to learning biology in school	55.5%	25.5%	13.4%	5.5%
Biology teaches me how things in the world work	62.9%	27.7%	6.6%	2.8%
I like to conduct biology experiments	61.3%	26.1%	8.1%	4.5%
Biology is one of my favourite subjects	52.0%	23.1%	15.4%	9.5%

Table 10.10: Maltese students like learning Chemistry

How much do you agree with these statements about learning chemistry?	Agree a lot	Agree a little	Disagree a little	Disagree a lot
I enjoy learning chemistry	55.1%	26.8%	9.7%	8.5%
I wish I did not have to study chemistry	13.4%	15.1%	23.4%	48.1%
Chemistry is boring	9.9%	16.5%	25.2%	48.4%
I learn many interesting things in chemistry	63.0%	25.5%	7.2%	4.4%
I like chemistry	57.5%	25.2%	9.6%	7.7%
I look forward to learning chemistry in school	50.1%	24.9%	14.7%	10.4%
Chemistry teaches me how things in the world work	61.4%	26.2%	7.8%	4.7%
I like to conduct chemistry experiments	72.7%	17.5%	5.2%	4.6%
Chemistry is one of my favourite subjects	52.4%	21.2%	14.7%	11.7%

Table 10.11: Maltese students like learning Physics

How much do you agree with these statements about learning physics?	Agree a lot	Agree a little	Disagree a little	Disagree a lot
I enjoy learning physics	41.5%	33.3%	14.6%	10.7%
I wish I did not have to study physics	18.7%	20.1%	27.0%	34.3%
Physics is boring	13.6%	20.8%	29.8%	35.9%
I learn many interesting things in physics	51.2%	31.2%	10.7%	6.9%
I like physics	41.2%	31.2%	14.8%	12.8%
I look forward to learning physics in school	36.7%	30.2%	19.6%	13.5%
Physics teaches me how things in the world work	54.1%	31.9%	7.8%	6.1%
I like to conduct physics experiments	53.8%	28.6%	9.8%	7.8%
Physics is one of my favourite subjects	33.3%	26.0%	21.5%	19.2%

Table 10.12: Maltese students like learning Geography

How much do you agree with these statements about learning earth science?	Agree a lot	Agree a little	Disagree a little	Disagree a lot
I enjoy learning geography	29.7%	35.7%	18.2%	16.3%
I wish I did not have to study geography	24.6%	24.6%	26.6%	24.1%
Geography is boring	20.5%	24.1%	28.4%	27.1%
I learn many interesting things in geography	39.2%	33.3%	16.5%	11.0%
I like geography	29.8%	31.4%	19.8%	18.9%
I look forward to learning geography in school	23.5%	29.0%	26.9%	20.6%
Geography teaches me how things in world work	40.4%	36.1%	13.1%	10.4%
I like to conduct geographyexperiments	22.3%	27.8%	25.2%	24.7%
Geography is one of my favourite subjects	18.4%	22.1%	25.5%	34.0%

Tables 10.8 to 10.12 show that students like to learn Biology, Chemistry and Physics more than Mathematics and Geography. Table 10.3 shows that the mean 'Like to Learn' scores of students attending independent schools are significantly higher in Mathematics, Biology, Physics and Geography while the mean 'Like to Learn' score of students attending state schools is significantly higher in Chemistry.

Table 10.13: Like Learning Mathematics and Science subjects clustered by school type

Like learning	School Type	Sample Size	Mean	Std. Deviation	P-value
Mathematics	State	1948	9.38	2.012	0.025
	Church	1423	9.53	2.064	
	Independent	403	9.63	2.017	
Biology	State	397	10.91	2.146	0.032
	Church	834	10.85	2.274	
	Independent	237	11.27	2.028	
Chemistry	State	237	11.46	2.221	0.024
	Church	513	11.01	2.229	
	Independent	150	11.31	2.115	
Physics	State	1699	9.99	2.108	0.000
	Church	1104	10.65	2.026	
	Independent	299	11.03	1.846	
Geography	State	1592	8.81	2.110	0.000
	Church	548	9.61	2.209	
	Independent	116	10.78	2.260	

Figure 10.3: Like to learn Mathematics clustered by country

Country	Very Much Like Learning Mathematics		Like Learning Mathematics		Do Not Like Learning Mathematics		Average Scale Score
	Percent of Students	Average Achievement	Percent of Students	Average Achievement	Percent of Students	Average Achievement	
Botswana (9)	50 (1.1)	416 (1.9)	38 (1.0)	373 (3.1)	12 (0.6)	377 (5.0)	11.4 (0.04)
Morocco	44 (0.8)	411 (2.5)	40 (0.6)	368 (3.1)	16 (0.6)	357 (2.4)	11.1 (0.03)
South Africa (9)	39 (1.2)	386 (4.7)	42 (0.8)	362 (4.9)	19 (1.0)	377 (6.3)	10.9 (0.05)
Oman	39 (1.0)	436 (3.1)	45 (0.8)	385 (2.6)	17 (0.7)	382 (3.6)	11.0 (0.04)
Egypt	39 (1.5)	429 (4.1)	42 (1.0)	369 (4.7)	20 (1.0)	378 (5.0)	10.9 (0.07)
Jordan	39 (1.0)	410 (3.6)	37 (0.8)	373 (4.0)	24 (0.8)	377 (4.2)	10.8 (0.05)
Kazakhstan	34 (1.3)	548 (5.9)	54 (1.1)	522 (5.9)	12 (0.8)	503 (6.3)	11.0 (0.05)
Iran, Islamic Rep. of	32 (1.1)	470 (6.1)	39 (0.9)	430 (4.8)	28 (1.1)	407 (4.3)	10.5 (0.05)
Lebanon	31 (1.3)	466 (4.5)	45 (1.5)	434 (4.7)	23 (1.4)	430 (4.6)	10.6 (0.06)
Malaysia	28 (1.0)	497 (4.1)	56 (0.7)	459 (3.9)	16 (0.8)	433 (4.9)	10.7 (0.04)
Turkey	28 (1.0)	495 (6.6)	42 (0.8)	445 (5.4)	30 (1.0)	443 (4.5)	10.3 (0.05)
Kuwait	26 (1.1)	413 (6.0)	38 (1.1)	392 (5.7)	36 (1.4)	379 (5.0)	10.0 (0.07)
United Arab Emirates	25 (0.7)	502 (3.0)	43 (0.6)	461 (2.3)	32 (0.8)	442 (2.6)	10.2 (0.04)
Singapore	24 (0.7)	654 (3.2)	42 (0.8)	625 (3.5)	33 (0.8)	592 (4.3)	10.1 (0.03)
Georgia	23 (1.2)	486 (4.8)	44 (1.0)	456 (4.4)	33 (1.3)	431 (4.2)	10.2 (0.06)
Saudi Arabia	21 (1.1)	396 (6.0)	37 (1.1)	370 (5.4)	42 (1.7)	354 (4.9)	9.8 (0.07)
Qatar	21 (0.8)	488 (4.8)	41 (0.8)	441 (3.9)	39 (0.9)	411 (2.9)	9.9 (0.04)
Bahrain	20 (0.9)	492 (3.5)	36 (1.0)	456 (2.7)	44 (1.4)	437 (2.1)	9.7 (0.06)
Canada	20 (0.8)	561 (2.6)	40 (0.9)	537 (2.4)	39 (1.1)	503 (2.3)	9.8 (0.05)
Thailand	20 (0.8)	466 (7.4)	58 (0.9)	425 (4.5)	23 (1.0)	418 (5.5)	10.3 (0.04)
Israel	19 (0.9)	524 (6.6)	36 (0.7)	517 (4.9)	44 (1.1)	502 (3.8)	9.6 (0.05)
Russian Federation	19 (1.0)	566 (6.8)	48 (0.7)	545 (5.1)	33 (1.1)	512 (4.6)	10.1 (0.04)
United States	17 (0.6)	554 (4.0)	36 (0.6)	528 (3.4)	47 (0.9)	499 (3.0)	9.5 (0.04)
Malta	17 (0.6)	536 (3.4)	34 (0.7)	500 (2.3)	49 (0.8)	478 (1.7)	9.5 (0.03)
Italy	17 (0.9)	537 (3.7)	32 (0.9)	506 (3.4)	51 (1.2)	473 (2.8)	9.4 (0.05)
Chile	16 (0.8)	466 (4.9)	34 (0.9)	435 (4.3)	50 (1.3)	410 (3.1)	9.5 (0.06)
Lithuania	15 (0.9)	553 (4.5)	41 (1.2)	515 (3.1)	43 (1.4)	493 (3.3)	9.7 (0.05)
Hong Kong SAR	15 (0.6)	638 (4.5)	39 (0.8)	605 (4.6)	46 (1.1)	572 (5.2)	9.5 (0.04)
New Zealand	14 (0.6)	534 (5.9)	40 (1.0)	501 (4.5)	46 (1.2)	476 (3.1)	9.6 (0.04)
England	14 (0.8)	559 (6.4)	39 (1.0)	532 (4.7)	48 (1.4)	498 (4.4)	9.5 (0.06)
Sweden	14 (1.3)	546 (4.7)	34 (1.2)	522 (3.4)	52 (1.5)	476 (2.9)	9.3 (0.06)
Ireland	14 (0.7)	562 (4.6)	35 (0.9)	537 (3.1)	52 (1.2)	505 (2.8)	9.3 (0.05)
Australia	13 (0.7)	551 (4.4)	36 (0.9)	522 (3.3)	50 (1.2)	482 (3.0)	9.4 (0.05)
Norway (9)	13 (0.6)	562 (3.9)	35 (1.0)	527 (2.9)	52 (1.3)	490 (2.4)	9.3 (0.05)
Chinese Taipei	11 (0.5)	666 (4.4)	33 (0.7)	633 (2.8)	56 (1.0)	566 (2.9)	9.2 (0.04)
Hungary	11 (0.7)	574 (8.8)	31 (1.1)	531 (5.3)	58 (1.3)	495 (3.5)	9.1 (0.05)
Japan	9 (0.5)	640 (4.8)	32 (0.8)	614 (2.8)	59 (1.1)	563 (2.4)	9.2 (0.04)
Korea, Rep. of	8 (0.4)	668 (4.2)	34 (0.7)	634 (3.0)	58 (0.8)	581 (2.7)	9.1 (0.04)
Slovenia	5 (0.4)	560 (7.0)	28 (1.1)	541 (2.7)	67 (1.2)	503 (2.2)	8.7 (0.05)
International Avg.	22 (0.1)	518 (0.8)	39 (0.1)	485 (0.6)	38 (0.2)	462 (0.6)	

The proportions of Maltese students who like very much learning Biology (55%), Chemistry (51%) and Physics (35%) were higher than the international averages (36%, 31% and 27% respectively); while the proportions of Maltese students who like learning Mathematics (17%) and Geography (20%) were lower than the international averages (22% and 28% respectively). The mean scale scores that measures engaging teaching in Maltese schools exceed the international average in Chemistry (11.2), Biology (10.9) and Physics (10.3), but not in Mathematics (9.5) and Geography (9.1). There is a significant relationship between students' attainment and how much the students like the subject, where students who like the subject very much tend to attain higher scores than those who do not like it.

Figure 10.4: Like to learn Science subjects clustered by country

<i>Students Like Learning Biology</i>							
Biology	Very Much Like Learning Biology		Like Learning Biology		Do Not Like Learning Biology		Average Scale Score
Country	Percent of Students	Average Achievement	Percent of Students	Average Achievement	Percent of Students	Average Achievement	
Malta	55 (1.3)	557 (2.7)	33 (1.0)	512 (5.6)	12 (0.9)	481 (6.0)	10.9 (0.06)
Morocco	53 (1.2)	412 (2.4)	39 (0.9)	378 (3.6)	8 (0.6)	378 (4.6)	11.0 (0.05)
Kazakhstan	46 (1.5)	544 (4.7)	50 (1.2)	525 (5.0)	4 (0.6)	522 (9.1)	10.7 (0.07)
Lebanon	42 (1.5)	438 (5.0)	44 (1.4)	383 (5.9)	14 (0.9)	365 (8.6)	10.4 (0.07)
Georgia	39 (1.4)	463 (3.8)	50 (1.2)	439 (3.6)	11 (0.9)	423 (6.4)	10.4 (0.06)
Russian Federation	35 (1.3)	550 (5.2)	52 (0.8)	540 (4.1)	13 (1.1)	544 (6.3)	10.1 (0.06)
Lithuania	31 (1.3)	526 (4.0)	46 (1.1)	515 (3.1)	23 (1.2)	518 (4.3)	9.7 (0.07)
Hungary	27 (1.3)	543 (4.2)	47 (0.9)	522 (3.8)	26 (1.3)	523 (4.9)	9.6 (0.06)
Sweden	20 (1.1)	539 (5.3)	52 (1.0)	529 (3.9)	28 (1.5)	511 (3.8)	9.3 (0.06)
Slovenia	16 (1.0)	557 (3.7)	47 (1.1)	552 (3.1)	38 (1.7)	549 (3.1)	8.9 (0.07)
International Avg.	36 (0.4)	513 (1.3)	46 (0.3)	489 (1.3)	18 (0.4)	482 (1.9)	
<i>Students Like Learning Chemistry</i>							
Chemistry	Very Much Like Learning Chemistry		Like Learning Chemistry		Do Not Like Learning Chemistry		Average Scale Score
Country	Percent of Students	Average Achievement	Percent of Students	Average Achievement	Percent of Students	Average Achievement	
Malta	51 (1.7)	589 (3.2)	31 (1.6)	551 (5.7)	17 (1.3)	522 (8.3)	11.2 (0.08)
Morocco	43 (1.1)	418 (3.0)	45 (0.8)	377 (3.0)	11 (0.5)	384 (3.9)	11.0 (0.04)
Kazakhstan	40 (1.5)	552 (5.2)	53 (1.2)	524 (5.2)	8 (0.7)	511 (6.9)	10.9 (0.05)
Lebanon	38 (1.7)	431 (5.9)	48 (1.5)	384 (6.2)	14 (1.3)	389 (10.0)	10.8 (0.07)
Russian Federation	31 (1.4)	561 (5.0)	46 (0.8)	541 (4.8)	23 (1.4)	530 (5.0)	10.3 (0.07)
Georgia	29 (1.4)	471 (4.4)	51 (1.1)	437 (3.9)	20 (1.4)	434 (4.5)	10.4 (0.07)
Lithuania	26 (1.4)	536 (3.5)	42 (1.2)	518 (3.4)	33 (1.7)	507 (4.5)	9.9 (0.08)
Slovenia	17 (0.9)	582 (4.0)	42 (1.1)	556 (2.6)	40 (1.5)	534 (3.5)	9.6 (0.06)
Sweden	17 (1.0)	553 (6.9)	46 (1.1)	531 (4.2)	37 (1.5)	510 (3.3)	9.7 (0.06)
Hungary	15 (1.0)	557 (6.6)	38 (1.0)	522 (4.2)	47 (1.5)	523 (4.0)	9.3 (0.06)
International Avg.	31 (0.4)	525 (1.6)	44 (0.4)	494 (1.4)	25 (0.4)	485 (1.8)	
<i>Students Like Learning Physics</i>							
Physics	Very Much Like Learning Physics		Like Learning Physics		Do Not Like Learning Physics		Average Scale Score
Country	Percent of Students	Average Achievement	Percent of Students	Average Achievement	Percent of Students	Average Achievement	
Morocco	45 (1.1)	417 (2.6)	44 (0.8)	378 (3.1)	11 (0.6)	384 (4.2)	11.0 (0.05)
Kazakhstan	38 (1.6)	554 (5.1)	55 (1.4)	523 (4.9)	8 (0.7)	520 (6.8)	10.8 (0.05)
Malta	35 (0.8)	535 (2.7)	40 (0.8)	489 (3.3)	26 (0.7)	448 (3.2)	10.3 (0.04)
Lebanon	33 (1.5)	445 (5.4)	49 (1.4)	386 (6.3)	17 (1.2)	391 (10.1)	10.5 (0.07)
Russian Federation	29 (1.0)	563 (5.4)	51 (0.8)	542 (4.5)	20 (1.2)	524 (4.8)	10.2 (0.05)
Georgia	24 (1.0)	471 (4.1)	49 (1.3)	439 (3.7)	27 (1.7)	440 (4.5)	10.0 (0.06)
Lithuania	19 (1.4)	554 (4.4)	42 (1.1)	518 (3.3)	39 (1.9)	503 (3.8)	9.5 (0.09)
Hungary	18 (1.0)	557 (5.2)	39 (1.2)	524 (4.4)	43 (1.7)	519 (3.8)	9.4 (0.07)
Sweden	17 (1.2)	558 (5.8)	43 (1.0)	529 (4.5)	40 (1.6)	511 (3.0)	9.5 (0.07)
Slovenia	11 (0.7)	585 (5.6)	37 (1.3)	557 (3.2)	53 (1.6)	542 (2.9)	9.0 (0.06)
International Avg.	27 (0.4)	524 (1.5)	45 (0.4)	489 (1.3)	28 (0.4)	478 (1.6)	
<i>Students Like Learning Earth Science</i>							
Earth Science	Very Much Like Learning Earth Science		Like Learning Earth Science		Do Not Like Learning Earth Science		Average Scale Score
Country	Percent of Students	Average Achievement	Percent of Students	Average Achievement	Percent of Students	Average Achievement	
Morocco	46 (1.0)	414 (2.5)	44 (0.8)	379 (3.2)	10 (0.6)	386 (4.9)	10.9 (0.05)
Kazakhstan	39 (1.4)	545 (4.5)	55 (1.2)	527 (5.4)	6 (0.5)	532 (9.3)	10.6 (0.05)
Georgia	32 (1.1)	468 (4.1)	55 (1.0)	437 (4.0)	14 (0.9)	431 (6.5)	10.3 (0.05)
Lithuania	30 (1.3)	535 (4.4)	47 (1.0)	514 (3.4)	23 (1.2)	511 (4.3)	9.9 (0.07)
Russian Federation	23 (1.2)	547 (6.5)	54 (1.2)	546 (4.5)	23 (1.4)	540 (4.7)	9.8 (0.06)
Malta	20 (0.9)	509 (4.7)	39 (1.0)	474 (3.5)	41 (0.9)	467 (3.0)	9.1 (0.05)
Hungary	16 (0.9)	540 (5.6)	40 (1.1)	523 (4.0)	45 (1.7)	528 (3.9)	9.0 (0.07)
Slovenia	15 (1.0)	558 (4.3)	43 (1.3)	555 (3.0)	42 (1.8)	547 (2.9)	9.0 (0.08)
Lebanon	--	--	--	--	--	--	--
Sweden	--	--	--	--	--	--	--
International Avg.	28 (0.4)	515 (1.7)	47 (0.4)	494 (1.4)	25 (0.4)	493 (1.9)	

Table 10.14: Like Learning Mathematics and Science subjects clustered by gender

Like learning	Gender	Sample Size	Mean	Std. Deviation	P-value
Mathematics	Female	1873	9.24	2.031	0.000
	Male	1901	9.67	2.014	
Biology	Female	853	11.09	2.025	0.001
	Male	615	10.72	2.418	
Chemistry	Female	428	11.24	2.100	0.383
	Male	472	11.12	2.316	
Physics	Female	1490	10.08	2.108	0.000
	Male	1612	10.56	2.047	
Geography	Female	1077	8.76	2.135	0.000
	Male	1179	9.42	2.217	

Table 10.14 shows that the mean ‘Like the subject’ scores of male students are significantly higher in Mathematics, Physics and Geography. On the other hand, the mean ‘Like the subject’ score of female students is significantly higher in Biology; while the mean ‘Like the subject’ scores in Chemistry vary marginally between the two gender groups since the p-value (0.383) exceeds the 0.05 level of significance.

10.4 Students’ confidence in Mathematics and Science subjects

To assess the students’ confidence in Mathematics and the Science subjects, a scale score was generated for each subject by using student’s responses to how much they agreed with eight/nine statements, displayed in Tables 10.15 to 10.19. Two threshold values were computed for each subject, where students scoring below the lower threshold value were not confident in the subject; students scoring between the two threshold values were confident in the subject and students scoring above the upper threshold value were very confident in the subject. The threshold values were 9.5 and 12.1 for Mathematics, 8.6 and 11.1 for Biology, 9.5 and 11.6 for Chemistry, 9.4 and 11.6 for Physics, 8.7 and 11.2 for Geography. Tables 10.15 to 10.19 show that students are more confident in Biology, Chemistry and Physics than Mathematics and Geography.

Table 10.15: Confidence of Maltese students in Mathematics

How much do you agree with these statements about mathematics?	Agree a lot	Agree a little	Disagree a little	Disagree a lot
I usually do well in mathematics	28.9%	36.3%	21.9%	13.0%
Mathematics is more difficult for me than my classmates	14.6%	26.9%	33.5%	25.0%
Mathematics is not one of my strengths	26.8%	28.7%	23.9%	20.6%
I learn things quickly in mathematics	23.0%	32.3%	29.2%	15.5%
Mathematics makes me nervous	25.5%	30.0%	24.4%	20.2%
I am good at working out difficult mathematics problems	15.7%	28.0%	29.9%	26.4%
My teacher tells me I am good at mathematics	23.7%	38.1%	24.6%	13.6%
Mathematics is harder for me than any other subject	23.7%	24.4%	25.7%	26.2%
Mathematics makes me confused	25.3%	29.4%	24.4%	20.9%

Table 10.16: Confidence of Maltese students in Biology

How much do you agree with these statements about biology?	Agree a lot	Agree a little	Disagree a little	Disagree a lot
I usually do well in biology	42.2%	36.9%	14.6%	6.2%
Biology is more difficult for me than my classmates	9.6%	20.7%	32.2%	37.5%
Biology is not one of my strengths	11.5%	20.8%	31.8%	35.9%
I learn things quickly in biology	34.0%	35.0%	23.1%	7.9%
I am good at working out difficult biology problems	27.5%	32.5%	27.9%	12.1%
My teacher tells me I am good at biology	40.6%	33.8%	18.7%	6.9%
Biology is harder for me than any other subject	10.3%	17.7%	32.4%	39.6%
Biology makes me confused	9.8%	19.6%	28.9%	41.8%

Table 10.17: Confidence of Maltese students in Chemistry

How much do you agree with these statements about chemistry?	Agree a lot	Agree a little	Disagree a little	Disagree a lot
I usually do well in chemistry	46.6%	33.1%	13.4%	6.9%
Chemistry is more difficult for me than my classmates	11.4%	18.9%	28.9%	40.7%
Chemistry is not one of my strengths	14.0%	18.3%	26.7%	40.9%
I learn things quickly in chemistry	34.5%	34.0%	22.2%	9.3%
I am good at working out difficult chemistry problems	30.5%	34.6%	23.5%	11.4%
My teacher tells me I am good at chemistry	40.9%	34.8%	16.5%	7.8%
Chemistry is harder for me than any other subject	14.0%	18.5%	29.1%	38.3%
Chemistry makes me confused	13.2%	23.2%	25.8%	37.8%

Table 10.18: Confidence of Maltese students in Physics

How much do you agree with these statements about physics?	Agree a lot	Agree a little	Disagree a little	Disagree a lot
I usually do well in physics	36.5%	35.7%	17.8%	9.9%
Physics is more difficult for me than my classmates	12.6%	23.3%	32.1%	31.9%
Physics is not one of my strengths	17.5%	26.7%	27.6%	28.2%
I learn things quickly in physics	27.5%	34.9%	25.9%	11.7%
I am good at working out difficult physics problems	25.0%	31.2%	26.9%	16.8%
My teacher tells me I am good at physics	31.8%	36.7%	20.8%	10.7%
Physics is harder for me than any other subject	16.3%	22.2%	29.5%	32.0%
Physics makes me confused	17.7%	25.9%	27.2%	29.2%

Table 10.19: Confidence of Maltese students in Geography

How much do you agree with these statements about earth science?	Agree a lot	Agree a little	Disagree a little	Disagree a lot
I usually do well in geography	33.6%	39.6%	15.4%	11.4%
Geography is more difficult for me than my classmates	10.3%	21.2%	33.9%	34.6%
Geography is not one of my strengths	19.9%	27.1%	28.7%	24.3%
I learn things quickly in geography	27.4%	34.7%	24.2%	13.7%
I am good at working out difficult geography problems	21.0%	30.1%	28.9%	20.0%
My teacher tells me I am good at geography	25.2%	33.4%	25.1%	16.2%
Geography is harder for me than any other subject	12.9%	20.1%	32.6%	34.4%
Geography makes me confused	14.9%	21.8%	29.4%	33.9%

Figure 10.5: Confidence in Mathematics clustered by country

Country	Very Confident in Mathematics		Confident in Mathematics		Not Confident in Mathematics		Average Scale Score
	Percent of Students	Average Achievement	Percent of Students	Average Achievement	Percent of Students	Average Achievement	
Canada	26 (0.7)	579 (2.1)	41 (0.8)	535 (2.3)	33 (0.9)	482 (2.2)	10.6 (0.04)
Israel	24 (0.9)	569 (5.0)	44 (0.8)	512 (4.4)	32 (1.0)	470 (3.6)	10.7 (0.05)
Norway (9)	23 (0.8)	576 (2.7)	41 (0.9)	515 (2.4)	36 (1.1)	468 (2.3)	10.4 (0.05)
United States	21 (0.7)	573 (3.5)	40 (0.6)	530 (3.0)	39 (0.9)	480 (2.9)	10.3 (0.05)
Hungary	19 (0.9)	597 (5.3)	39 (0.9)	528 (3.9)	42 (1.2)	465 (3.5)	10.2 (0.06)
Italy	19 (0.7)	553 (2.9)	38 (1.0)	507 (3.0)	43 (1.2)	458 (2.9)	10.0 (0.05)
Sweden	18 (1.0)	570 (3.3)	41 (1.1)	514 (3.1)	41 (1.2)	459 (2.9)	10.2 (0.06)
Lebanon	18 (1.1)	494 (6.0)	45 (1.0)	446 (4.1)	37 (1.0)	422 (4.5)	10.4 (0.05)
Jordan	17 (0.7)	454 (4.9)	48 (0.8)	389 (3.3)	35 (0.8)	354 (3.5)	10.5 (0.04)
Oman	17 (0.6)	465 (3.9)	52 (0.7)	403 (2.4)	31 (0.7)	372 (2.8)	10.5 (0.03)
United Arab Emirates	17 (0.5)	536 (2.9)	50 (0.6)	467 (2.1)	33 (0.7)	429 (2.5)	10.4 (0.03)
Iran, Islamic Rep. of	16 (0.8)	512 (5.8)	42 (0.8)	444 (5.1)	42 (1.1)	400 (3.8)	10.2 (0.05)
Ireland	16 (0.8)	583 (4.0)	42 (0.9)	534 (2.9)	43 (1.0)	492 (3.2)	10.0 (0.05)
Kuwait	15 (1.0)	450 (7.1)	47 (0.9)	394 (5.2)	38 (1.4)	368 (5.3)	10.2 (0.06)
Qatar	15 (0.6)	520 (4.7)	47 (0.8)	447 (3.4)	38 (0.9)	398 (3.3)	10.3 (0.04)
England	15 (0.8)	578 (5.4)	50 (1.0)	530 (4.2)	35 (1.4)	479 (4.2)	10.3 (0.06)
Australia	15 (0.7)	580 (3.6)	42 (0.7)	522 (3.4)	43 (0.9)	465 (2.5)	10.0 (0.04)
Lithuania	15 (0.8)	589 (3.6)	45 (0.9)	525 (2.7)	40 (1.2)	468 (2.8)	10.2 (0.05)
Bahrain	15 (0.5)	522 (3.7)	43 (0.9)	460 (2.2)	42 (1.1)	428 (2.3)	10.1 (0.04)
Egypt	15 (0.8)	467 (4.9)	51 (0.8)	393 (4.0)	34 (1.1)	364 (4.5)	10.4 (0.05)
Kazakhstan	15 (0.8)	571 (6.7)	57 (1.0)	533 (5.6)	28 (1.3)	496 (5.9)	10.5 (0.05)
Turkey	14 (0.7)	571 (5.7)	32 (0.8)	473 (6.4)	54 (1.1)	419 (3.7)	9.8 (0.05)
Malta	13 (0.5)	571 (3.2)	37 (0.6)	506 (2.1)	49 (0.7)	468 (1.7)	9.7 (0.03)
Singapore	13 (0.5)	675 (3.0)	41 (0.7)	642 (2.8)	46 (0.8)	588 (4.0)	9.7 (0.04)
Saudi Arabia	12 (0.9)	433 (7.8)	50 (1.3)	373 (4.4)	37 (1.5)	342 (5.4)	10.2 (0.05)
Russian Federation	12 (0.6)	602 (5.0)	42 (0.9)	558 (5.2)	46 (1.1)	503 (4.8)	9.8 (0.04)
New Zealand	12 (0.6)	576 (4.6)	43 (0.7)	509 (3.7)	44 (0.8)	456 (3.2)	9.9 (0.04)
Georgia	12 (0.8)	533 (5.1)	44 (1.0)	473 (3.9)	44 (1.1)	415 (4.1)	10.0 (0.05)
Chile	12 (0.7)	506 (4.5)	36 (0.9)	441 (3.7)	52 (1.1)	401 (3.2)	9.7 (0.05)
Slovenia	12 (0.5)	586 (3.7)	44 (0.9)	535 (2.3)	44 (0.9)	479 (2.6)	9.9 (0.03)
Hong Kong SAR	10 (0.5)	660 (4.3)	36 (0.8)	611 (5.4)	54 (0.9)	571 (4.5)	9.4 (0.05)
South Africa (9)	10 (0.6)	448 (7.5)	43 (0.9)	375 (4.6)	48 (1.1)	359 (4.8)	9.8 (0.04)
Chinese Taipei	9 (0.4)	688 (3.7)	30 (0.7)	647 (3.3)	60 (0.9)	562 (2.6)	9.1 (0.04)
Morocco	9 (0.4)	467 (3.7)	50 (0.7)	391 (2.4)	41 (0.7)	361 (2.6)	10.0 (0.02)
Botswana (9)	8 (0.4)	475 (4.6)	45 (0.8)	396 (2.4)	47 (0.9)	381 (2.4)	9.8 (0.03)
Korea, Rep. of	8 (0.4)	687 (4.9)	38 (0.7)	643 (2.8)	55 (0.8)	569 (2.7)	9.4 (0.03)
Japan	5 (0.3)	676 (5.3)	32 (0.8)	625 (2.9)	63 (0.9)	561 (2.2)	9.0 (0.04)
Malaysia	4 (0.2)	568 (6.6)	42 (0.9)	485 (4.2)	54 (0.9)	444 (3.5)	9.5 (0.03)
Thailand	3 (0.3)	560 (13.9)	29 (0.9)	456 (6.3)	69 (1.0)	416 (4.2)	9.1 (0.04)
International Avg.	14 (0.1)	554 (0.8)	43 (0.1)	494 (0.6)	43 (0.2)	449 (0.6)	

The proportion of Maltese students who were very confident in Biology (34%), Chemistry (35%) and Physics (23%) were higher than the international averages (26%, 21% and 18% respectively); while the proportions of Maltese students who were very confident in Mathematics (13%) and Geography (21%) were lower than the international averages (14% and 24% respectively). The scale scores that measure the students' confidence in Maltese schools exceed the international average in Chemistry (10.8), Biology (10.2) and Physics (10.2), but not in Mathematics (9.7) and Geography (9.5). There is a significant relationship between students' attainment and how students' confidence in the subject, where students who are confident in the subject tend to attain higher scores than those who are not confident in it.

Figure 10.6: Confidence in Science subjects clustered by country

<i>Students Confident in Biology</i>							
Biology	Very Confident in Biology		Confident in Biology		Not Confident in Biology		Average Scale Score
Country	Percent of Students	Average Achievement	Percent of Students	Average Achievement	Percent of Students	Average Achievement	
Malta	34 (1.3)	585 (3.2)	36 (1.2)	527 (3.7)	30 (1.2)	481 (4.5)	10.2 (0.07)
Hungary	32 (1.2)	560 (3.7)	45 (1.0)	522 (4.0)	23 (1.2)	496 (5.8)	10.2 (0.06)
Kazakhstan	31 (1.4)	558 (5.0)	55 (1.0)	528 (4.9)	14 (0.9)	503 (6.7)	10.6 (0.07)
Georgia	29 (1.1)	486 (3.3)	45 (0.9)	448 (4.0)	26 (1.2)	402 (4.7)	10.2 (0.05)
Russian Federation	28 (1.1)	561 (4.7)	50 (0.8)	542 (4.6)	22 (1.0)	529 (5.2)	10.2 (0.06)
Lebanon	27 (1.5)	463 (6.3)	40 (1.0)	399 (5.8)	33 (1.5)	366 (6.7)	10.1 (0.08)
Lithuania	25 (1.2)	551 (4.0)	47 (1.1)	513 (3.4)	27 (1.3)	501 (3.8)	10.0 (0.07)
Morocco	19 (0.7)	445 (2.9)	47 (0.7)	392 (2.7)	33 (1.1)	373 (3.8)	9.7 (0.04)
Slovenia	19 (1.2)	585 (3.9)	51 (1.1)	554 (2.8)	30 (1.3)	527 (3.7)	9.6 (0.06)
Sweden	18 (0.9)	563 (4.9)	51 (1.0)	534 (3.6)	31 (1.3)	491 (3.6)	9.6 (0.05)
International Avg.	26 (0.4)	536 (1.4)	47 (0.3)	496 (1.3)	27 (0.4)	467 (1.6)	
<i>Students Confident in Chemistry</i>							
Chemistry	Very Confident in Chemistry		Confident in Chemistry		Not Confident in Chemistry		Average Scale Score
Country	Percent of Students	Average Achievement	Percent of Students	Average Achievement	Percent of Students	Average Achievement	
Malta	35 (1.4)	599 (3.6)	33 (1.4)	575 (4.4)	32 (1.5)	522 (6.8)	10.8 (0.08)
Lebanon	26 (1.3)	454 (6.1)	40 (0.9)	395 (5.6)	34 (1.2)	373 (7.0)	10.6 (0.06)
Kazakhstan	24 (1.1)	560 (5.7)	49 (1.0)	534 (4.8)	27 (1.2)	512 (5.1)	10.7 (0.05)
Georgia	23 (0.8)	494 (3.9)	39 (1.1)	454 (3.6)	39 (1.4)	413 (3.7)	10.3 (0.05)
Slovenia	20 (0.9)	602 (3.4)	42 (1.1)	559 (2.9)	39 (1.2)	519 (3.6)	10.1 (0.05)
Lithuania	19 (1.2)	557 (4.1)	40 (1.0)	523 (3.4)	41 (1.5)	498 (3.6)	10.1 (0.07)
Russian Federation	18 (1.2)	576 (6.0)	34 (1.0)	549 (4.4)	48 (1.5)	530 (4.9)	9.9 (0.07)
Morocco	17 (0.6)	452 (3.8)	46 (0.7)	392 (3.0)	38 (1.0)	377 (3.1)	10.3 (0.03)
Sweden	16 (0.8)	574 (5.0)	44 (1.0)	536 (4.1)	40 (1.2)	498 (3.5)	10.0 (0.05)
Hungary	16 (0.9)	579 (5.2)	36 (1.1)	531 (4.9)	48 (1.5)	510 (4.3)	9.8 (0.06)
International Avg.	21 (0.3)	545 (1.5)	40 (0.3)	505 (1.3)	39 (0.4)	475 (1.5)	
<i>Students Confident in Physics</i>							
Physics	Very Confident in Physics		Confident in Physics		Not Confident in Physics		Average Scale Score
Country	Percent of Students	Average Achievement	Percent of Students	Average Achievement	Percent of Students	Average Achievement	
Malta	23 (0.7)	565 (3.2)	35 (0.8)	505 (3.0)	42 (0.8)	447 (2.7)	10.2 (0.04)
Hungary	23 (0.9)	580 (4.2)	38 (1.0)	530 (4.1)	39 (1.4)	496 (4.2)	10.2 (0.06)
Lebanon	22 (1.4)	468 (6.1)	41 (1.2)	401 (5.6)	37 (1.3)	373 (6.2)	10.5 (0.06)
Kazakhstan	22 (1.2)	560 (5.9)	51 (0.9)	534 (5.0)	27 (1.1)	516 (5.1)	10.6 (0.06)
Morocco	18 (0.6)	450 (3.2)	47 (0.7)	391 (2.7)	35 (1.0)	377 (3.2)	10.3 (0.03)
Russian Federation	16 (0.8)	579 (5.1)	41 (0.9)	551 (4.6)	42 (1.2)	525 (4.7)	10.0 (0.05)
Georgia	16 (0.9)	498 (4.5)	35 (1.3)	454 (3.9)	48 (1.3)	426 (4.2)	9.9 (0.05)
Sweden	16 (0.9)	578 (4.8)	44 (0.9)	538 (3.4)	40 (1.4)	495 (3.8)	10.0 (0.06)
Lithuania	13 (1.1)	576 (4.7)	36 (1.2)	526 (3.6)	51 (1.6)	500 (3.2)	9.6 (0.07)
Slovenia	13 (0.6)	609 (4.2)	41 (1.2)	565 (3.2)	47 (1.3)	525 (2.9)	9.6 (0.05)
International Avg.	18 (0.3)	546 (1.5)	41 (0.3)	499 (1.3)	41 (0.4)	468 (1.3)	
<i>Students Confident in Earth Science</i>							
Earth Science	Very Confident in Earth Science		Confident in Earth Science		Not Confident in Earth Science		Average Scale Score
Country	Percent of Students	Average Achievement	Percent of Students	Average Achievement	Percent of Students	Average Achievement	
Kazakhstan	31 (1.3)	558 (4.7)	53 (0.9)	528 (5.2)	16 (0.9)	511 (6.2)	10.6 (0.07)
Lithuania	26 (1.1)	552 (3.8)	46 (1.1)	518 (3.6)	28 (1.1)	490 (3.8)	10.1 (0.06)
Hungary	25 (1.3)	561 (4.0)	42 (1.0)	527 (4.4)	32 (1.5)	504 (4.2)	9.9 (0.07)
Georgia	25 (0.9)	493 (3.8)	42 (1.0)	450 (3.9)	33 (1.1)	406 (4.7)	10.0 (0.05)
Russian Federation	25 (1.3)	563 (4.9)	50 (0.8)	547 (4.4)	25 (1.3)	522 (4.7)	10.1 (0.06)
Malta	21 (0.8)	534 (4.2)	37 (1.0)	492 (4.0)	42 (1.0)	442 (3.2)	9.5 (0.05)
Slovenia	20 (1.0)	584 (3.3)	49 (0.9)	557 (3.1)	30 (1.2)	522 (3.4)	9.8 (0.06)
Morocco	17 (0.6)	446 (3.3)	47 (0.7)	394 (2.6)	36 (1.0)	374 (3.5)	9.7 (0.04)
Lebanon	--	--	--	--	--	--	--
Sweden	--	--	--	--	--	--	--
International Avg.	24 (0.4)	536 (1.4)	46 (0.3)	502 (1.4)	30 (0.4)	471 (1.5)	

Table 10.20: Confidence in Mathematics and Science subjects clustered by school type

Confidence in	School Type	Sample Size	Mean	Std. Deviation	P-value
Mathematics	State	1935	9.43	1.966	0.000
	Church	1423	9.99	2.351	
	Independent	403	10.32	2.587	
Biology	State	395	9.80	2.360	0.000
	Church	834	10.22	2.618	
	Independent	236	10.71	2.359	
Chemistry	State	234	10.71	2.397	0.667
	Church	513	10.83	2.473	
	Independent	149	10.94	2.541	
Physics	State	1664	9.82	2.295	0.000
	Church	1095	10.61	2.428	
	Independent	298	11.03	2.382	
Geography	State	1568	9.31	2.255	0.000
	Church	536	9.87	2.253	
	Independent	117	11.20	2.430	

Table 10.21: Confidence in Mathematics and Science subjects clustered by gender

Confidence in	Gender	Sample Size	Mean	Std. Deviation	P-value
Mathematics	Female	1867	9.48	2.273	0.000
	Male	1894	9.99	2.126	
Biology	Female	852	10.20	2.400	0.852
	Male	613	10.17	2.691	
Chemistry	Female	427	10.80	2.484	0.880
	Male	469	10.83	2.447	
Physics	Female	1478	9.99	2.431	0.000
	Male	1579	10.43	2.341	
Geography	Female	1068	9.39	2.279	0.002
	Male	1153	9.69	2.328	

Table 10.20 shows that the mean confidence scores of students attending independent schools are significantly higher in Mathematics, Biology, Physics and Geography; however the mean confidence scores in Chemistry do not differ significantly between the school types. Table 10.21 shows that the mean confidence scores of male students are significantly higher in Mathematics, Physics and Geography. However, the mean confidence scores in Biology and Chemistry vary marginally between the two gender groups.

10.5 Students value Mathematics and Science subjects

To assess the value students give to Mathematics and the Science subjects, a scale score was generated for Mathematics and Science combined by using student's responses to how much they agreed with nine statements, displayed in Tables 10.22 and 10.23. Two threshold values were computed for each scale, where students scoring below the lower threshold value did not value the subject; students scoring between the two threshold values valued the subject and students scoring

above the upper threshold value strongly valued the subject. The threshold values were 7.7 and 10.3 for Mathematics and 8.4 and 10.7 for Science. Tables 10.22 to 10.23 show that students, on average, value Mathematics and Science subjects the same.

Table 10.22: Value of Mathematics to Maltese Students

How much do you agree with these statements about learning mathematics?	Agree a lot	Agree a little	Disagree a little	Disagree a lot
I think learning mathematics will help me in my life	49.8%	31.6%	11.3%	7.3%
I need mathematics to learn other school subjects	40.6%	38.1%	14.2%	7.0%
I need to do well in maths to get to university/vocational institution	64.7%	23.5%	7.3%	4.5%
I need to do well in mathematics to get the job I want	54.5%	25.1%	13.0%	7.3%
I would like a job that involves using mathematics	19.2%	25.8%	25.9%	29.0%
It is important to learn mathematics to get ahead in the world	46.7%	34.4%	12.7%	6.3%
Learning mathematics will give me more job opportunities	60.0%	29.2%	7.0%	3.7%
My parents think that it is important that I do well in mathematics	75.9%	18.5%	3.6%	2.1%
It is important to do well in mathematics	71.0%	21.8%	4.3%	2.9%

Table 10.23: Value of Science to Maltese Students

How much do you agree with these statements about science (Biology, Chemistry, Physics, Geography)?	Agree a lot	Agree a little	Disagree a little	Disagree a lot
I think learning science will help me in my life	49.6%	32.2%	11.3%	6.9%
I need science to learn other school subjects	32.3%	32.5%	24.3%	10.9%
I need to do well in science to get to university/vocational institution	47.5%	26.2%	16.0%	10.2%
I need to do well in science to get the job I want	41.3%	21.0%	21.1%	16.6%
I would like a job that involves using science	31.9%	17.9%	23.0%	27.2%
It is important to learn about science to get ahead in the world	42.9%	32.2%	15.0%	9.9%
Learning science will give me more job opportunities	47.4%	27.5%	14.8%	10.3%
My parents think that it is important that I do well in science	50.0%	28.3%	13.1%	8.5%
It is important to do well in science	53.6%	28.1%	10.3%	8.0%

Table 10.24: Value of Mathematics and Science to Maltese Students clustered by school type

Students Value	School Type	Sample Size	Mean	Std. Deviation	P-value
Mathematics	State	1926	9.97	1.998	0.875
	Church	1422	9.96	1.926	
	Independent	402	9.91	1.998	
Science	State	1840	9.36	2.246	0.000
	Church	1379	10.32	2.033	
	Independent	386	10.67	1.866	

Table 10.25: Value of Mathematics and Science to Maltese Students clustered by gender

Students Value	Gender	Sample Size	Mean	Std. Deviation	P-value
Mathematics	Female	1867	9.82	1.832	0.000
	Male	1883	10.10	2.090	
Science	Female	1813	9.92	2.163	0.136
	Male	1792	9.82	2.221	

Table 10.24 shows that students attending church and independent value Science subjects more than state school students; however the value given to Mathematics vary marginally between the three school types. Table 10.25 shows that male students value Mathematics more than female students; however, there is no significant gender discrepancy for the value given to Science subjects.

Figure 10.7: Value given to Mathematics clustered by country

Country	Strongly Value Mathematics		Value Mathematics		Do Not Value Mathematics		Average Scale Score
	Percent of Students	Average Achievement	Percent of Students	Average Achievement	Percent of Students	Average Achievement	
South Africa (9)	72 (0.8)	382 (4.6)	24 (0.7)	360 (5.7)	4 (0.3)	329 (7.5)	11.1 (0.04)
Botswana (9)	72 (0.8)	411 (1.9)	25 (0.7)	359 (3.4)	3 (0.3)	312 (6.9)	11.2 (0.04)
Morocco	68 (0.8)	395 (2.4)	27 (0.7)	368 (2.8)	5 (0.3)	349 (4.9)	11.1 (0.04)
Jordan	65 (0.9)	399 (3.3)	29 (0.8)	372 (3.8)	6 (0.4)	350 (7.2)	11.0 (0.04)
Egypt	61 (1.2)	409 (4.0)	32 (1.0)	374 (4.7)	7 (0.5)	365 (8.1)	10.8 (0.06)
Oman	59 (0.9)	421 (2.6)	35 (0.7)	384 (2.8)	6 (0.4)	359 (6.3)	10.7 (0.04)
Israel	58 (1.0)	524 (4.4)	34 (0.8)	505 (4.3)	8 (0.5)	462 (7.1)	10.5 (0.05)
Lebanon	58 (1.4)	453 (3.9)	34 (1.1)	438 (4.7)	9 (0.6)	425 (7.0)	10.7 (0.07)
Iran, Islamic Rep. of	53 (1.0)	446 (5.3)	38 (0.9)	431 (4.6)	9 (0.5)	407 (6.4)	10.4 (0.04)
Canada	51 (0.8)	540 (2.2)	42 (0.6)	522 (2.3)	7 (0.5)	483 (3.7)	10.3 (0.03)
Thailand	50 (1.2)	446 (5.3)	45 (1.1)	421 (4.9)	5 (0.4)	390 (6.9)	10.3 (0.04)
Turkey	47 (1.1)	472 (5.4)	41 (0.8)	449 (5.1)	12 (0.6)	436 (6.0)	10.1 (0.05)
England	46 (1.1)	526 (4.4)	46 (0.9)	518 (4.5)	8 (0.6)	490 (6.5)	10.1 (0.05)
Kuwait	46 (1.4)	405 (5.7)	42 (1.1)	388 (5.1)	12 (0.8)	366 (6.2)	10.0 (0.06)
Chile	46 (1.0)	436 (3.6)	42 (0.9)	424 (3.6)	12 (0.8)	412 (5.2)	10.0 (0.04)
Qatar	45 (1.0)	465 (3.5)	41 (0.8)	429 (3.3)	13 (0.6)	386 (5.4)	10.0 (0.04)
United Arab Emirates	45 (0.8)	487 (2.7)	45 (0.6)	456 (2.3)	11 (0.4)	420 (3.9)	10.0 (0.04)
Georgia	44 (1.1)	466 (4.2)	46 (1.0)	451 (3.6)	9 (0.7)	423 (6.8)	10.1 (0.05)
United States	44 (0.8)	531 (3.6)	45 (0.6)	516 (3.1)	11 (0.4)	488 (3.8)	10.0 (0.03)
Malta	44 (0.7)	509 (2.2)	45 (0.8)	492 (1.8)	11 (0.5)	458 (4.6)	10.0 (0.03)
Australia	43 (0.9)	524 (3.1)	46 (0.8)	501 (3.3)	12 (0.7)	464 (3.9)	9.9 (0.04)
Saudi Arabia	42 (1.4)	379 (5.4)	42 (1.0)	369 (4.8)	15 (0.9)	344 (7.2)	9.8 (0.07)
New Zealand	42 (0.8)	505 (4.1)	48 (0.8)	491 (3.2)	10 (0.4)	458 (5.3)	9.9 (0.03)
Bahrain	41 (0.9)	473 (2.4)	43 (0.9)	450 (2.6)	16 (0.9)	424 (4.6)	9.8 (0.05)
Ireland	41 (0.9)	534 (3.3)	48 (0.8)	520 (3.1)	11 (0.5)	501 (4.6)	9.8 (0.04)
Norway (9)	41 (1.0)	527 (2.7)	48 (0.9)	509 (2.5)	12 (0.5)	476 (3.7)	9.8 (0.04)
Kazakhstan	40 (1.2)	538 (5.7)	52 (0.9)	522 (5.8)	8 (0.5)	523 (6.9)	10.0 (0.05)
Malaysia	39 (0.9)	487 (3.5)	53 (0.7)	458 (4.0)	8 (0.7)	425 (6.2)	9.8 (0.04)
Lithuania	37 (1.1)	523 (4.5)	53 (0.9)	507 (2.7)	11 (0.6)	490 (4.8)	9.7 (0.04)
Singapore	34 (0.8)	629 (3.5)	58 (0.7)	621 (3.4)	8 (0.4)	590 (5.8)	9.7 (0.03)
Russian Federation	31 (1.2)	547 (6.4)	52 (1.1)	538 (4.8)	17 (0.7)	522 (5.2)	9.4 (0.05)
Hungary	28 (0.9)	537 (6.2)	54 (0.9)	511 (3.6)	19 (0.9)	492 (5.0)	9.3 (0.05)
Sweden	28 (1.2)	518 (3.8)	58 (1.2)	501 (2.9)	14 (0.8)	471 (4.5)	9.4 (0.05)
Italy	19 (0.8)	513 (3.8)	57 (0.9)	496 (3.0)	24 (0.8)	477 (3.4)	8.9 (0.03)
Slovenia	19 (0.8)	532 (4.5)	64 (1.0)	516 (2.3)	17 (0.8)	499 (2.9)	9.0 (0.03)
Hong Kong SAR	19 (0.8)	617 (5.4)	52 (1.0)	602 (4.3)	29 (1.0)	567 (5.6)	8.7 (0.05)
Korea, Rep. of	13 (0.6)	656 (4.4)	63 (0.9)	614 (2.8)	24 (0.8)	557 (3.7)	8.6 (0.04)
Japan	11 (0.6)	614 (4.4)	59 (0.7)	595 (2.5)	29 (0.9)	560 (3.6)	8.5 (0.03)
Chinese Taipei	10 (0.5)	650 (4.8)	49 (0.9)	621 (2.8)	41 (1.0)	561 (2.8)	8.1 (0.04)
International Avg.	42 (0.2)	498 (0.7)	45 (0.1)	477 (0.6)	13 (0.1)	449 (0.9)	

Figure 10.8: Value given to Science subjects clustered by country

Country	Strongly Value Science		Value Science		Do Not Value Science		Average Scale Score
	Percent of Students	Average Achievement	Percent of Students	Average Achievement	Percent of Students	Average Achievement	
Botswana (9)	73 (0.8)	423 (2.3)	23 (0.7)	332 (4.2)	4 (0.3)	292 (9.6)	11.6 (0.03)
Jordan	68 (0.9)	440 (3.2)	25 (0.8)	414 (4.4)	7 (0.5)	391 (7.3)	11.4 (0.04)
Egypt	65 (1.2)	392 (3.9)	29 (0.9)	347 (5.4)	6 (0.4)	334 (6.9)	11.3 (0.05)
Oman	62 (1.0)	469 (2.7)	32 (0.9)	438 (3.5)	6 (0.4)	429 (5.7)	11.1 (0.04)
Morocco	59 (1.0)	402 (2.7)	33 (0.7)	387 (3.4)	8 (0.4)	389 (4.5)	11.0 (0.04)
Lebanon	58 (1.3)	420 (5.0)	32 (1.1)	381 (6.4)	10 (0.7)	359 (9.2)	11.0 (0.05)
Iran, Islamic Rep. of	57 (1.1)	465 (4.8)	32 (0.8)	446 (4.2)	10 (0.6)	446 (5.1)	10.9 (0.05)
South Africa (9)	57 (1.2)	366 (5.6)	31 (0.8)	344 (6.1)	12 (0.8)	383 (9.4)	10.8 (0.05)
Kuwait	54 (1.1)	422 (5.8)	36 (1.0)	405 (6.1)	10 (0.6)	381 (7.8)	10.7 (0.04)
Bahrain	52 (1.1)	485 (2.6)	34 (0.9)	457 (3.6)	14 (0.6)	435 (5.0)	10.6 (0.04)
Qatar	50 (1.0)	486 (3.8)	35 (0.9)	443 (3.6)	15 (0.5)	411 (4.7)	10.6 (0.04)
Thailand	49 (1.2)	472 (4.6)	45 (1.1)	442 (4.2)	6 (0.4)	427 (7.2)	10.7 (0.04)
Saudi Arabia	49 (1.5)	411 (5.5)	36 (1.0)	391 (5.0)	15 (1.1)	381 (6.3)	10.5 (0.07)
United Arab Emirates	48 (0.7)	504 (2.8)	39 (0.5)	460 (2.6)	13 (0.5)	438 (4.1)	10.5 (0.03)
Turkey	46 (1.0)	505 (4.5)	40 (0.8)	485 (4.5)	14 (0.8)	485 (5.2)	10.4 (0.05)
Georgia	43 (1.2)	454 (3.7)	45 (1.1)	444 (4.0)	12 (0.8)	430 (6.8)	10.5 (0.05)
Kazakhstan	41 (1.2)	546 (4.8)	49 (1.0)	525 (5.2)	10 (0.8)	527 (6.6)	10.5 (0.05)
Israel	40 (1.1)	523 (4.6)	36 (0.7)	512 (4.4)	24 (1.0)	481 (4.9)	10.0 (0.06)
England	39 (1.1)	558 (4.1)	43 (0.8)	536 (3.9)	18 (0.9)	502 (4.5)	10.1 (0.05)
United States	38 (0.8)	550 (3.2)	42 (0.7)	529 (2.8)	19 (0.6)	501 (3.1)	10.1 (0.03)
Malaysia	38 (1.0)	483 (3.4)	54 (0.8)	481 (4.3)	9 (0.8)	387 (8.9)	10.4 (0.04)
Russian Federation	38 (1.4)	544 (5.2)	48 (1.2)	545 (4.1)	14 (0.6)	543 (5.9)	10.2 (0.05)
Lithuania	38 (1.1)	525 (3.5)	47 (0.9)	517 (3.1)	15 (0.8)	515 (5.2)	10.2 (0.04)
Singapore	37 (0.8)	621 (3.4)	53 (0.7)	589 (3.4)	10 (0.5)	548 (4.7)	10.2 (0.03)
Malta	37 (0.7)	536 (2.9)	37 (0.8)	475 (2.8)	26 (0.7)	436 (3.6)	9.9 (0.03)
Canada	37 (0.8)	546 (2.5)	44 (0.8)	525 (2.4)	19 (0.8)	501 (2.9)	10.1 (0.03)
Chile	32 (1.1)	458 (4.3)	41 (0.9)	453 (3.6)	27 (0.8)	455 (3.4)	9.7 (0.05)
New Zealand	30 (0.8)	537 (4.1)	46 (0.7)	514 (3.4)	24 (0.9)	486 (3.2)	9.7 (0.04)
Ireland	30 (0.9)	557 (3.4)	43 (0.8)	540 (3.0)	27 (1.0)	501 (3.8)	9.6 (0.05)
Australia	27 (0.9)	547 (3.2)	41 (0.6)	517 (2.7)	32 (0.8)	482 (3.4)	9.4 (0.04)
Hong Kong SAR	24 (1.0)	565 (5.0)	46 (1.0)	549 (4.2)	31 (1.2)	528 (4.3)	9.4 (0.05)
Sweden	21 (1.0)	535 (5.7)	50 (0.9)	532 (3.7)	28 (1.3)	503 (3.8)	9.4 (0.05)
Norway (9)	21 (0.9)	526 (4.4)	51 (0.8)	515 (3.1)	29 (0.9)	489 (3.4)	9.4 (0.04)
Hungary	21 (0.9)	539 (6.8)	48 (0.8)	526 (3.4)	32 (1.1)	522 (3.5)	9.3 (0.04)
Slovenia	20 (0.8)	577 (4.2)	52 (0.9)	556 (2.9)	28 (1.0)	525 (3.2)	9.3 (0.04)
Italy	15 (0.7)	516 (4.5)	46 (1.1)	502 (2.9)	40 (1.1)	490 (3.3)	9.0 (0.04)
Korea, Rep. of	13 (0.6)	605 (4.2)	51 (0.9)	566 (1.9)	36 (0.9)	522 (2.5)	9.0 (0.04)
Chinese Taipei	11 (0.5)	616 (4.5)	38 (0.9)	589 (2.5)	51 (1.0)	546 (2.1)	8.6 (0.03)
Japan	9 (0.5)	605 (3.6)	44 (0.8)	586 (2.0)	47 (0.9)	550 (2.3)	8.6 (0.03)
International Avg.	40 (0.2)	506 (0.7)	41 (0.1)	482 (0.6)	19 (0.1)	460 (0.9)	

The proportion of Maltese students who strongly value Mathematics (44%) is marginally higher than the international average (42%); while the proportion of Maltese students who strongly value Science (37%) is marginally lower than the international average (40%). The mean scale scores that measure the value Maltese students give to Mathematics (10.0) and Science (9.9) are comparable to the international averages.

APPENDIX

A. Maltese Students' Responses

Do you have any of these things at home?	Yes	No
A computer or tablet of your own	87.6%	12.4%
A computer or tablet that is shared with others	76.5%	23.5%
Study desk/table for your use	86.5%	13.5%
Your own room	79.2%	20.8%
Internet connection	99.1%	0.9%
Your own mobile phone	96.3%	3.7%
A gaming system	81.0%	19.0%
Flat screen TV, plasma TV, LCD TV, smart TV	91.2%	8.8%
Cable TV, pay TV, satellite TV	89.2%	10.8%
Works of art	72.6%	27.4%
Photovoltaic panels	31.2%	68.8%

How many books are there in your home?	Frequency	Percentage
0-10 books	407	10.8%
11-25 books	811	21.5%
26-100 books	1247	33.0%
101-200 books	743	19.7%
More than 200 books	572	15.1%

What is the highest level of education completed by the student's father and mother?	Father	Mother
Primary or no schooling	20.6%	20.8%
Lower secondary	5.0%	5.3%
Upper secondary	15.0%	18.4%
Post-secondary, non-tertiary	3.0%	2.6%
Short-cycle tertiary	3.2%	4.2%
Bachelor's or equivalent	3.6%	4.0%
Postgraduate degree	8.6%	6.2%
Don't know	41.0%	38.5%

How far in your education do you expect to go?	Frequency	Percentage
Finish Lower secondary	350	9.7%
Finish Upper secondary	942	26.1%
Finish Post-secondary, non-tertiary	268	7.4%
Finish Short-cycle tertiary	349	9.7%
Finish Bachelor's or equivalent	371	10.3%
Finish Postgraduate degree	1327	36.8%

How often do you speak English at home?	Frequency	Percentage
Always	372	9.8%
Almost always	587	15.5%
Sometimes	2074	54.8%
Never	755	19.9%

Were you and your parents (guardians) born in Malta?	Yes	No	Don't know
Child (Student)	82.9%	15.7%	1.3%
Mother (Female guardian)	85.6%	13.7%	0.7%
Father (Male guardian)	91.8%	8.2%	0.0%

How many digital information devices (computers, tablets, smartphones, smart TVs) are in your home?	Frequency	Percentage
None	44	1.2%
1-3 devices	193	5.1%
4-6 devices	799	21.1%
7-10 devices	1330	35.1%
More than 10 devices	1418	37.5%

About how often are you absent from school?	Frequency	Percentage
Once a week or more	181	5.0%
Once every two weeks	211	5.8%
Once a month	850	23.2%
Never or almost never	2414	66.0%

How often do you eat breakfast on school days?	Frequency	Percentage
Every day	1482	39.9%
Most days	538	14.5%
Sometimes	847	22.8%
Never or almost never	846	22.8%

Do you use the Internet to do any of the following tasks for schoolwork?	Yes	No
Access the textbook or other course materials	44.9%	55.1%
Access assignments posted online by my teacher	65.6%	34.4%
Collaborate with classmates on assignments or projects	80.4%	19.6%
Communicate with the teacher	34.6%	65.4%
Find information, articles, or tutorials to aid in understanding mathematics	58.0%	42.0%
Find information, articles, or tutorials to aid in understanding science	60.6%	39.4%

What do you think about your school?	Agree a lot	Agree a little	Disagree a little	Disagree a lot
I like being in school	22.7%	48.1%	18.8%	10.4%
I feel safe when I am at school	36.9%	41.0%	15.1%	7.0%
I feel like I belong at this school	34.7%	36.7%	17.2%	11.3%
I like to see my classmates at school	73.5%	19.7%	4.3%	2.5%
Teachers at my school are fair to me	33.9%	41.5%	18.0%	6.6%
I am proud to go to this school	46.0%	32.4%	13.1%	8.4%
I learn a lot in school	54.0%	34.6%	8.0%	3.5%

Appendix

How often do you use a computer or tablet in Each of these places for schoolwork?	Almost everyday	1-2 times a week	1-2 times a month	Almost never
At home	67.9%	20.9%	8.0%	3.2%
At school	3.8%	33.0%	16.4%	46.8%
Some other place	24.9%	24.4%	19.3%	31.4%

In the last year, have you attended extra lessons not provided by the school in the following subjects?	Yes to excel in class	Yes to keep up in class	No
Mathematics	20.1%	18.1%	61.9%
Science (Biology, Chemistry, Geography, Physics)	5.4%	8.5%	86.1%

During this year, how often have other students from your school done any of the following things to you?	At least once a week	1-2 times a month	A few times a year	Never
Made fun of me or called me names	16.1%	12.5%	29.1%	42.3%
Left me out of their games or activities	7.0%	11.2%	21.9%	60.0%
Spread lies about me	7.2%	10.4%	27.7%	54.7%
Stole something from me	4.0%	5.7%	19.6%	70.7%
Hit or hurt me	5.7%	6.0%	18.1%	70.2%
Made me do things I didn't want to do	3.9%	5.0%	14.2%	76.9%
Shared embarrassing information about me	4.5%	5.6%	16.7%	73.3%
Posted embarrassing things about me online	2.7%	2.6%	6.8%	88.0%
Threatened me	3.7%	4.1%	10.0%	82.1%

How much do you agree with these statements about learning mathematics?	Agree a lot	Agree a little	Disagree a little	Disagree a lot
I enjoy learning mathematics	27.5%	35.4%	21.4%	15.6%
I wish I did not have to study mathematics	25.7%	22.4%	23.9%	27.9%
Mathematics is boring	19.9%	30.7%	27.1%	22.4%
I learn many interesting things in mathematics	28.9%	38.1%	21.8%	11.1%
I like mathematics	27.4%	30.6%	21.5%	20.5%
I like any schoolwork that involves numbers	16.2%	28.1%	31.6%	24.1%
I like to solve mathematics problems	18.0%	25.0%	24.4%	32.5%
I look forward to mathematics class	17.2%	28.9%	29.2%	24.7%
Mathematics is one of my favourite subjects	22.5%	20.1%	22.8%	34.6%

How much do you agree with these statements about your mathematics lessons?	Agree a lot	Agree a little	Disagree a little	Disagree a lot
I know what my teacher expects me to do	49.3%	38.6%	8.0%	4.2%
My teacher is easy to understand	42.9%	31.5%	17.4%	8.3%
I am interested in what my teacher says	39.1%	36.2%	17.4%	7.3%
My teacher gives me interesting things to do	24.9%	32.8%	28.5%	13.9%
My teacher has clear answers to my questions	43.7%	31.9%	15.9%	8.5%
My teacher is good at explaining mathematics	52.4%	26.4%	13.7%	7.5%
My teacher lets me show what I have learned	31.6%	34.8%	22.0%	11.6%
My teacher does a variety of things to help us learn	44.3%	30.0%	17.0%	8.6%
My teacher tells me how to do better when I make a mistake	53.3%	30.9%	10.4%	5.4%
My teacher listens to what I have to say	54.3%	27.5%	11.4%	6.8%

How much do you agree with these statements about mathematics?	Agree a lot	Agree a little	Disagree a little	Disagree a lot
I usually do well in mathematics	28.9%	36.3%	21.9%	13.0%
Mathematics is more difficult for me than for many of my classmates	14.6%	26.9%	33.5%	25.0%
Mathematics is not one of my strengths	26.8%	28.7%	23.9%	20.6%
I learn things quickly in mathematics	23.0%	32.3%	29.2%	15.5%
Mathematics makes me nervous	25.5%	30.0%	24.4%	20.2%
I am good at working out difficult mathematics problems	15.7%	28.0%	29.9%	26.4%
My teacher tells me I am good at mathematics	23.7%	38.1%	24.6%	13.6%
Mathematics is harder for me than any other subject	23.7%	24.4%	25.7%	26.2%
Mathematics makes me confused	25.3%	29.4%	24.4%	20.9%

How much do you agree with these statements about learning mathematics?	Agree a lot	Agree a little	Disagree a little	Disagree a lot
I think learning mathematics will help me in my life	49.8%	31.6%	11.3%	7.3%
I need mathematics to learn other school subjects	40.6%	38.1%	14.2%	7.0%
I need to do well in mathematics to get into the university or vocational institution	64.7%	23.5%	7.3%	4.5%
I need to do well in mathematics to get the job I want	54.5%	25.1%	13.0%	7.3%
I would like a job that involves using mathematics	19.2%	25.8%	25.9%	29.0%
It is important to learn about mathematics to get ahead in the world	46.7%	34.4%	12.7%	6.3%
Learning mathematics will give me more job opportunities when I am an adult	60.0%	29.2%	7.0%	3.7%
My parents think that it is important that I do well in mathematics	75.9%	18.5%	3.6%	2.1%
It is important to do well in mathematics	71.0%	21.8%	4.3%	2.9%

How much do you agree with these statements about science (Biology, Chemistry, Physics, Geography)?	Agree a lot	Agree a little	Disagree a little	Disagree a lot
I think learning science will help me in my life	49.6%	32.2%	11.3%	6.9%
I need science to learn other school subjects	32.3%	32.5%	24.3%	10.9%
I need to do well in science to get into the university or vocational institution	47.5%	26.2%	16.0%	10.2%
I need to do well in science to get the job I want	41.3%	21.0%	21.1%	16.6%
I would like a job that involves using science	31.9%	17.9%	23.0%	27.2%
It is important to learn about science to get ahead in the world	42.9%	32.2%	15.0%	9.9%
Learning science will give me more job opportunities when I am an adult	47.4%	27.5%	14.8%	10.3%
My parents think that it is important that I do well in science	50.0%	28.3%	13.1%	8.5%
It is important to do well in science	53.6%	28.1%	10.3%	8.0%

For how long, in the last year, have you attended extra lessons or tutoring?	Did not attend	Less than 4 months	4-8 months	More than 8 months
Mathematics	62.4%	14.2%	9.3%	14.1%
Science (Biology, Chemistry, Geography, Physics)	85.5%	7.2%	2.7%	4.6%

Appendix

How much do you agree with these statements about learning biology?	Agree a lot	Agree a little	Disagree a little	Disagree a lot
I enjoy learning biology	60.5%	27.2%	7.4%	4.8%
I wish I did not have to study biology	9.4%	14.1%	24.9%	51.6%
Biology is boring	7.1%	13.5%	25.5%	53.9%
I learn many interesting things in biology	72.2%	21.0%	4.0%	2.7%
I like biology	63.9%	22.5%	8.4%	5.3%
I look forward to learning biology in school	55.5%	25.5%	13.4%	5.5%
Biology teaches me how things in the world work	62.9%	27.7%	6.6%	2.8%
I like to conduct biology experiments	61.3%	26.1%	8.1%	4.5%
Biology is one of my favourite subjects	52.0%	23.1%	15.4%	9.5%

How much do you agree with these statements about your biology lessons?	Agree a lot	Agree a little	Disagree a little	Disagree a lot
I know what my teacher expects me to do	60.2%	31.3%	6.1%	2.4%
My teacher is easy to understand	57.0%	24.8%	12.6%	5.6%
I am interested in what my teacher says	63.9%	23.6%	8.7%	3.8%
My teacher gives me interesting things to do	51.4%	28.4%	15.0%	5.3%
My teacher has clear answers to my questions	58.5%	24.4%	12.8%	4.2%
My teacher is good at explaining biology	64.5%	21.4%	9.5%	4.6%
My teacher lets me show what I have learned	45.3%	33.8%	15.8%	5.2%
My teacher does a variety of things to help us learn	55.7%	29.5%	10.7%	4.1%
My teacher tells me how to do better when I make a mistake	59.9%	27.2%	9.7%	3.3%
My teacher listens to what I have to say	63.5%	25.1%	7.6%	3.8%

How much do you agree with these statements about biology?	Agree a lot	Agree a little	Disagree a little	Disagree a lot
I usually do well in biology	42.2%	36.9%	14.6%	6.2%
Biology is more difficult for me than for many of my classmates	9.6%	20.7%	32.2%	37.5%
Biology is not one of my strengths	11.5%	20.8%	31.8%	35.9%
I learn things quickly in biology	34.0%	35.0%	23.1%	7.9%
I am good at working out difficult biology problems	27.5%	32.5%	27.9%	12.1%
My teacher tells me I am good at biology	40.6%	33.8%	18.7%	6.9%
Biology is harder for me than any other subject	10.3%	17.7%	32.4%	39.6%
Biology makes me confused	9.8%	19.6%	28.9%	41.8%

How much do you agree with these statements about learning geography?	Agree a lot	Agree a little	Disagree a little	Disagree a lot
I enjoy learning geography	29.7%	35.7%	18.2%	16.3%
I wish I did not have to study geography	24.6%	24.6%	26.6%	24.1%
Geography is boring	20.5%	24.1%	28.4%	27.1%
I learn many interesting things in geography	39.2%	33.3%	16.5%	11.0%
I like geography	29.8%	31.4%	19.8%	18.9%
I look forward to learning geography in school	23.5%	29.0%	26.9%	20.6%
Geography teaches me how things in the world work	40.4%	36.1%	13.1%	10.4%
I like to conduct geography experiments	22.3%	27.8%	25.2%	24.7%
Geography is one of my favourite subjects	18.4%	22.1%	25.5%	34.0%

How much do you agree with these statements about your geography lessons?	Agree a lot	Agree a little	Disagree a little	Disagree a lot
I know what my teacher expects me to do	41.8%	33.7%	14.2%	10.4%
My teacher is easy to understand	42.5%	31.5%	14.6%	11.3%
I am interested in what my teacher says	38.5%	32.8%	16.6%	12.2%
My teacher gives me interesting things to do	30.0%	27.3%	25.1%	17.6%
My teacher has clear answers to my questions	43.1%	31.6%	14.7%	10.6%
My teacher is good at explaining geography	48.7%	30.9%	11.3%	9.1%
My teacher lets me show what I have learned	31.3%	29.4%	23.8%	15.5%
My teacher does a variety of things to help us learn	39.2%	28.4%	19.5%	12.9%
My teacher tells me how to do better when mistaken	39.6%	32.0%	17.0%	11.4%
My teacher listens to what I have to say	47.1%	30.1%	12.3%	10.6%

How much do you agree with these statements about geography?	Agree a lot	Agree a little	Disagree a little	Disagree a lot
I usually do well in geography	33.6%	39.6%	15.4%	11.4%
Geography is more difficult for me than for many of my classmates	10.3%	21.2%	33.9%	34.6%
Geography is not one of my strengths	19.9%	27.1%	28.7%	24.3%
I learn things quickly in geography	27.4%	34.7%	24.2%	13.7%
I am good at working out difficult geography problems	21.0%	30.1%	28.9%	20.0%
My teacher tells me I am good at geography	25.2%	33.4%	25.1%	16.2%
Geography is harder for me than any other subject	12.9%	20.1%	32.6%	34.4%
Geography makes me confused	14.9%	21.8%	29.4%	33.9%

How much do you agree with these statements about learning chemistry?	Agree a lot	Agree a little	Disagree a little	Disagree a lot
I enjoy learning chemistry	55.1%	26.8%	9.7%	8.5%
I wish I did not have to study chemistry	13.4%	15.1%	23.4%	48.1%
Chemistry is boring	9.9%	16.5%	25.2%	48.4%
I learn many interesting things in chemistry	63.0%	25.5%	7.2%	4.4%
I like chemistry	57.5%	25.2%	9.6%	7.7%
I look forward to learning chemistry in school	50.1%	24.9%	14.7%	10.4%
Chemistry teaches me how things in the world work	61.4%	26.2%	7.8%	4.7%
I like to conduct chemistry experiments	72.7%	17.5%	5.2%	4.6%
Chemistry is one of my favourite subjects	52.4%	21.2%	14.7%	11.7%

How much do you agree with these statements about your chemistry lessons?	Agree a lot	Agree a little	Disagree a little	Disagree a lot
I know what my teacher expects me to do	60.9%	27.9%	8.3%	2.9%
My teacher is easy to understand	52.1%	27.5%	13.2%	7.2%
I am interested in what my teacher says	59.5%	24.4%	10.4%	5.7%
My teacher gives me interesting things to do	50.6%	27.5%	13.9%	8.0%
My teacher has clear answers to my questions	56.8%	25.1%	12.3%	5.8%
My teacher is good at explaining chemistry	62.0%	20.6%	10.7%	6.7%
My teacher lets me show what I have learned	45.8%	28.5%	18.0%	7.6%
My teacher does a variety of things to help us learn	52.1%	28.4%	13.1%	6.4%
My teacher tells me how to do better when mistaken	59.8%	27.0%	9.1%	4.1%
My teacher listens to what I have to say	62.3%	24.7%	8.2%	4.8%

Appendix

How much do you agree with these statements about chemistry?	Agree a lot	Agree a little	Disagree a little	Disagree a lot
I usually do well in chemistry	46.6%	33.1%	13.4%	6.9%
Chemistry is more difficult for me than for many of my classmates	11.4%	18.9%	28.9%	40.7%
Chemistry is not one of my strengths	14.0%	18.3%	26.7%	40.9%
I learn things quickly in chemistry	34.5%	34.0%	22.2%	9.3%
I am good at working out difficult chemistry problems	30.5%	34.6%	23.5%	11.4%
My teacher tells me I am good at chemistry	40.9%	34.8%	16.5%	7.8%
Chemistry is harder for me than any other subject	14.0%	18.5%	29.1%	38.3%
Chemistry makes me confused	13.2%	23.2%	25.8%	37.8%

How much do you agree with these statements about learning physics?	Agree a lot	Agree a little	Disagree a little	Disagree a lot
I enjoy learning physics	41.5%	33.3%	14.6%	10.7%
I wish I did not have to study physics	18.7%	20.1%	27.0%	34.3%
Physics is boring	13.6%	20.8%	29.8%	35.9%
I learn many interesting things in physics	51.2%	31.2%	10.7%	6.9%
I like physics	41.2%	31.2%	14.8%	12.8%
I look forward to learning physics in school	36.7%	30.2%	19.6%	13.5%
Physics teaches me how things in the world work	54.1%	31.9%	7.8%	6.1%
I like to conduct physics experiments	53.8%	28.6%	9.8%	7.8%
Physics is one of my favourite subjects	33.3%	26.0%	21.5%	19.2%

How much do you agree with these statements about your physics lessons?	Agree a lot	Agree a little	Disagree a little	Disagree a lot
I know what my teacher expects me to do	55.1%	32.0%	7.9%	5.0%
My teacher is easy to understand	50.0%	29.8%	12.4%	7.8%
I am interested in what my teacher says	52.3%	28.5%	12.4%	6.8%
My teacher gives me interesting things to do	45.2%	29.9%	16.8%	8.1%
My teacher has clear answers to my questions	52.3%	27.8%	13.1%	6.8%
My teacher is good at explaining physics	56.4%	25.1%	10.7%	7.8%
My teacher lets me show what I have learned	40.9%	33.2%	17.0%	8.9%
My teacher does a variety of things to help us learn	51.6%	29.3%	12.1%	7.0%
My teacher tells me how to do better when I make a mistake	54.5%	30.6%	9.2%	5.8%
My teacher listens to what I have to say	57.8%	27.0%	9.0%	6.2%

How much do you agree with these statements about physics?	Agree a lot	Agree a little	Disagree a little	Disagree a lot
I usually do well in physics	36.5%	35.7%	17.8%	9.9%
Physics is more difficult for me than for many of my classmates	12.6%	23.3%	32.1%	31.9%
Physics is not one of my strengths	17.5%	26.7%	27.6%	28.2%
I learn things quickly in physics	27.5%	34.9%	25.9%	11.7%
I am good at working out difficult physics problems	25.0%	31.2%	26.9%	16.8%
My teacher tells me I am good at physics	31.8%	36.7%	20.8%	10.7%
Physics is harder for me than any other subject	16.3%	22.2%	29.5%	32.0%
Physics makes me confused	17.7%	25.9%	27.2%	29.2%

How much do you agree with these statements about learning science	Agree a lot	Agree a little	Disagree a little	Disagree a lot
I think learning science will help me in my life	49.6%	32.2%	11.3%	6.9%
I need science to learn other school subjects	32.3%	32.5%	24.3%	10.9%
I need to do well in science to get into the university or vocational institution	47.5%	26.2%	16.0%	10.2%
I need to do well in science to get the job I want	41.3%	21.0%	21.1%	16.6%
I would like a job that involves using science	31.9%	17.9%	23.0%	27.2%
It is important to learn about science to get ahead in the world	42.9%	32.2%	15.0%	9.9%
Learning science will give me more job opportunities when I am an adult	47.4%	27.5%	14.8%	10.3%
My parents think that it is important that I do well in science	50.0%	28.3%	13.1%	8.5%
It is important to do well in science	53.6%	28.1%	10.3%	8.0%

How often does your teacher give you homework in the following subjects?	Everyday	3-4 times a week	1-2 times a week	Less than once a week	Never
Mathematics	72.6%	19.9%	4.0%	1.8%	1.6%
Biology	3.5%	10.2%	28.0%	22.4%	35.8%
Geography	6.5%	7.2%	27.3%	34.3%	24.6%
Chemistry	3.6%	8.9%	21.5%	16.5%	49.5%
Physics	6.2%	20.7%	38.7%	25.2%	9.2%

How many minutes do you usually spend on your homework?	No homework	1-15 minutes	16-30 minutes	31-60 minutes	61-90 minutes	More than 90 minutes
Mathematics	2.4%	32.0%	43.3%	16.4%	3.9%	2.0%
Biology	6.9%	18.0%	35.4%	27.2%	7.9%	4.5%
Geography	8.3%	49.4%	26.2%	10.6%	3.3%	2.1%
Chemistry	10.8%	17.7%	36.4%	24.7%	6.4%	4.0%
Physics	3.3%	26.9%	39.9%	22.4%	5.1%	2.4%

B. Maltese Heads of School Responses

Approximately what percentages of students in your school have the following backgrounds?	0-10%	11-25%	26-50%	51-100%
Come from economically disadvantaged homes	72.3%	21.3%	6.4%	0.0%
Come from economically affluent homes	42.6%	21.3%	8.5%	27.7%

Approximately what percentages of students in your school have English as their native language?	Frequency	Percentage
More than 90%	2	4.3%
76 to 90%	2	4.3%
51 to 75%	2	4.3%
26 to 50%	0	0.0%
25% or less	41	87.2%

How many people live in the city, town, or area where your school is located?	Frequency	Percentage
15,001 to 30,000	9	19.1%
3,001 to 15,000	29	61.7%
3,000 or fewer	9	19.1%

Which best describes the immediate area in which your school is located?	Frequency	Percentage
Medium size city or large town	9	19.1%
Small town or village	34	72.3%
Remote rural	4	8.5%

Does your school provide a place and assistance to students to do their schoolwork before/after school?	Frequency	Percentage
Provides a place and assistance to students	3	6.4%
Provides a place but no assistance to students	10	21.3%
Does not provide a place and assistance to students	34	72.3%

How many computers (including tablets) does your school have for use by Year 9 students?	Frequency	Percentage
30 or less	16	34.0%
31- 60	20	42.6%
More than 60	11	23.4%

Are the following available in your school?	Yes	No
Science laboratory	100.0%	0.0%
Assistance to teachers during lab science sessions	92.4%	7.6%
School library	97.9%	2.1%

Does your school provide free meals for students?	Yes, for all students	Yes, for some students	No
Breakfast	0.0%	6.4%	93.6%
Lunch	0.0%	4.3%	95.7%

As a general school policy, is student achievement used to assign Year 9 students to classes?	Yes	No
For mathematics classes	58.7%	41.3%
For science classes	35.6%	64.4%

How many books (print and digital) with different titles does your school library have?	Print	Digital
250 or fewer	0.0%	94.9%
251–500	8.7%	2.6%
501–2,000	30.4%	0.0%
2,001–5,000	19.6%	0.0%
5,001–10,000	28.3%	2.6%
More than 10,000	13.0%	0.0%

How many titles of magazines and other periodicals (print and digital) does your school library have?	Print	Digital
0	4.3%	66.7%
1–5	47.8%	25.6%
6–10	26.1%	0.0%
11–30	17.4%	5.1%
31 or more	4.3%	2.6%

How much is your school affected by a shortage or inadequacy of general school resources?	Not at all	A little	Some	A lot
Instructional materials (e.g., textbooks)	80.9%	8.5%	4.3%	6.4%
Supplies (e.g., papers, pencils, materials)	87.2%	8.5%	2.1%	2.1%
School buildings and grounds	42.6%	36.2%	8.5%	12.8%
Heating/cooling and lighting systems	51.1%	31.9%	14.9%	2.1%
Instructional space (e.g., classrooms)	42.6%	34.0%	14.9%	8.5%
Technologically competent staff	51.1%	31.9%	10.6%	6.4%
Audio-visual resources for delivery of instruction	78.3%	15.2%	2.2%	4.3%
Computer technology for teaching and learning	55.3%	23.4%	17.0%	4.3%
Resources for students with disabilities	29.8%	44.7%	14.9%	10.6%

How much is your school affected by a shortage or inadequacy of resources for mathematics instruction?	Not at all	A little	Some	A lot
Teachers with a specialization in mathematics	83.0%	10.6%	4.3%	2.1%
Computer software/ applications for mathematics instruction	48.9%	34.0%	17.0%	0.0%
Library resources relevant to mathematics instruction	46.8%	31.9%	19.1%	2.1%
Calculators for mathematics instruction	85.1%	10.6%	2.1%	2.1%
Concrete objects or materials to help students understand quantities or procedures	48.9%	34.0%	14.9%	2.1%

Appendix

How much is your school affected by a shortage or inadequacy of resources for science instruction?	Not at all	A little	Some	A lot
Teachers with a specialization in science	83.0%	8.5%	6.4%	2.1%
Computer software/ applications for science instruction	48.9%	31.9%	14.9%	4.3%
Library resources relevant to science instruction	53.2%	25.5%	19.1%	2.1%
Calculators for science instruction	87.2%	8.5%	4.3%	0.0%
Science equipment and materials for experiments	66.0%	23.4%	4.3%	6.4%

How would you characterize each of the following within your school?	Very high	High	Medium	Low	Very low
Teachers' understanding of the school's curricular goals	34.0%	51.1%	14.9%	0.0%	0.0%
Teachers' degree of success in implementing the school's curriculum	21.3%	63.8%	14.9%	0.0%	0.0%
Teachers' expectations for student achievement	23.4%	61.7%	12.8%	2.1%	0.0%
Teachers working together to improve student achievement	14.9%	57.4%	21.3%	6.4%	0.0%
Teachers' ability to inspire students	8.5%	70.2%	21.3%	0.0%	0.0%
Parental involvement in school activities	8.5%	27.7%	38.3%	14.9%	10.6%
Parental commitment to ensure that students are ready to learn	13.0%	41.3%	34.8%	8.7%	2.2%
Parental expectations for student achievement	39.1%	43.5%	17.4%	0.0%	0.0%
Parental support for student achievement	13.0%	39.1%	43.5%	4.3%	0.0%
Parental pressure for the school to maintain high academic standards	23.9%	45.7%	28.3%	2.2%	0.0%
Students' desire to do well in school	19.6%	41.3%	37.0%	2.2%	0.0%
Students' ability to reach school's academic goals	8.7%	50.0%	41.3%	0.0%	0.0%
Students' respect for classmates who excel in school	10.9%	52.2%	34.8%	2.2%	0.0%

To what degree is each of the following a problem among Year 9 students in your school?	Not a problem	Minor problem	Moderate problem	Serious problem
Arriving late at school	59.6%	34.0%	4.3%	2.1%
Absenteeism (i.e., unjustified absences)	51.1%	40.4%	6.4%	2.1%
Classroom disturbance	23.4%	51.1%	21.3%	4.3%
Cheating	55.3%	38.3%	4.3%	2.1%
Swearing	63.8%	25.5%	8.5%	2.1%
Vandalism	46.8%	40.4%	10.6%	2.1%
Theft	67.4%	28.3%	2.2%	2.2%
Intimidation or verbal abuse among students	17.0%	68.1%	12.8%	2.1%
Physical injury to other students	60.9%	30.4%	6.5%	2.2%
Intimidation or verbal abuse of teachers or staff	68.1%	25.5%	2.1%	4.3%
Physical injury to teachers or staff	95.7%	2.1%	0.0%	2.1%

How difficult was it to fill Year 9 teaching vacancies for this school year for the following subjects?	No vacancies	Easy to fill vacancies	Somewhat difficult	Very difficult
Mathematics	74.5%	17.0%	8.5%	0.0%
Science	61.7%	29.8%	8.5%	0.0%
Other	37.0%	39.1%	21.7%	2.2%

To what degree is each of the following a problem among teachers in your school?	Not a problem	Minor problem	Moderate problem	Serious problem
Arriving late or leaving late	53.2%	42.6%	2.1%	2.1%
Absenteeism	53.2%	36.2%	8.5%	2.1%

Does your school currently use any incentives to recruit or retain Year 9 teachers in the following fields?	Yes	No
Mathematics	10.6%	89.4%
Science	12.8%	87.2%
Other	10.9%	89.1%

How many years will you have been a Head of school?	Altogether	At this school
0-4 years	55.3%	66.0%
5-9 years	19.0%	23.4%
10-19 years	21.3%	6.4%
20 years or more	4.4%	4.2%

What is the highest level of formal education you have completed?	Frequency	Percentage
Did not complete Bachelor's Degree or, Vocational Education and Training Degree or equivalent level	0	0.0%
Bachelor's Degree, Vocational Education and Training Degree or equivalent level	20	42.5%
Master's or equivalent level	26	55.3%
Doctorate or equivalent level	1	2.2%

Do you hold the following degrees in educational leadership?	Yes	No
Master's or equivalent level	59.6%	40.4%
Doctorate or equivalent level	0.0%	100.0%

C. Maltese Mathematics Teachers' Responses

By the end of this school year, how many years will you have been teaching?	Frequency	Percentage
0-4 years	49	23.0%
5-9 years	51	23.9%
10-19 years	81	38.1%
20 years or more	32	15.0%

How old are you?	Frequency	Percentage
Under 25	25	11.7%
25-29	46	21.6%
30-39	87	40.8%
40-49	37	17.4%
50-59	13	6.1%
60 or more	5	2.3%

Highest level of formal education completed	Frequency	Percentage
Upper secondary	3	1.4%
Short-cycle tertiary	12	5.6%
Bachelor's or equivalent	171	80.2%
Master's or equivalent	27	12.7%

During your tertiary education, what was your major or main area(s) of study?	Frequency	Percentage
Mathematics	184	87.6%
Biology	2	1.0%
Physics	62	29.5%
Chemistry	5	2.4%
Geography	1	0.5%
Education - Mathematics	158	75.2%
Education - Science	33	15.7%
Education - General	99	47.1%
Other	60	28.6%

Indicate the extent to which you agree or disagree with each of the following statements	Agree a lot	Agree a little	Disagree a little	Disagree a lot
This school is located in a safe neighbourhood	71.8%	20.2%	7.5%	0.5%
I feel safe at this school	70.4%	24.9%	3.8%	0.9%
This school's security policies and practices are sufficient	51.2%	32.9%	12.7%	3.3%
The students behave in an orderly manner	34.3%	44.1%	14.1%	7.5%
The students are respectful of the teachers	34.7%	43.2%	16.4%	5.6%
The students respect school property	31.0%	41.8%	20.2%	7.0%
This school has clear rules about student conduct	49.8%	38.0%	10.3%	1.9%
This school's rules are enforced in a fair and consistent manner	40.4%	37.6%	20.2%	1.9%

What is your gender?	Frequency	Percentage
Male	137	64.3%
Female	76	35.7%

How would you characterize each of the following within your school?	Very high	High	Medium	Low	Very low
Teachers' understanding of the school's curricular goals	35.7%	48.8%	13.6%	1.9%	0.0%
Teachers' degree of success in implementing the school's curriculum	24.4%	54.5%	18.3%	2.3%	0.5%
Teachers' expectations for student achievement	23.0%	51.6%	21.1%	3.8%	0.5%
Teachers working together to improve student achievement	19.2%	45.1%	31.5%	2.8%	1.4%
Teachers' ability to inspire students	17.4%	55.9%	25.8%	0.5%	0.5%
Parental involvement in school activities	3.3%	28.2%	39.0%	23.0%	6.6%
Parental commitment to ensure that students are ready to learn	2.8%	32.4%	43.2%	16.9%	4.7%
Parental expectations for student achievement	16.4%	45.1%	30.5%	5.6%	2.3%
Parental support for student achievement	4.7%	33.3%	44.6%	14.6%	2.8%
Parental pressure for the school to maintain high academic standards	15.0%	37.6%	33.8%	10.3%	3.3%
Students' desire to do well in school	8.9%	42.7%	38.0%	8.9%	1.4%
Students' ability to reach school's academic goals	6.1%	37.1%	49.3%	6.1%	1.4%
Students' respect for classmates who excel in school	8.9%	44.6%	39.0%	5.6%	1.9%
Clarity of the school's educational objectives	15.1%	55.2%	25.9%	3.3%	0.5%
Collaboration between school leadership and teachers to plan instruction	13.6%	45.5%	33.8%	6.1%	0.9%
Amount of instructional support provided to teachers by school leadership	12.2%	49.3%	33.3%	4.7%	0.5%
School leadership's support for teachers' professional development	20.2%	50.7%	25.4%	2.8%	0.9%

In your current school, how severe is each problem?	Not a problem	Minor problem	Moderate problem	Serious problem
The school building needs significant repair	47.4%	33.3%	12.7%	6.6%
Teachers do not have adequate workspace	32.4%	35.7%	22.1%	9.9%
Teachers do not have adequate instructional materials and supplies	45.1%	32.9%	19.2%	2.8%
The school classrooms are not cleaned often enough	54.5%	32.9%	8.9%	3.8%
The school classrooms need maintenance work	48.4%	32.9%	13.1%	5.6%
Teachers do not have adequate technological resources	50.7%	26.8%	14.6%	8.0%
Teachers do not have adequate support for using technology	46.9%	33.8%	15.0%	4.2%

How many students are in this class?	Frequency	Percentage
Less than 15	48	23.1%
15-20	72	34.6%
21-25	79	38.0%
More than 25	9	4.3%

Appendix

How often do you have the following types of interactions with other teachers?	Very often	Often	Sometimes	Almost never
Discuss how to teach a particular topic	24.9%	36.2%	29.1%	9.9%
Collaborate in planning/preparing instruction material	21.6%	26.8%	36.6%	15.0%
Share what I learnt about my teaching experiences	21.1%	30.5%	39.0%	9.4%
Visit another classroom to learn more about teaching	3.3%	3.8%	16.4%	76.5%
Work together to try out new ideas	12.3%	19.8%	45.8%	22.2%
Work as a group on implementing the curriculum	21.1%	24.9%	38.5%	15.5%
Work with teachers from other grades to ensure continuity in learning	12.7%	21.6%	45.1%	20.7%

How often do you feel the following way about being a teacher?	Very often	Often	Sometimes	Almost never
I am content with my profession as a teacher	54.5%	33.3%	12.2%	0.0%
I am satisfied with being a teacher at this school	50.2%	31.5%	16.0%	2.3%
I find my work full of meaning and purpose	41.3%	39.0%	19.2%	0.5%
I am enthusiastic about my job	46.7%	39.2%	13.7%	0.5%
My work inspires me	45.8%	36.3%	17.5%	0.5%
I am proud of the work I do	60.1%	27.7%	11.7%	0.5%
I am going to continue teaching for as long as I can	45.3%	31.6%	19.3%	3.8%

Indicate the extent to which you agree or disagree with each of the following statements	Agree a lot	Agree a little	Disagree a little	Disagree a lot
There are too many students in the classes	23.5%	44.6%	19.2%	12.7%
I have too much material to cover in class	50.2%	35.2%	10.8%	3.8%
I have too many teaching hours	16.4%	39.0%	30.5%	14.1%
I need more time to prepare for class	31.9%	43.2%	21.6%	3.3%
I need more time to assist individual students	60.4%	32.1%	6.6%	0.9%
I feel too much pressure from parents	6.2%	32.7%	42.2%	19.0%
I have difficulty keeping up with all of the changes to the curriculum	9.9%	35.8%	36.3%	17.9%
I have too many administrative tasks	16.9%	36.2%	31.5%	15.5%

How often do you do the following in teaching this class?	Almost every lesson	About half the lessons	Some lessons	Never
Relate the lesson to students' daily lives	39.4%	34.1%	26.4%	0.0%
Ask students to explain their answers	54.3%	28.8%	16.8%	0.0%
Ask students to complete challenging exercises that require them to go beyond the instruction	19.7%	28.8%	48.1%	3.4%
Encourage classroom discussions among students	33.7%	26.0%	38.9%	1.4%
Link new content to students' prior knowledge	69.7%	26.9%	3.4%	0.0%
Ask students to give their problem solving procedure	37.0%	34.1%	27.4%	1.4%
Encourage students to express their ideas in class	65.4%	22.6%	12.0%	0.0%

In a typical week, how much time do you spend teaching mathematics to the students in this class?	Frequency	Percentage
200 minutes or less	119	58.3%
201-240	81	39.7%
More than 240 minutes	4	2.0%

In your view, to what extent do the following limit how you teach this class?	Not at all	Some	A lot
Students lacking prerequisite knowledge or skills	7.2%	54.3%	38.5%
Students suffering from lack of basic nutrition	73.1%	23.6%	3.4%
Students suffering from not enough sleep	46.6%	50.0%	3.4%
Disruptive students	24.0%	56.3%	19.7%
Uninterested students	17.3%	59.1%	23.6%
Students with physical disabilities	83.2%	14.9%	1.9%
Students with mental, emotional, or psychological disabilities	42.8%	49.5%	7.7%

How many Year 9 students experience difficulties understanding spoken English?	Frequency	Percentage
0	79	38.2%
1-2	25	12.0%
3-5	43	20.8%
6-10	32	15.5%
More than 10	28	13.5%

In teaching mathematics to this class, how would you characterize your confidence in doing the following?	Very high	High	Medium	Low
Inspiring students to learn mathematics	30.4%	53.6%	15.5%	0.5%
Showing students problem solving strategies	32.9%	52.7%	13.5%	1.0%
Providing challenging tasks for the highest achievers	23.2%	43.0%	29.0%	4.8%
Adapting my teaching to engage students' interest	30.4%	57.0%	12.1%	0.5%
Helping students appreciate the value of learning mathematics	34.0%	50.5%	14.6%	1.0%
Assessing student comprehension of mathematics	31.9%	56.5%	11.6%	0.0%
Improving the understanding of struggling students	25.7%	53.9%	19.4%	1.0%
Making mathematics relevant to students	28.0%	53.6%	16.9%	1.4%
Developing students' higher-order thinking skills	21.4%	47.6%	27.7%	3.4%

In teaching mathematics to this class, how often do you ask students to do the following?	Almost every lesson	About half the lessons	Some lessons	Never
Listen to me explain new mathematics content	54.8%	29.3%	15.9%	0.0%
Listen to me explain how to solve problems	46.2%	28.4%	24.0%	1.4%
Memorize rules, procedures, and facts	15.4%	31.7%	44.2%	8.7%
Work problems (individually/peers) with my guidance	41.8%	38.0%	19.7%	0.5%
Work problems together in the whole class with direct guidance from me	35.1%	38.9%	24.5%	1.4%
Work problems (individually or with peers) while I am occupied by other tasks	10.1%	20.2%	29.3%	40.4%
Work on problems for which there is no immediately obvious method of solution	3.9%	19.3%	54.1%	22.7%
Take a written test or quiz	1.9%	8.7%	80.8%	8.7%
Work in mixed ability groups	10.6%	17.4%	56.0%	15.9%
Work in same ability groups	3.9%	17.9%	47.3%	30.9%

Appendix

Are the students in this class permitted to use calculators during mathematics lessons?	Frequency	Percentage
Yes, with unrestricted use	62	30.0%
Yes, with restricted use	145	70.0%
No, calculators are not permitted	0	0.0%

How often do students in this class use calculators in their mathematics lessons for the following activities?	Almost every lesson	About half the lessons	Some lessons	Never
Check answers	52.2%	24.2%	22.2%	1.4%
Do routine computations	43.2%	37.9%	18.9%	0.0%
Solve complex problems	45.9%	27.1%	21.7%	5.3%
Explore number concepts	22.3%	25.7%	45.1%	6.8%

Do the students in this class have computers/tablets available to use during their mathematics lessons?	Frequency	Percentage
Yes	9	4.3%
No	199	95.7%

If computers are available, what access do the students have to these computers?	Yes	No
Each student has a computer	0	9
The class has computers that students can share	2	7
The school has computers that the class can use sometimes	9	0

If computers are available, how often do the students do these activities on computers during lessons?	Almost every day	Once or twice a week	Once or twice a month	Almost never
Explore mathematics principles and concepts	0	1	4	4
Practice skills and procedures	1	0	4	4
Look up ideas and information	0	0	4	5
Process and analyze data	0	0	5	4

Choose the response that best describes when the students in this class have been taught Numbers	Mostly taught before this year	Mostly taught this year	Not yet taught or not introduced
Computing with whole numbers	87.4%	12.1%	0.5%
Comparing and ordering rational numbers	73.8%	24.3%	1.9%
Computing with rational numbers (fractions, decimals, and integers)	59.7%	39.8%	0.5%
Concepts of irrational numbers	22.3%	29.1%	48.5%
Problem solving involving percentages or proportions	25.9%	66.8%	7.3%

How often do you usually assign mathematics homework to the students in this class?	Frequency	Percentage
I do not assign mathematics homework	7	3.4%
Less than once a week	4	1.9%
1 or 2 times a week	12	5.8%
3 or 4 times a week	61	29.5%
Every day	123	59.4%

Choose the response that best describes when the students in this class have been taught Algebra	Mostly taught before this year	Mostly taught this year	Not yet taught or not introduced
Simplifying and evaluating algebraic expressions	35.4%	58.3%	6.3%
Simple linear equations and inequalities	17.5%	66.0%	16.5%
Simultaneous (two variables) equations	1.0%	51.5%	47.6%
Numeric, algebraic, and geometric patterns or sequences (extension, missing terms, patterns)	17.5%	61.7%	20.9%
Representation of functions as ordered pairs, tables, graphs, words, or equations	13.1%	59.7%	27.2%
Properties of functions (slopes, intercepts, etc.)	10.7%	52.9%	36.4%

Choose the response that best describes when the students in this class have been taught Geometry	Mostly taught before this year	Mostly taught this year	Not yet taught or not introduced
Geometric properties of angles and geometric shapes (triangles, quadrilaterals, and polygons)	49.8%	47.8%	2.4%
Congruent figures and similar triangles	1.0%	9.2%	89.9%
Relationship between three-dimensional shapes and their two-dimensional representations	16.9%	30.9%	52.2%
Using appropriate measurement formulas for areas, volumes perimeters, circumferences, surface areas)	16.4%	70.5%	13.0%
Points on the Cartesian plane	42.0%	40.1%	17.9%
Translation, reflection, and rotation	35.7%	15.9%	48.3%

Choose the response that best describes when the students in class have been taught Data and Chance	Mostly taught before this year	Mostly taught this year	Not yet taught or not introduced
Characteristics of data sets (mean, median, mode, and shape of distributions)	40.1%	45.4%	14.5%
Interpreting data sets(e.g., draw conclusions, make predictions)	16.0%	31.6%	52.4%
Judging, predicting, and determining the chances of possible outcomes	27.1%	27.5%	45.4%

When you assign mathematics homework to the students how many minutes do you usually assign?	Frequency	Percentage
15 minutes or less	49	24.5%
16–30 minutes	120	60.0%
31–60 minutes	31	15.5%
61–90 minutes	0	0.0%
More than 90 minutes	0	0.0%

How often do you do the following with the mathematics homework assignments for this class?	Almost always	Sometimes	Almost never
Correct assignments and give feedback to students	41.0%	57.0%	2.0%
Have students correct their own homework	54.0%	32.5%	13.5%
Discuss the homework in class	85.0%	14.5%	0.5%
Monitor whether or not the homework was completed	80.9%	19.1%	0.0%
Use the homework to contribute towards students' grades or marks	48.5%	45.5%	6.0%

Appendix

How much emphasis do you place on the following sources to monitor students' progress in mathematics?	Major emphasis	Some emphasis	Little or no emphasis
Assessment of students' ongoing work	74.3%	25.2%	0.5%
Classroom tests (teacher-made or textbook tests)	54.4%	36.4%	9.2%
National or regional achievement tests	37.6%	30.2%	32.2%

In the past two years, have you participated in professional development in any of the following?	Frequency	Percentage
Mathematics content	102	45.1%
Mathematics pedagogy/instruction	126	59.9%
Mathematics curriculum	113	53.7%
Integrating information technology into mathematics	121	57.4%
Improving students' critical thinking or problem solving skills	74	33.3%
Mathematics assessment	86	41.3%
Addressing individual students' needs	92	43.8%

How well prepared do you feel you are to teach Numbers?	Not applicable	Very well prepared	Somewhat prepared	Not well prepared
Computing with whole numbers	16.1%	81.0%	2.8%	0.0%
Comparing and ordering rational numbers	14.2%	82.9%	2.8%	0.0%
Computing with rational numbers (fractions, decimals, and integers)	5.7%	90.0%	4.3%	0.0%
Concepts of irrational numbers	32.4%	53.8%	12.9%	1.0%
Problem solving involving percentages or proportions	4.3%	91.4%	4.3%	0.0%

How well prepared do you feel you are to teach Algebra?	Not applicable	Very well prepared	Somewhat prepared	Not well prepared
Simplifying and evaluating algebraic expressions	8.1%	87.7%	4.3%	0.0%
Simple linear equations and inequalities	10.9%	84.4%	4.7%	0.0%
Simultaneous (two variables) equations	24.6%	72.0%	2.8%	0.5%
Numeric, algebraic, and geometric patterns or sequences (extension, missing terms, patterns)	9.0%	82.0%	9.0%	0.0%
Representation of functions as ordered pairs, tables, graphs, words, or equations	10.0%	82.0%	8.0%	0.0%
Properties of functions (slopes, intercepts, etc.)	15.7%	74.8%	9.5%	0.0%

How well prepared do you feel you are to teach Geometry?	Not applicable	Very well prepared	Somewhat prepared	Not well prepared
Geometric properties of angles and geometric shapes (triangles, quadrilaterals, and polygons)	6.3%	90.8%	2.9%	0.0%
Congruent figures and similar triangles	55.5%	40.2%	4.3%	0.0%
Relationship between three-dimensional shapes and their two-dimensional representations	30.3%	57.7%	11.5%	0.5%
Using appropriate measurement formulas for areas, volumes perimeters, circumferences, surface areas	7.7%	88.5%	3.8%	0.0%
Points on the Cartesian plane	14.4%	81.3%	4.3%	0.0%
Translation, reflection, and rotation	39.7%	53.1%	7.2%	0.0%

How well prepared do you feel you are to teach Data and Chance?	Not applicable	Very well prepared	Somewhat prepared	Not well prepared
Characteristics of data sets (mean, median, mode, and shape of distributions)	14.4%	80.4%	5.3%	0.0%
Interpreting data sets (e.g., draw conclusions, make predictions)	32.7%	53.4%	13.9%	0.0%
Judging, predicting, and determining the chances of possible outcomes	19.7%	68.8%	11.5%	0.0%

In the past two years, how many hours have you spent in all in formal in-service/professional development?	Frequency	Percentage
None	29	13.7%
Less than 6 hours	41	19.4%
6–15 hours	62	29.4%
16–35 hours	55	26.1%
More than 35 hours	24	11.4%

D. Maltese Science Teachers' Responses

Subjects taught	Frequency	Percentage
Physics	261	42.9%
Biology	119	19.6%
Chemistry	86	14.1%
Geography	129	21.2%
Integrated Science	13	2.1%

By the end of this school year, how many years will you have been teaching?	Frequency	Percentage
0-4 years	156	28.0%
5-9 years	140	25.1%
10-19 years	173	31.0%
20 years or more	89	15.9%

What is your gender?	Frequency	Percentage
Male	389	69.6%
Female	170	30.4%

How old are you?	Frequency	Percentage
Under 25	64	11.4%
25-29	158	28.3%
30-39	174	31.1%
40-49	111	19.9%
50-59	46	8.2%
60 or more	6	1.1%

Highest level of formal education completed	Frequency	Percentage
Upper secondary	3	.5%
Short-cycle tertiary	7	1.3%
Bachelor's or equivalent	425	76.0%
Master's or equivalent	118	21.1%
Doctor or equivalent	6	1.1%

During your tertiary education, what was your major or main area(s) of study?	Frequency	Percentage
Mathematics	145	26.2%
Biology	186	33.6%
Physics	238	43.0%
Chemistry	143	25.8%
Geography	120	21.7%
Education - Mathematics	79	14.3%
Education - Science	234	42.5%
Education - General	207	37.4%
Other	124	22.5%

How would you characterize each of the following within your school?	Very high	High	Medium	Low	Very low
Teachers' understanding of the school's curricular goals	37.6%	48.4%	13.1%	0.5%	0.4%
Teachers' degree of success in implementing the school's curriculum	22.9%	54.7%	20.6%	1.3%	0.5%
Teachers' expectations for student achievement	24.0%	49.1%	24.7%	2.0%	0.2%
Teachers working together to improve student achievement	20.1%	48.0%	27.2%	4.3%	0.4%
Teachers' ability to inspire students	18.6%	55.4%	25.1%	0.9%	0.0%
Parental involvement in school activities	5.4%	19.7%	48.1%	20.8%	5.9%
Parental commitment to ensure that students are ready to learn	6.1%	24.8%	46.4%	18.3%	4.3%
Parental expectations for student achievement	14.7%	36.3%	40.8%	6.5%	1.8%
Parental support for student achievement	5.6%	24.9%	53.2%	13.4%	2.9%
Parental pressure for the school to maintain high academic standards	14.0%	35.1%	38.4%	9.9%	2.7%
Students' desire to do well in school	9.0%	38.0%	45.7%	5.9%	1.4%
Students' ability to reach school's academic goals	4.5%	34.9%	51.3%	8.1%	1.3%
Students' respect for classmates who excel in school	6.3%	37.3%	44.3%	9.3%	2.7%
Clarity of the school's educational objectives	16.7%	48.0%	30.3%	2.9%	2.2%
Collaboration between school leadership and teachers to plan instruction	16.3%	42.7%	31.5%	5.7%	3.8%
Amount of instructional support provided to teachers by school leadership	13.8%	45.7%	30.1%	7.5%	2.9%
School leadership's support for teachers' professional development	17.7%	52.1%	24.7%	4.3%	1.3%

Indicate the extent to which you agree or disagree with each of the following statements	Agree a lot	Agree a little	Disagree a little	Disagree a lot
This school is located in a safe neighbourhood	73.3%	16.6%	8.8%	1.3%
I feel safe at this school	71.0%	22.7%	4.1%	2.1%
This school's security policies and practices are sufficient	46.5%	36.5%	12.0%	5.0%
The students behave in an orderly manner	33.5%	39.2%	19.5%	7.7%
The students are respectful of the teachers	30.3%	43.9%	18.8%	7.0%
The students respect school property	20.8%	42.7%	28.3%	8.2%
This school has clear rules about student conduct	48.7%	33.9%	14.3%	3.0%
This school's rules are enforced in a fair and consistent manner	36.9%	40.1%	18.6%	4.3%

In your current school, how severe is each problem?	Not a problem	Minor problem	Moderate problem	Serious problem
The school building needs significant repair	41.9%	36.5%	18.8%	2.9%
Teachers do not have adequate workspace	32.4%	37.6%	21.0%	9.0%
Teachers do not have adequate instructional materials and supplies	42.6%	38.1%	17.0%	2.3%
The school classrooms are not cleaned often enough	58.8%	22.6%	10.4%	8.2%
The school classrooms need maintenance work	46.8%	30.6%	18.8%	3.8%
Teachers do not have adequate technological resources	49.6%	31.1%	15.9%	3.4%
Teachers do not have adequate support for using technology	49.2%	31.1%	17.2%	2.5%

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How often do you have the following types of interactions with other teachers?	Very often	Often	Sometimes	Almost never
Discuss how to teach a particular topic	21.9%	30.7%	37.7%	9.7%
Collaborate in planning and preparing instructional materials	20.8%	27.5%	38.2%	13.5%
Share what I have learned about my teaching experiences	21.9%	33.8%	35.7%	8.6%
Visit another classroom to learn more about teaching	3.8%	5.9%	19.3%	71.0%
Work together to try out new ideas	12.8%	23.9%	46.8%	16.5%
Work as a group on implementing the curriculum	19.1%	27.7%	37.5%	15.7%
Work with teachers from other grades to ensure continuity in learning	11.0%	19.6%	34.1%	35.4%

How often do you feel the following way about being a teacher?	Very often	Often	Sometimes	Almost never
I am content with my profession as a teacher	49.4%	37.2%	12.0%	1.4%
I am satisfied with being a teacher at this school	48.0%	35.5%	14.5%	2.0%
I find my work full of meaning and purpose	41.5%	42.6%	14.0%	2.0%
I am enthusiastic about my job	47.4%	36.9%	14.1%	1.6%
My work inspires me	39.9%	43.6%	14.5%	2.0%
I am proud of the work I do	49.9%	42.0%	6.4%	1.6%
I am going to continue teaching for as long as I can	39.8%	36.2%	18.6%	5.4%

Indicate the extent to which you agree or disagree with each of the following statements	Agree a lot	Agree A little	Disagree A little	Disagree A lot
There are too many students in the classes	12.4%	35.8%	26.2%	25.6%
I have too much material to cover in class	51.2%	37.9%	9.3%	1.6%
I have too many teaching hours	14.5%	38.8%	34.3%	12.4%
I need more time to prepare for class	33.0%	47.0%	16.3%	3.8%
I need more time to assist individual students	53.9%	40.4%	4.7%	1.1%
I feel too much pressure from parents	4.8%	25.7%	43.6%	25.9%
I have difficulty keeping up with all of the changes to the curriculum	15.3%	27.8%	40.0%	16.9%
I have too many administrative tasks	16.1%	41.7%	26.3%	15.9%

How many students are in this class?	Frequency	Percentage
Less than 15	289	53.9%
15-20	180	33.6%
21-25	64	11.9%
More than 25	3	0.6%

How many Year 9 students experience difficulties understanding spoken English?	Frequency	Percentage
0	200	37.5%
1-2	112	20.9%
3-5	91	17.1%
6-10	89	16.6%
More than 10	42	7.9%

How often do you do the following in teaching this class?	Almost every lesson	About half the lessons	Some lessons	Never
Relate the lesson to students' daily lives	66.2%	23.2%	10.6%	0.0%
Ask students to explain their answers	54.8%	30.7%	13.9%	0.6%
Ask students to complete challenging exercises that require them to go beyond the instruction	17.1%	34.8%	43.9%	4.1%
Encourage classroom discussions among students	37.5%	31.2%	27.5%	3.7%
Link new content to students' prior knowledge	68.4%	24.0%	7.2%	0.4%
Ask students to decide their own problem solving procedures	13.0%	29.6%	48.9%	8.6%
Encourage students to express their ideas in class	58.5%	27.0%	13.4%	1.1%

In your view, to what extent do the following limit how you teach this class?	Not at all	Some	A lot
Students lacking prerequisite knowledge or skills	15.3%	61.6%	23.1%
Students suffering from lack of basic nutrition	79.9%	15.8%	4.3%
Students suffering from not enough sleep	50.1%	41.3%	8.6%
Disruptive students	39.4%	40.5%	20.1%
Uninterested students	25.3%	50.7%	24.0%
Students with physical disabilities	85.3%	13.1%	1.7%
Students with mental, emotional, or psychological disabilities	53.7%	39.7%	6.5%

In a typical week, how much time do you spend teaching science to the students in this class?	Frequency	Percentage
120 minutes or less	145	22.8%
121-160 minutes	310	63.5%
More than 240 minutes	72	13.7%

In teaching science to this class, how would you characterize your confidence in doing the following?	Very high	High	Medium	Low
Inspiring students to learn science	36.7%	49.1%	13.0%	1.3%
Explaining science concepts or principles by doing science experiments	34.2%	44.9%	16.7%	4.1%
Providing challenging tasks for the highest achieving students	25.1%	43.2%	28.3%	3.4%
Adapting my teaching to engage students' interest	36.0%	50.6%	13.2%	0.2%
Helping students appreciate the value of learning science	33.0%	52.2%	13.0%	1.9%
Assessing students comprehension of science	27.5%	54.5%	17.2%	0.8%
Improving the understanding of struggling students	21.3%	54.8%	22.0%	1.9%
Making science relevant to students	38.2%	50.1%	11.3%	0.4%
Developing students' higher-order thinking skills	23.9%	44.6%	28.1%	3.4%
Teaching science using inquiry methods	20.0%	45.3%	29.8%	4.9%

Do the students in this class have computers/tablets available to use during their science lessons?	Frequency	Percentage
Yes	42	7.9%
No	490	92.1%

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In teaching science to this class, how often do you ask students to do the following?	Almost every lesson	About half the lessons	Some lessons	Never
Listen to me explain new science content	44.1%	37.1%	17.5%	1.3%
Observe natural phenomena and describe what they see	17.0%	48.1%	32.3%	2.6%
Watch me demonstrate an experiment or investigation	4.9%	31.3%	54.9%	8.9%
Design or plan experiments or investigations	0.9%	22.6%	62.3%	14.1%
Conduct experiments or investigations	2.6%	37.3%	49.2%	10.9%
Present data from experiments or investigations	2.3%	28.2%	58.4%	11.1%
Interpret data from experiments or investigations	2.1%	32.3%	55.1%	10.6%
Use evidence from experiments or investigations to support conclusions	8.1%	37.4%	47.4%	7.2%
Read their textbooks or other resource materials	17.0%	27.4%	36.0%	19.6%
Have students memorize facts and principles	9.6%	21.9%	51.4%	17.0%
Use scientific formulas and laws to solve routine problems	12.5%	27.3%	34.8%	25.4%
Do field work outside of class	0.4%	3.2%	52.0%	44.4%
Take a written test or quiz	0.4%	8.5%	85.7%	5.5%
Work in mixed ability groups	11.7%	24.3%	53.4%	10.6%
Work in same ability groups	1.7%	15.7%	51.2%	31.4%

If computers are available, what access do the students have to these computers?	Yes	No
Each student has a computer	5	37
The class has computers that students can share	30	12
The school has computers that the class can use sometimes	28	14

If computers are available, how often do the students do these activities on computers during lessons?	Almost every day	Once or twice a week	Once or twice a month	Almost never
Practice skills and procedures	2.4%	19.0%	38.1%	40.5%
Look up ideas and information	0.0%	40.5%	26.2%	33.3%
Do scientific procedures or experiments	2.4%	14.3%	42.9%	40.5%
Study natural phenomena through simulations	4.8%	40.5%	23.8%	31.0%
Process and analyze data	0.0%	28.6%	33.3%	38.1%

Choose the response that best describes when the students in this class have been taught Biology	Mostly taught before this year	Mostly taught this year	Not yet taught or not introduced
Differences among major taxonomic groups of organisms	25.6%	31.4%	43.0%
Major organs and organ systems in humans and other organisms	21.0%	14.3%	64.7%
Cells, their structure and functions, including respiration and photosynthesis as cellular processes	21.3%	34.0%	44.7%
Life cycles, sexual reproduction, and heredity	15.4%	5.9%	78.7%
Role of variation and adaptation in survival/extinction of species in a changing environment	18.6%	13.0%	68.4%
Interdependence of populations of organisms in an ecosystem	26.3%	16.0%	57.7%
Human health and the importance of diet and exercise in maintaining health	24.9%	11.1%	64.0%

Choose the response that best describes when the students in this class have been taught Chemistry	Mostly taught before this year	Mostly taught this year	Not yet taught or not introduced
Classification, composition, and particulate structure of matter	25.7%	28.4%	45.9%
Physical and chemical properties of matter	26.3%	30.8%	43.0%
Mixtures and solutions	25.2%	27.3%	47.5%
Properties and uses of common acids and bases	24.7%	15.6%	59.7%
Chemical change	13.5%	24.4%	62.1%
The role of electrons in chemical bonds	8.8%	28.9%	62.3%

Choose the response that best describes when the students in this class have been taught Physics	Mostly taught before this year	Mostly taught this year	Not yet taught or not introduced
Physical states and changes in matter	12.1%	50.5%	37.4%
Energy forms, transformations, heat, and temperature	8.8%	44.0%	47.2%
Basic properties/behaviours of light	6.3%	13.9%	79.8%
Electric circuits and properties and uses of permanent magnets and electromagnets	7.3%	4.8%	87.9%
Forces and motion	9.1%	55.9%	35.0%

Choose the response that best describes when the students in class have been taught Earth Science topics	Mostly taught before this year	Mostly taught this year	Not yet taught or not introduced
Earth's structure and physical features	33.9%	14.7%	51.4%
Earth's processes, cycles, and history	20.3%	27.7%	52.0%
Earth's resources, their use and conservation	17.7%	29.6%	52.7%
Earth in the solar system and the universe	15.9%	15.2%	68.9%

How often do you usually assign science homework to the students in this class?	Frequency	Percentage
I do not assign science homework	20	3.8%
Less than once a week	215	40.6%
1 or 2 times a week	278	52.5%
3 or 4 times a week	13	2.5%
Every day	4	0.8%

When you assign science homework to the student, how many minutes do you usually assign?	Frequency	Percentage
15 minutes or less	92	18.1%
16–30 minutes	265	52.1%
31–60 minutes	132	25.9%
61–90 minutes	20	3.9%
More than 90 minutes	0	0.0%

How much emphasis do you place on the following sources to monitor students' progress in science?	Major emphasis	Some emphasis	Little or no emphasis
Assessment of students' ongoing work	71.0%	28.1%	0.9%
Classroom tests (teacher-made or textbook tests)	46.4%	46.0%	7.5%
National or regional achievement tests	34.7%	34.5%	30.9%

Appendix

In the past two years, how many hours have you spent in all in formal in-service/professional development?	Frequency	Percentage
None	58	10.6%
Less than 6 hours	105	19.2%
6–15 hours	182	33.2%
16–35 hours	158	28.8%
More than 35 hours	45	8.2%

How often do you do the following with the science homework assignments for this class?	Almost always	Sometimes	Almost never
Correct assignments and give feedback to students	66.9%	31.2%	2.0%
Have students correct their own homework	11.0%	56.2%	32.7%
Discuss the homework in class	49.2%	48.0%	2.8%
Monitor whether or not the homework was completed	85.4%	14.0%	0.6%
Use the homework to contribute towards students' grades or marks	69.8%	27.8%	2.4%

In the past two years, have you participated in professional development in any of the following?	Frequency	Percentage
Science content	300	55.1%
Science pedagogy/instruction	327	60.0%
Science curriculum	328	60.3%
Integrating information technology into science	307	56.3%
Improving students' critical thinking or problem-solving skills	242	44.6%
Science assessment	203	37.2%
Addressing individual students' needs	267	49.0%

How well prepared do you feel you are to teach Chemistry?	Not applicable	Very well prepared	Somewhat prepared	Not well prepared
Classification, composition, and particulate structure of matter	70.5%	24.5%	1.9%	3.0%
Physical and chemical properties of matter	68.8%	24.7%	3.4%	3.0%
Mixtures and solutions	71.8%	21.5%	3.2%	3.4%
Properties and uses of common acids and bases	74.0%	19.8%	2.8%	3.4%
Chemical change	74.2%	20.0%	1.7%	4.1%
The role of electrons in chemical bonds	73.5%	20.6%	2.4%	3.4%

How well prepared do you feel you are to teach Physics?	Not applicable	Very well prepared	Somewhat prepared	Not well prepared
Physical states and changes in matter	45.1%	51.1%	2.3%	1.5%
Energy forms, transformations, heat, and temperature	46.6%	49.1%	2.6%	1.7%
Basic properties/behaviours of light	54.3%	39.4%	4.5%	1.9%
Electric circuits and properties and uses of permanent magnets and electromagnets	56.8%	35.1%	5.7%	2.3%
Forces and motion	46.0%	48.9%	3.6%	1.5%

How well prepared do you feel you are to teach Biology?	Not applicable	Very well prepared	Somewhat prepared	Not well prepared
Differences among major taxonomic groups of organisms	67.9%	27.1%	1.3%	3.7%
Major organs and organ systems in humans and other organisms	76.2%	18.3%	2.0%	3.5%
Cells, their structure and functions, including respiration and photosynthesis as cellular processes	67.5%	26.9%	2.0%	3.7%
Life cycles, sexual reproduction, and heredity	76.6%	16.4%	2.6%	4.4%
Role of variation and adaptation in survival/extinction of species in a changing environment	75.5%	16.8%	4.1%	3.5%
Interdependence of populations of organisms in an ecosystem	70.1%	23.1%	3.5%	3.3%
Human health and the importance of diet and exercise in maintaining health	74.7%	19.0%	3.1%	3.3%

How well prepared do you feel you are to teach Earth Science topics?	Not applicable	Very well prepared	Somewhat prepared	Not well prepared
Earth's structure and physical features	68.9%	26.3%	2.7%	2.1%
Earth's processes, cycles, and history	68.7%	26.1%	3.3%	1.9%
Earth's resources, their use and conservation	56.5%	37.9%	3.7%	1.9%
Earth in the solar system and the universe	59.9%	22.7%	13.1%	4.4%