

**Junior Cycle Science and Impact of Budget Cutbacks on
Science in Second-Level Schools**



The ASTI commissioned this research to:

- (i) assess the facilities for the teaching of Junior Certificate science;
- (ii) obtain feedback from teachers on barriers to the teaching and learning of science;
- (iii) find out how cutbacks in education funding were affecting provision of science subjects in schools.

Context

Science education is a vital dimension of the holistic education second-level schools aim to provide. Science education is vital because it enables young people to understand the role and application of science in modern society and the economy. Science education is essential to good citizenship because an understanding of science is central to participation in debates on climate change, sustainability, genetic modification, etc. Science education is central to the emergence of the knowledge economy, economic growth and participation in the labour market.

The importance of science education at second level has been brought centre stage by the publication of the 2009 Government report ***Building Ireland's Smart Economy*** and by the recently published ***Report of the Innovation Task Force***. The 2002 ***Report of the Task Force on the Physical Sciences*** provided a policy framework for the upgrading of science education in second-level schools. Regrettably, most of its recommendations remain unimplemented.

Research methodology

A self-completion survey was sent to a junior cycle science teacher in each of 534 schools, including voluntary secondary and community and comprehensive schools and community colleges. A total of 334 questionnaires were returned, giving a response rate of 63%. This is a very high response rate and provides a comprehensive picture of aspects of science education in second-level schools. The survey was conducted by Millward Brown Lansdowne on behalf of the ASTI.



The Findings

Science in schools – good infrastructure, weakened by budget cutbacks

A worrying 14% of schools have dropped science subjects from the school timetable this year. 65% of these schools no longer offer physics and 33% no longer offer chemistry.

20% of teachers in schools that did not drop a science subject this year believe it is likely the school will drop a science subject next year.

Higher and ordinary level science classes are amalgamated in over 70% of schools. This is true of both junior cycle and senior cycle classes.

Three-quarters of schools have reduced the number of field trips and out-of-school learning activities because of budget cutbacks.

Science facilities – concerns about adequacy of laboratory and ICT facilities

Almost one-third of teachers surveyed had concerns about the adequacy of science laboratories to accommodate students.

Only 6 in 10 teachers rate the facilities in school laboratories as good.

70% feel there are not enough computer facilities in their science laboratories. However, 46% regularly use ICT in their classroom teaching, while 59% use ICT regularly to source material. Those teachers who rarely or never use ICT cite a lack of time due to workload as the most common reason.

Science teachers' work – non-teaching tasks diminishing teaching experience

Daily tasks such as preparing and returning materials for practical work take their toll on science teaching; almost 90% state that they spend too much time on preparation and clean up for practical work. The majority of teachers spend time daily on activities such as laying out materials for practical work, returning materials after practical work and cleaning facilities and utensils.

Nine in ten teachers felt laboratory preparation time built into their timetable would be very helpful to improving the teaching and learning of junior cycle science. 88% said the same of the availability of a laboratory technician, while 63% said smaller classes would improve the teaching and learning of science.

Student attitudes to science – negative attitudes a barrier to science uptake

Four in ten teachers agree that students have a more negative attitude towards science than other subjects. This may be driven by a perception of the difficulty of the subject, given that this factor is seen to be the greatest barrier to the take up of physics and chemistry at leaving cert. 50% of teachers surveyed felt students perceived the subjects as too theoretical and removed from every day life. 41% said students are unaware of career options in science.

Overall, the survey highlights policy areas that require particular focus in order to improve the learning experience of Junior Cycle Science students. These include the need to ensure that teaching time – including time for practical work - is not eroded by preparatory work/clean up for experiments; more computers in science laboratories; and proper opportunities for field trips and out-of-school learning activities.

Crucially, the change in pupil-teacher ratio has resulted in schools dropping science subjects. This issue must be addressed as a matter of urgency.

Daily non-teaching tasks for experiment preparation and clean up, administration of notebooks for Coursework A & B are consuming too much of classroom teaching time.

The fact that non-science classes take place in science laboratories in 65% of schools exacerbates this trend.

Large proportion of teachers – 7 in 10 – feel there are insufficient computer facilities in laboratories.

Greatest barrier to increased use of ICT in teaching is daily workload and lack of computers.

Across many areas, small schools (350 pupils = 28% all schools) express higher levels of dissatisfaction.

3 in 4 schools have had number of field trips/out-of-school learning reduced because of changes to Supervision and Substitution Scheme.

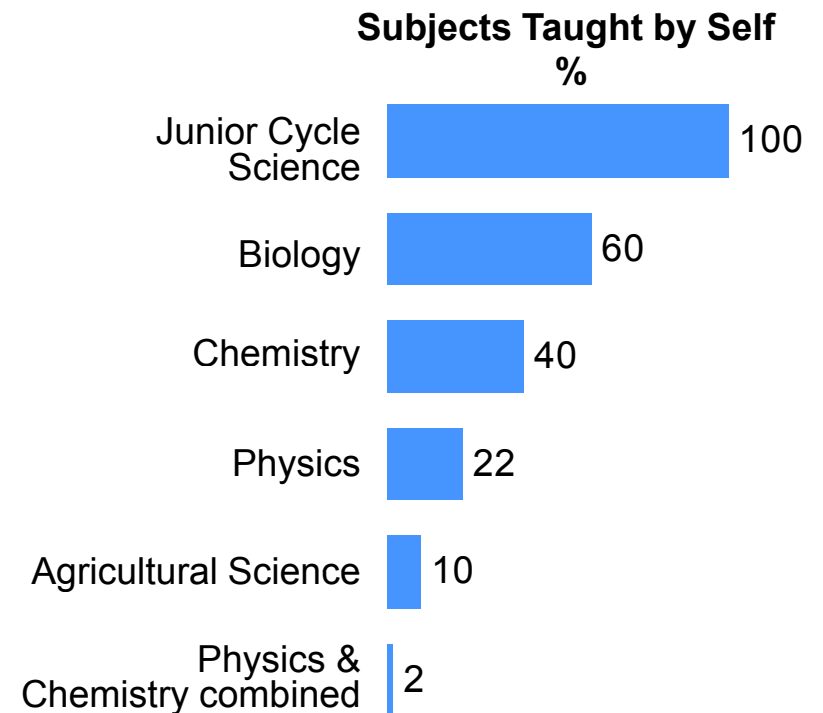
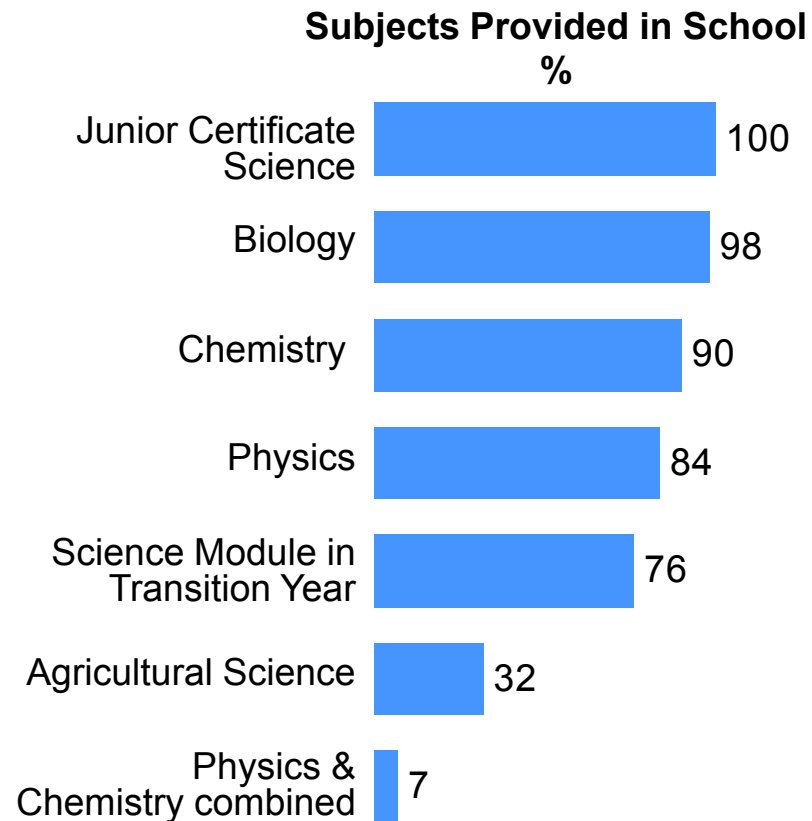
Having timetabled hours for preparation or a laboratory assistant seen as having greatest potential to improve the learning environment.

Conclusions

1. **A strong infrastructure for science education exists in our schools but cutbacks in education are already undermining capacity.**
2. **Learning time in the class is being eroded because of amount of non-teaching tasks teachers are required to do daily.**
3. **Need to up-skill Science teachers to ensure more students take Physical Science subjects.**

Strong Science infrastructure in schools

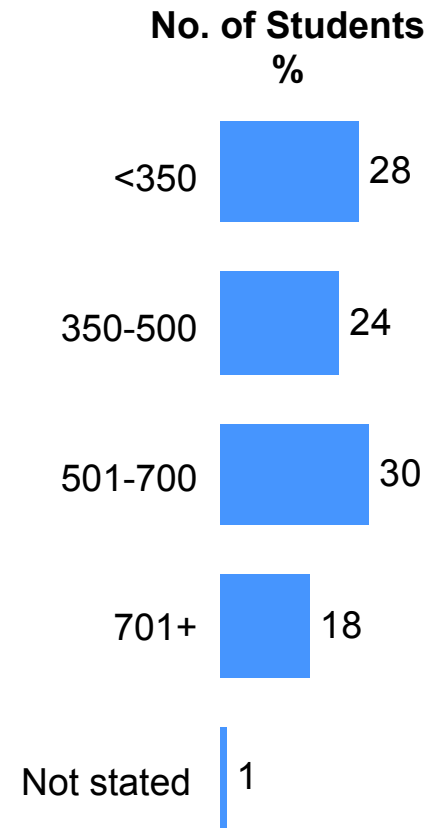
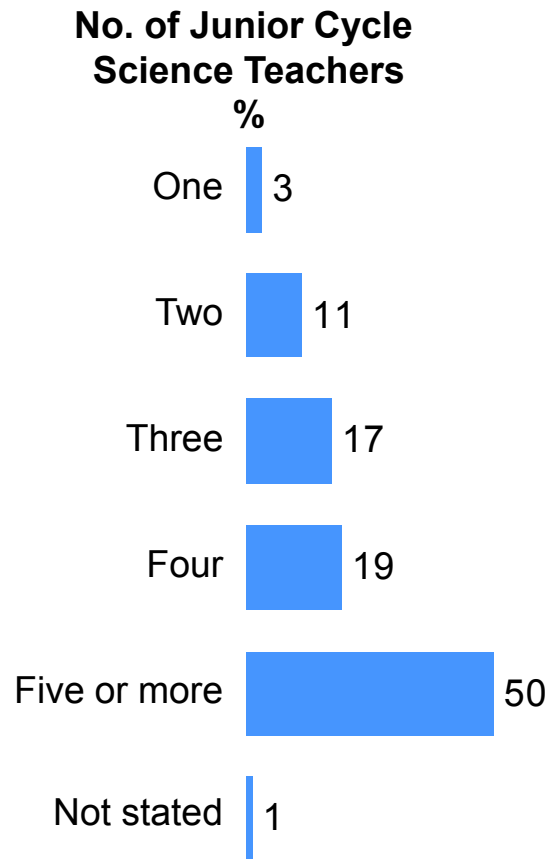
All schools surveyed provide a range of science subjects.



Base: All Junior Cycle Science Teachers

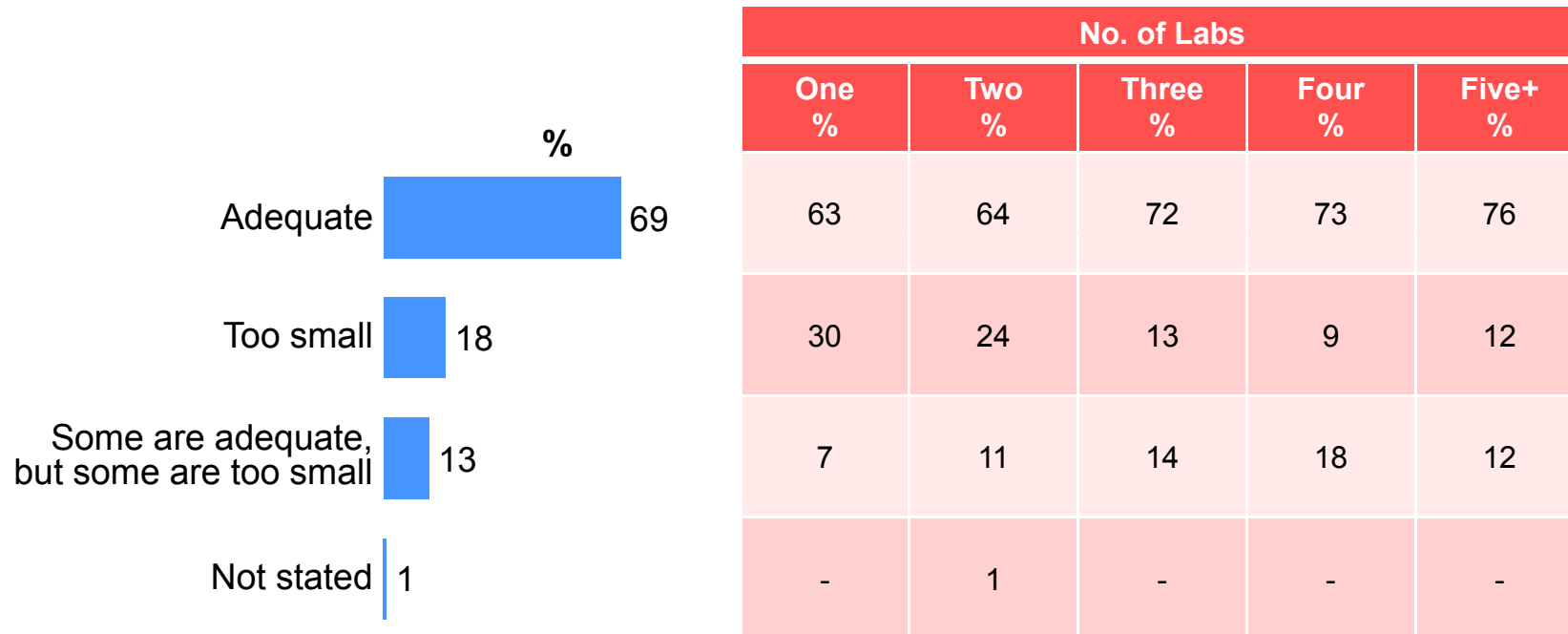
Half of schools have five or more Junior Cycle Science Teachers and have >500 students

Base: All Junior Cycle Science Teachers



Size of science laboratories

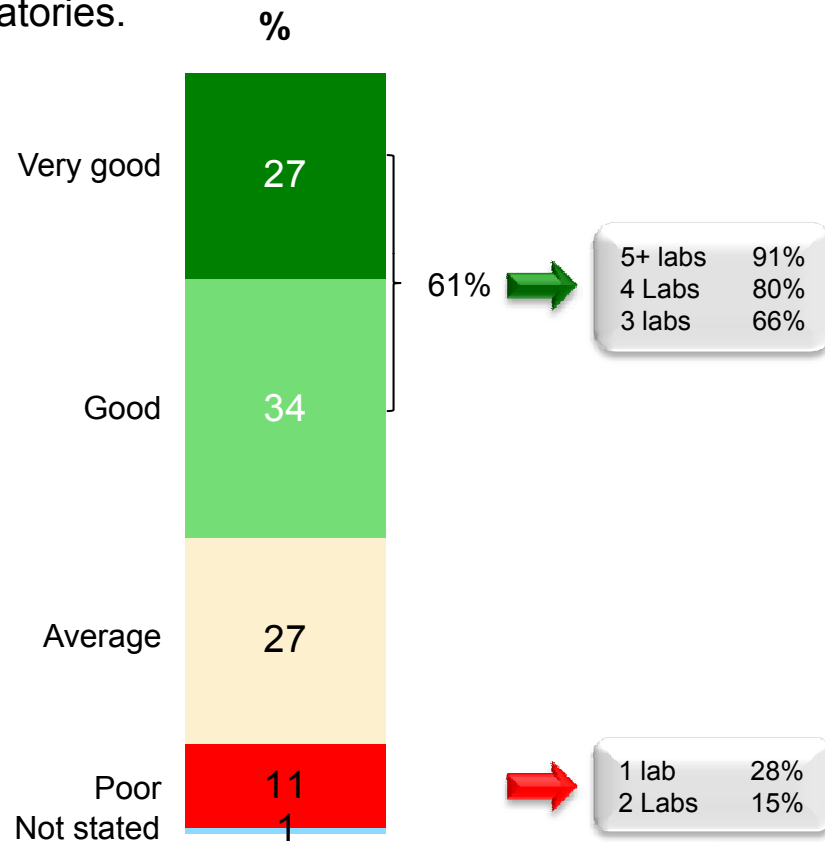
Base: All Junior Cycle Science Teachers



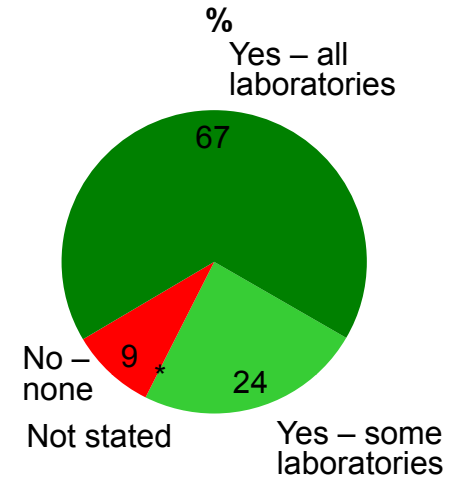
Almost one-third of teachers had concerns about the adequacy of science laboratories to accommodate student numbers.

Facilities in Science Laboratories

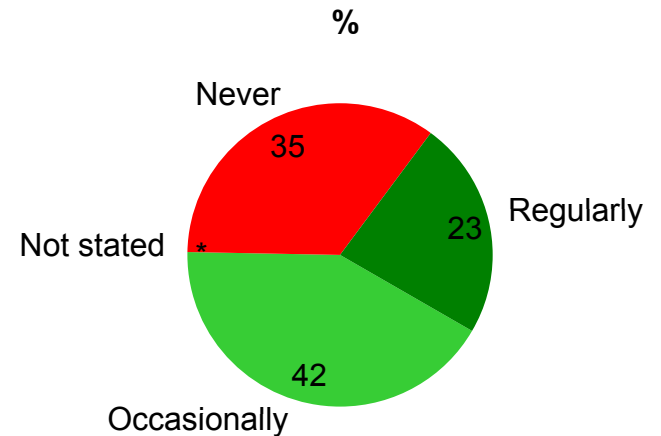
6 in 10 Junior Science teachers rate the facilities in school laboratories as good. 67% of schools had a Preparatory Room attached to all the science laboratories.



Preparatory Rooms



Non-Science Classes Held



Base: All Junior Cycle Science Teachers

In 6 of 10 schools, the science laboratory was used by non-science classes, underlining a more general problem in schools in terms of the overall adequacy of the school building for the student numbers.

Conclusion:

Strong science infrastructure in schools in terms of numbers taking science and the range of subjects provided. Science laboratories are generally deemed to be adequate in terms of size.

But capacity is being undermined by cutbacks in education...

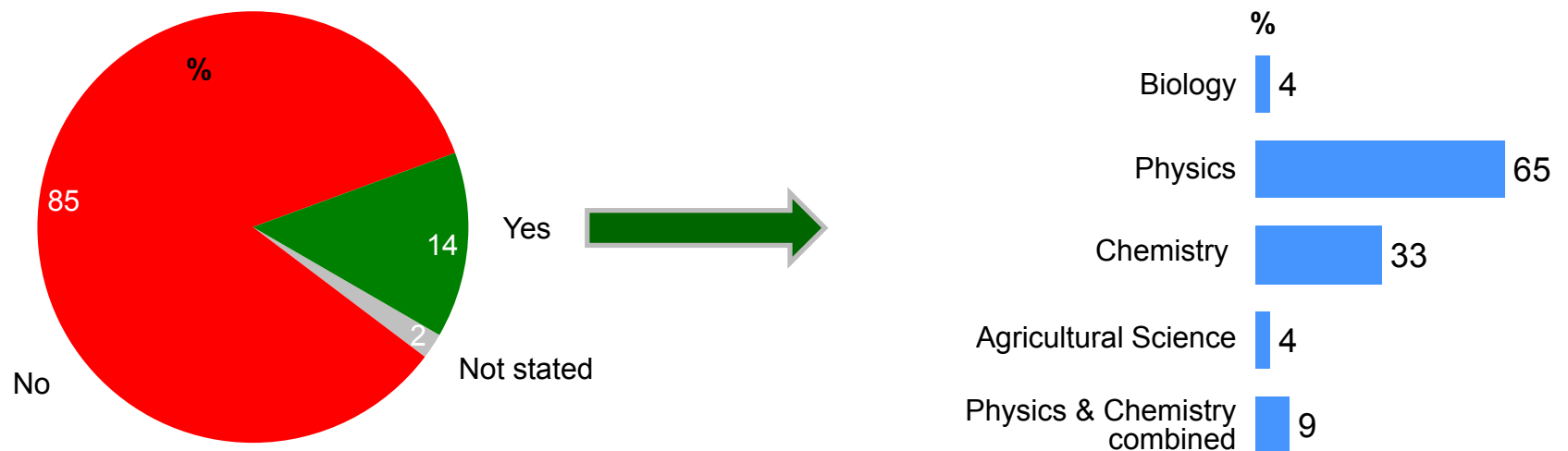
The increase in the pupil-teacher ratio, combined with the loss of grants for Physics and Chemistry, have affected the number of science subjects which schools can provide to students in the current school year.

14% of schools surveyed have dropped a science subject at Leaving Certificate level as a result of cutbacks. Of the schools that have dropped a science subject, 65% have dropped physics.

Higher and Ordinary level classes are now amalgamated in 7 out of 10 schools and 1 in 10 schools have amalgamated 5th & 6th Year classes.

Science subjects dropped from school timetable

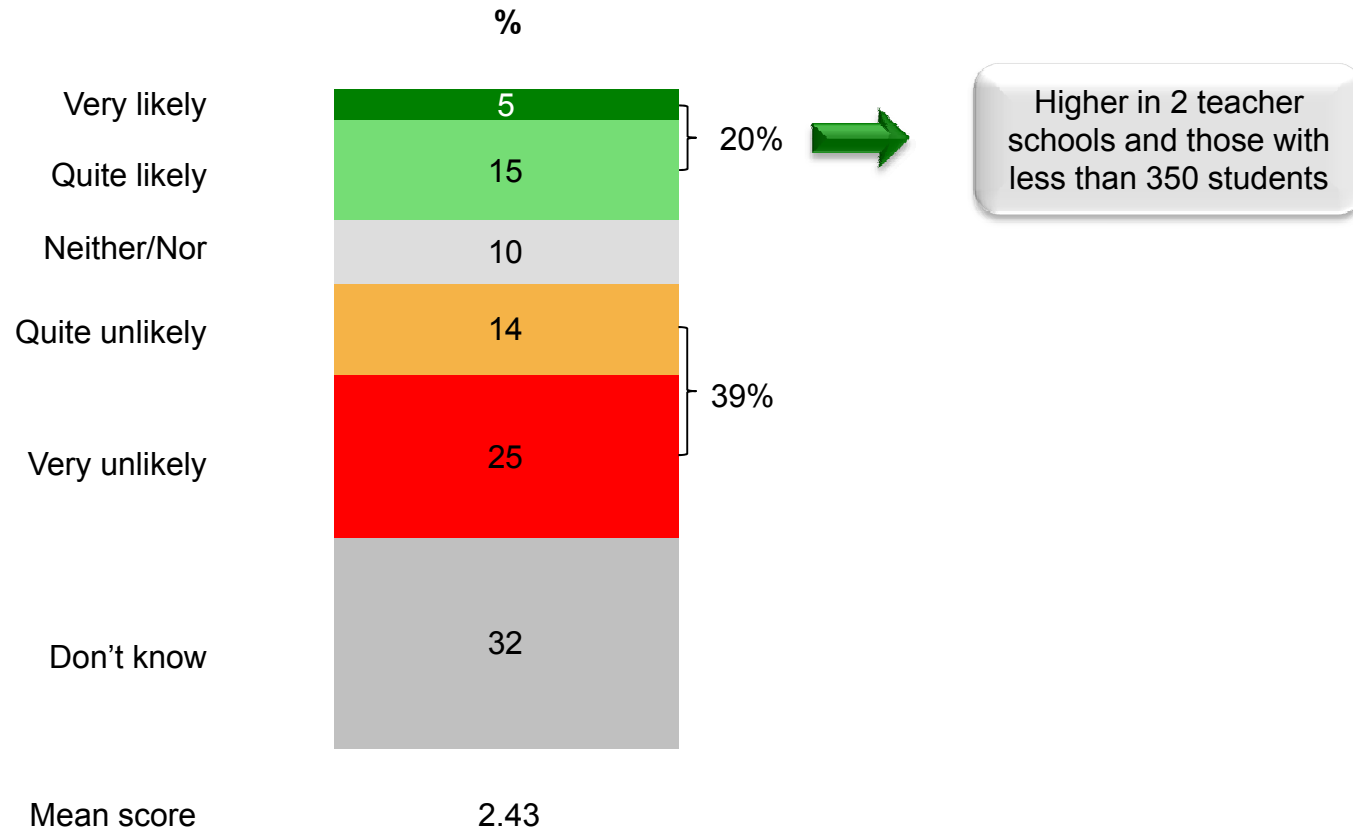
Base: All Junior Cycle Science Teachers



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Science subjects dropped from school timetable

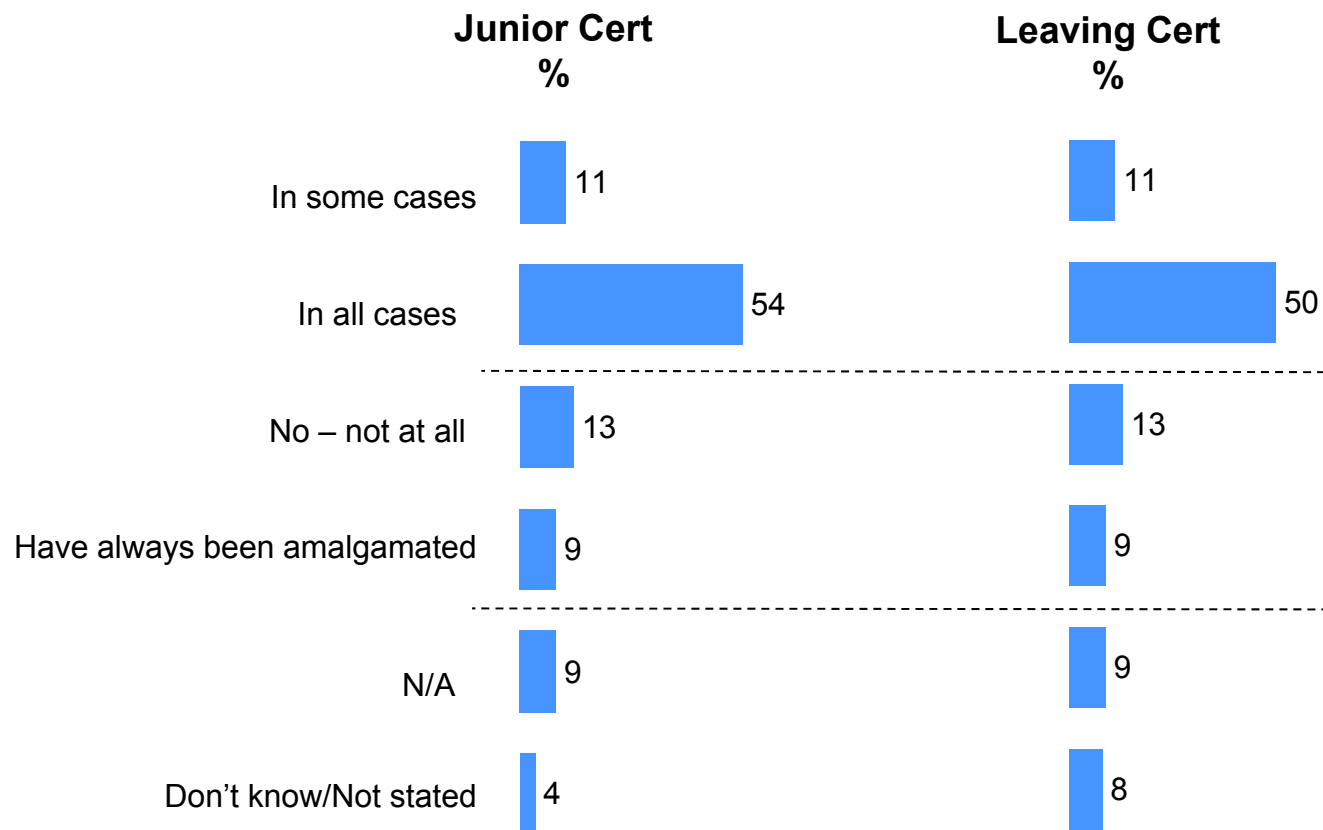
One fifth of schools who did not drop a subject in 2009/2010 think it likely that they will drop subject next year



Base: All who did not drop a science subject in 2009/2010 school year

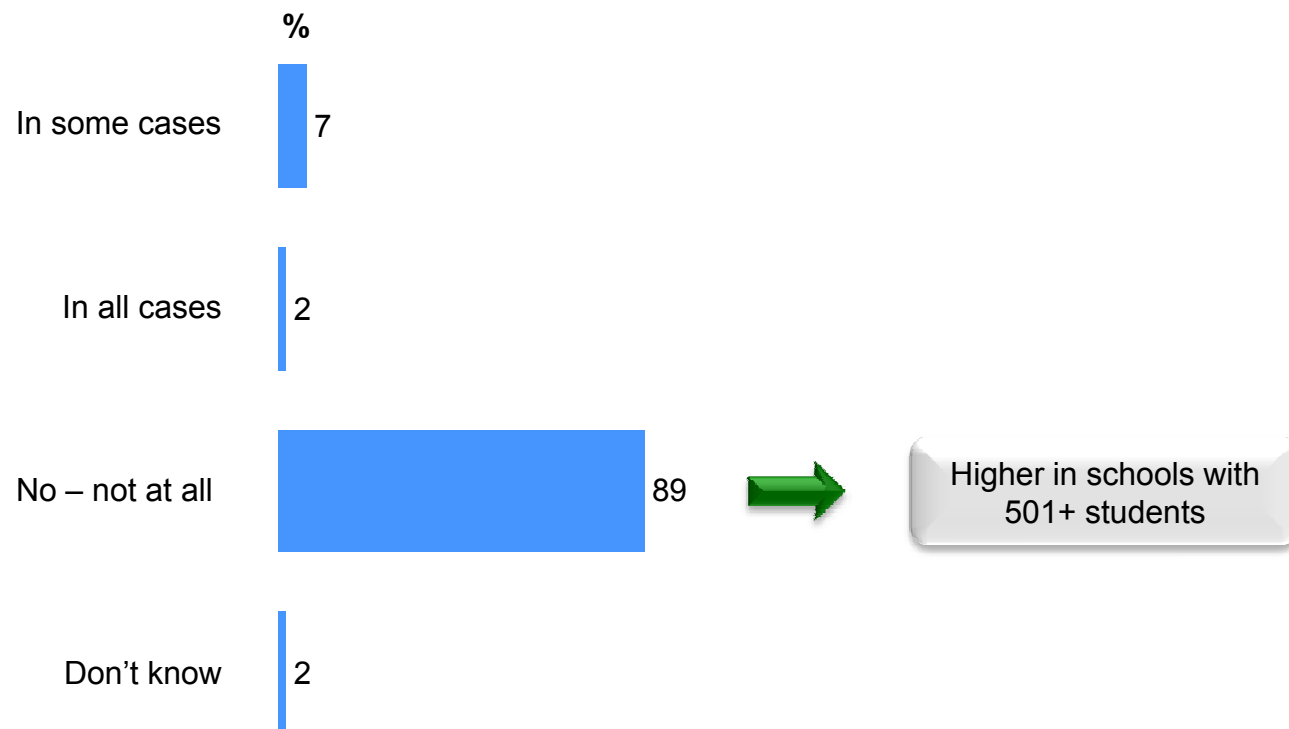
Higher and Ordinary level amalgamated

Higher and ordinary level amalgamated in over 7 of 10 schools.



Base: All Junior Cycle Science Teachers

1 in 10 schools have amalgamated 5th & 6th year science classes

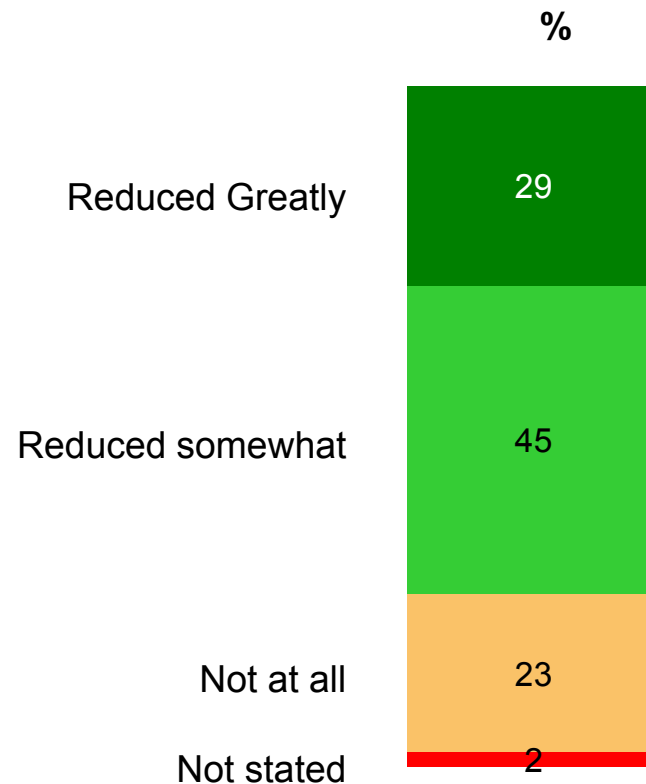


Base: All Junior Cycle Science Teachers

Schools not able to do Field Trips and Out-of-School Learning

Base: All Junior Cycle Science Teachers

Three-quarters of all schools have reduced the number of field trips and out-of-school learning activities.



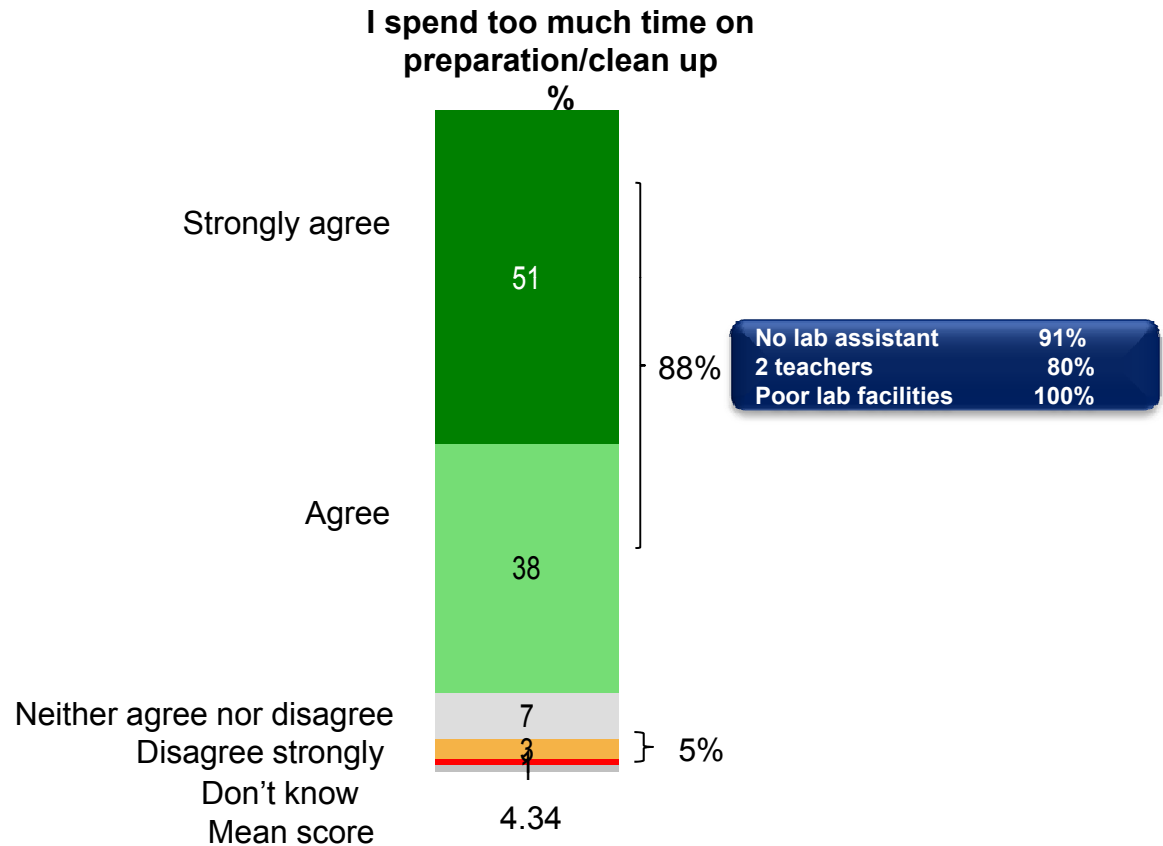
Teachers in schools where field trips and outings have been reduced, are more likely to agree that have a more negative attitude towards learning science compared to some other subjects (42% v 27%). See slide 28

This shows the strong potential for field trips & outings to promote a positive view of science in schools.

Non-teaching tasks taking up too much teachers time

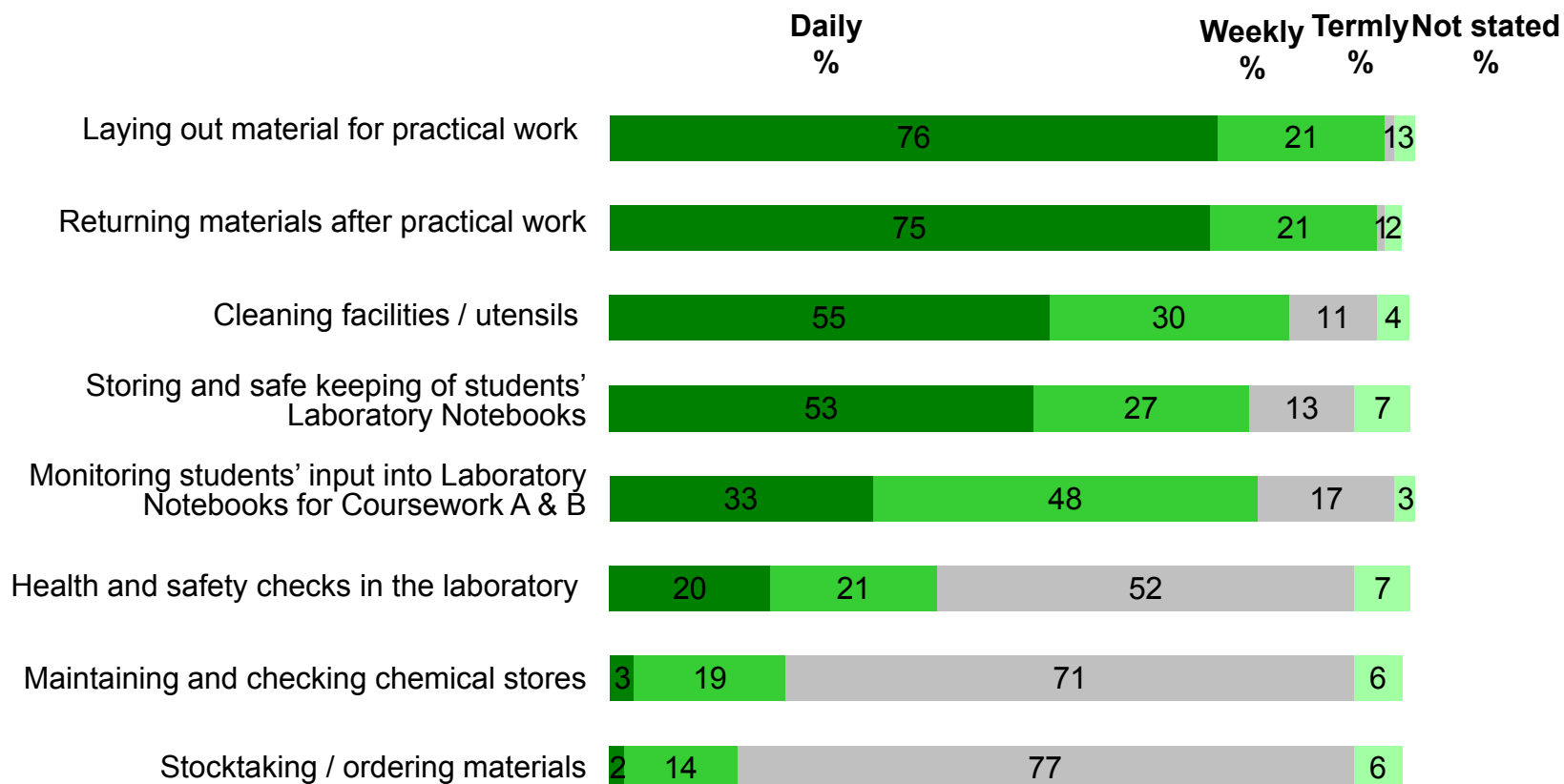
Base: All Junior Cycle Science Teachers

88% of teachers stated that they spend too much time on preparation and clean up for practical work.



Completion of non-teaching tasks

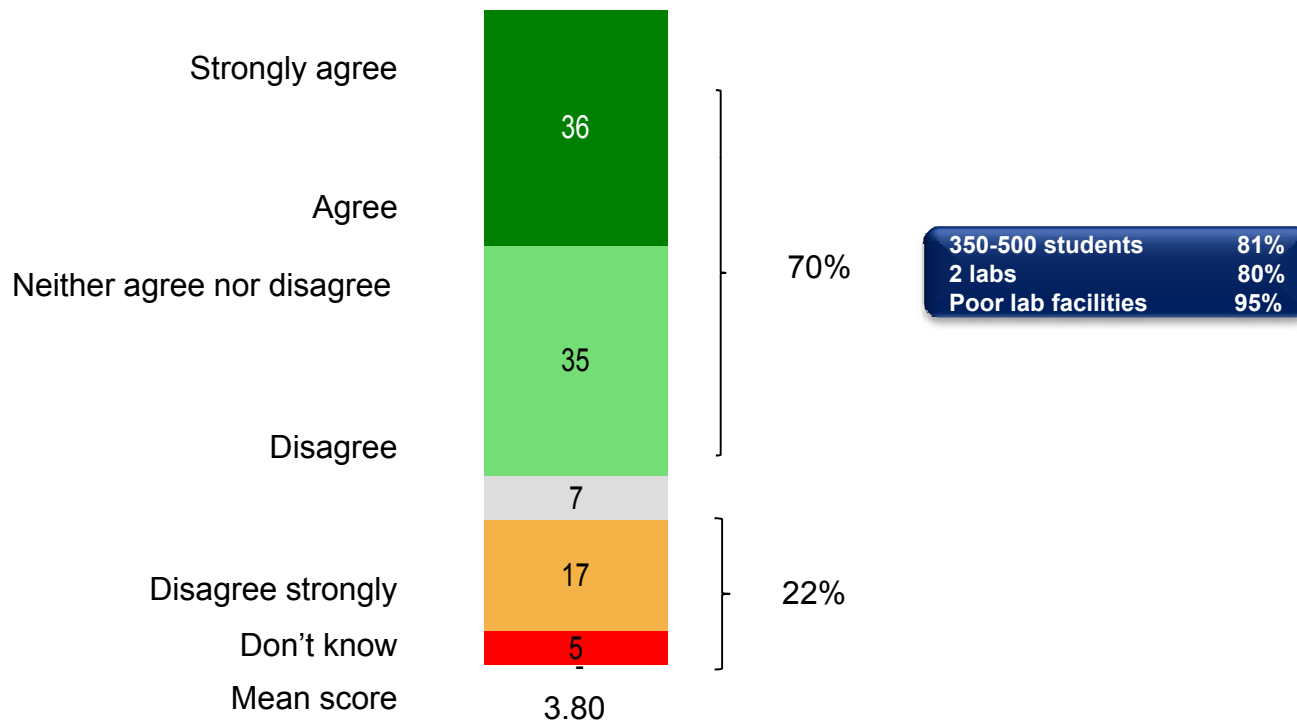
Base: All Junior Cycle Science Teachers



Not enough computers for Science teaching

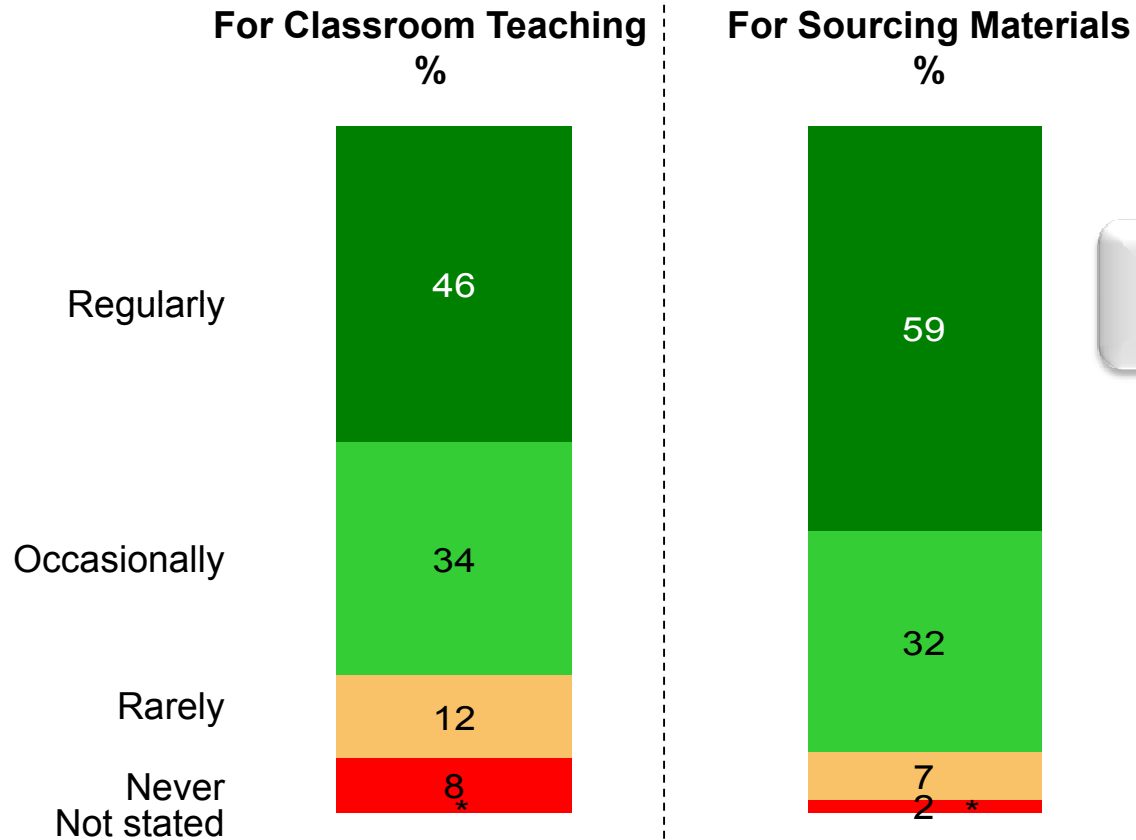
Base: All Junior Cycle Science Teachers

**There are not enough
computer facilities in the
science laboratories in my
school**
%



Use of ICT in Science teaching

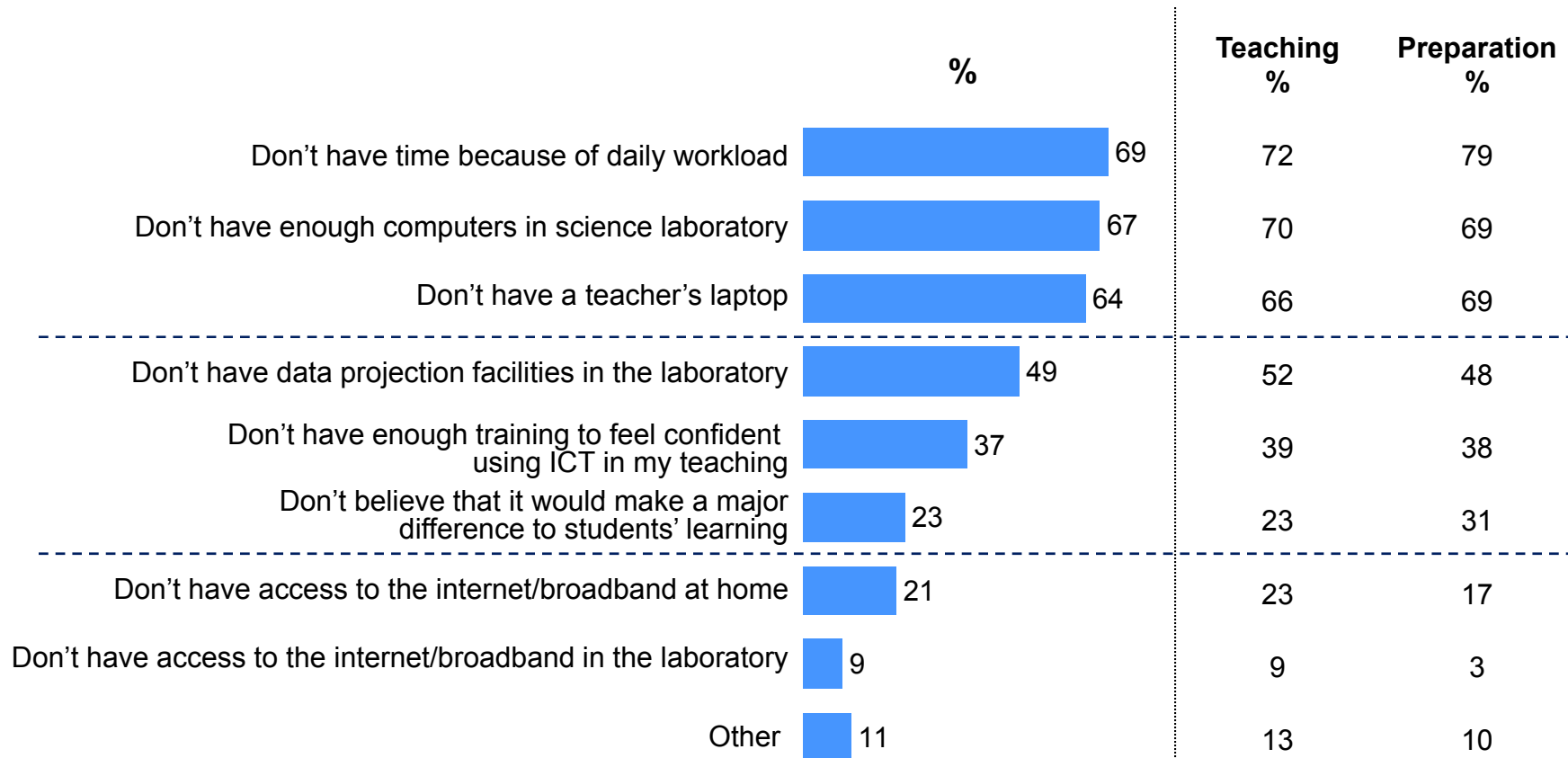
Base: All Junior Cycle Science Teachers



Greater use of ICT in schools with 701+ students

Use of ICT in science teaching

Base: All who rarely/never use ICT in teaching/preparation



The reasons teachers gave for not using computers more regularly in their classroom teaching underline their stated concerns re. excessive preparatory work, etc, for practical activities and the lack of computers/laptops in the laboratories.

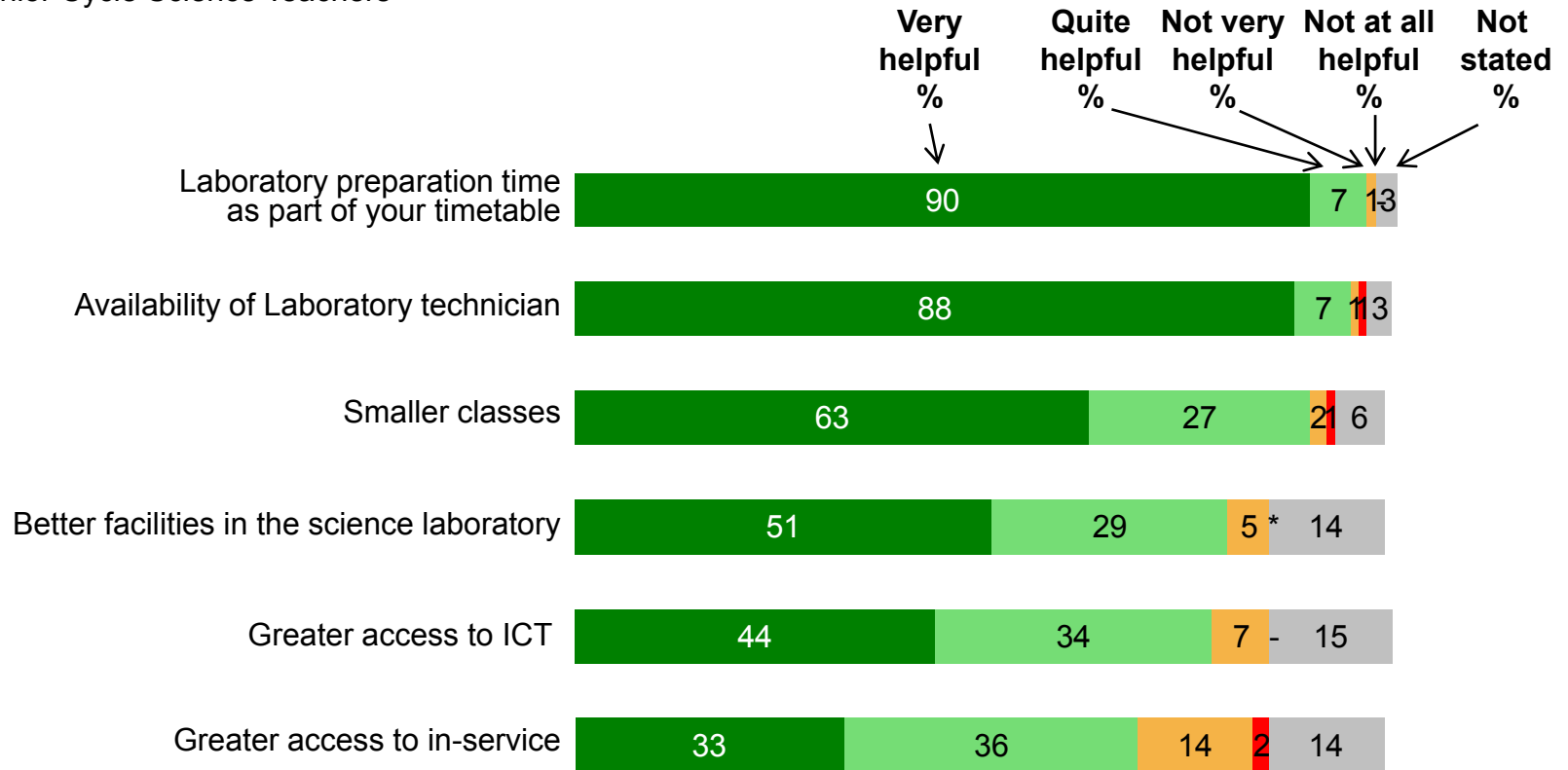
Measures to improve the quality of students' experience of Science in Schools

 **MillwardBrown**
Lansdowne



Most important measures to improve Junior Cycle Science for students

Base: All Junior Cycle Science Teachers

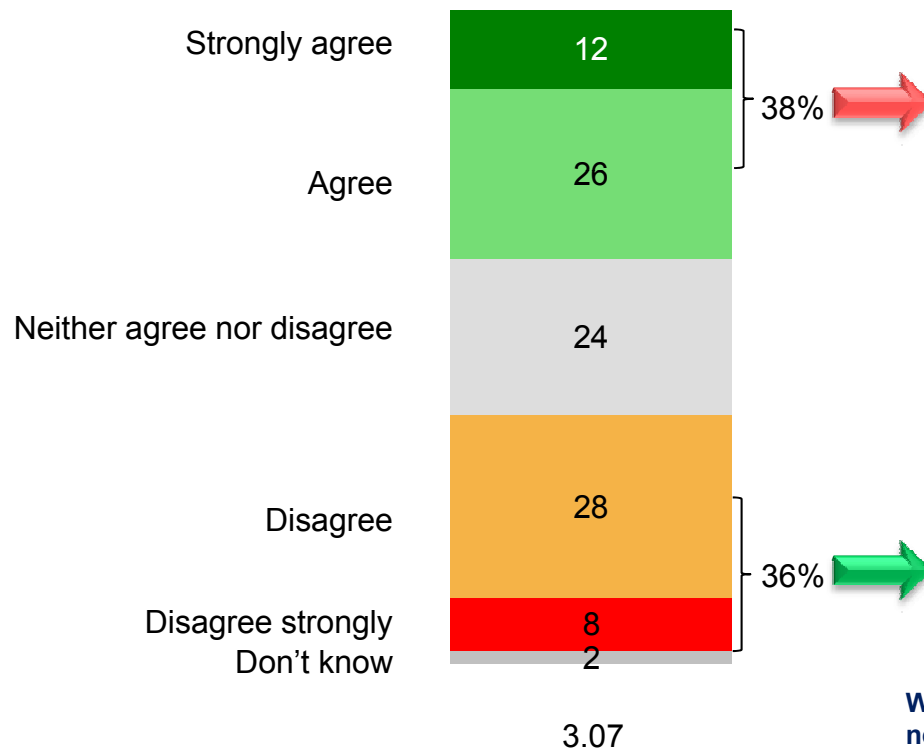


Single most helpful measure identified by teachers would be the inclusion of laboratory preparation time in Science teachers' timetable, followed by the provision of a Laboratory technician in schools.

Students' Attitudes to Science

Base: All Junior Cycle Science Teachers

Students have a more negative attitude towards learning science compared to some other subjects
%



Field Trips/Outings Reduced

| | |
|--------------------------|-----|
| Reduced Greatly/Somewhat | 42% |
| No/Not at all | 27% |

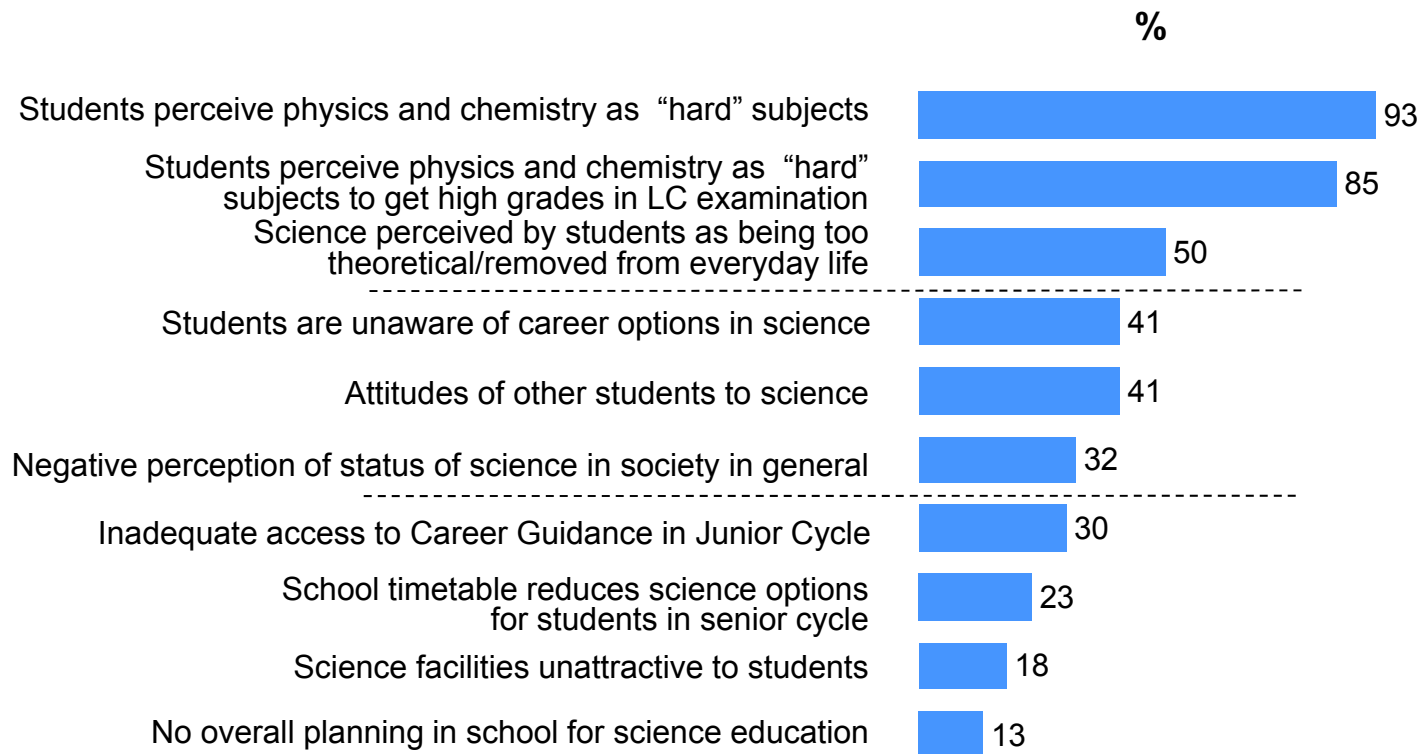
Field Trips/Outings Reduced

| | |
|--------------------------|-----|
| Reduced Greatly/Somewhat | 33% |
| No/Not at all | 48% |

While teachers had mixed views on whether students had negative attitudes towards learning science compared to other subjects, they were unanimous in stating that students perceive the physical sciences as both 'hard subjects' in terms of content and in terms of achieving high grades in the Leaving Certificate examination.

Barriers To Take-Up Physical Sciences At Senior Cycle Level

Base: All Junior Cycle Science Teachers

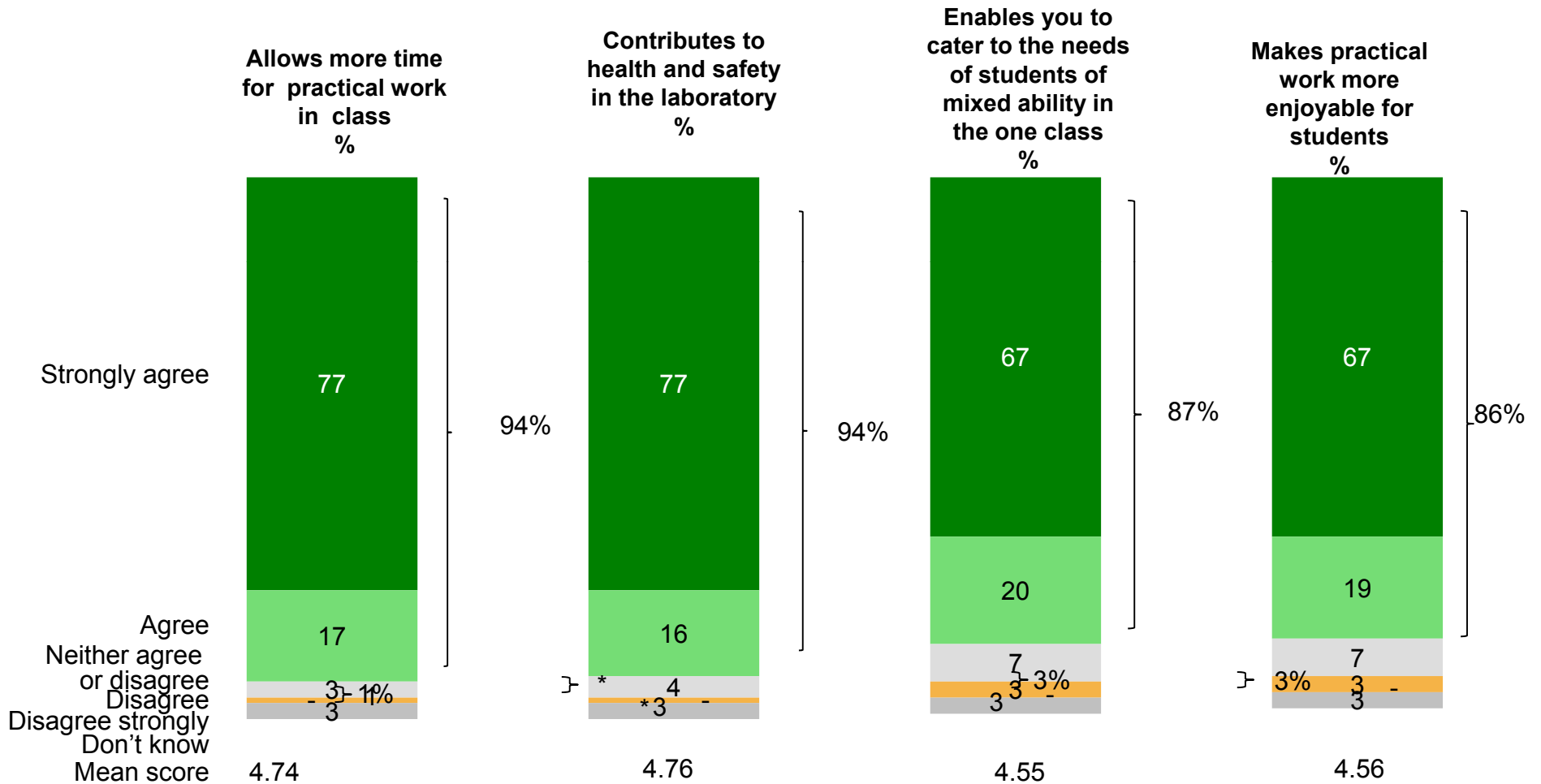


Schools where field trips and outings have been reduced are more likely to endorse the statement ‘Science perceived by students as being too theoretical/removed from everyday life’ than those who have not had their field trips/outings reduced (54% v 38%).

While having a lab assistant in school is extremely favorable for all situations, its contribution to health and safety and for allowing more time for practical work seen as most favorable benefits

Base: All Junior Cycle Science Teachers

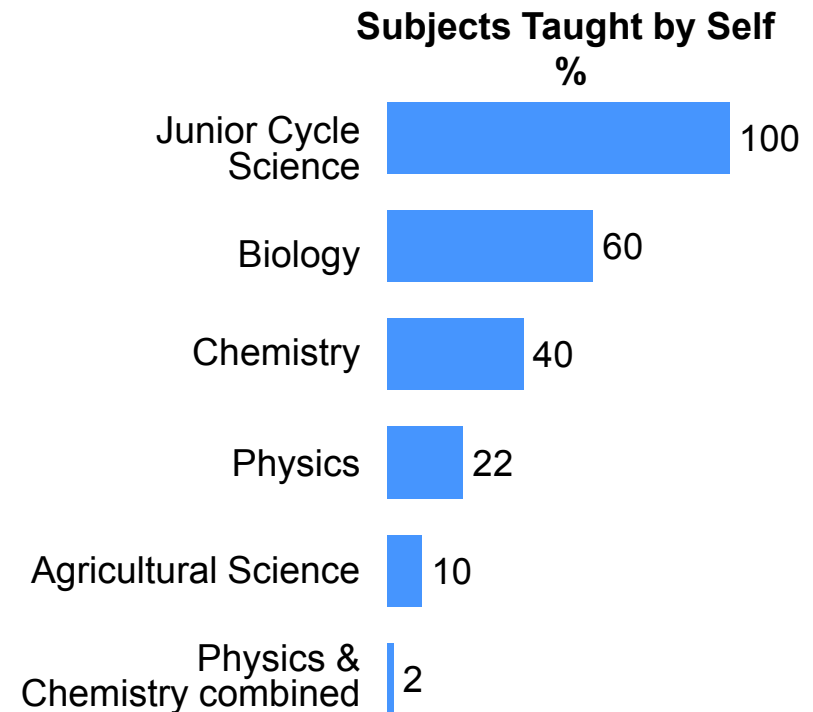
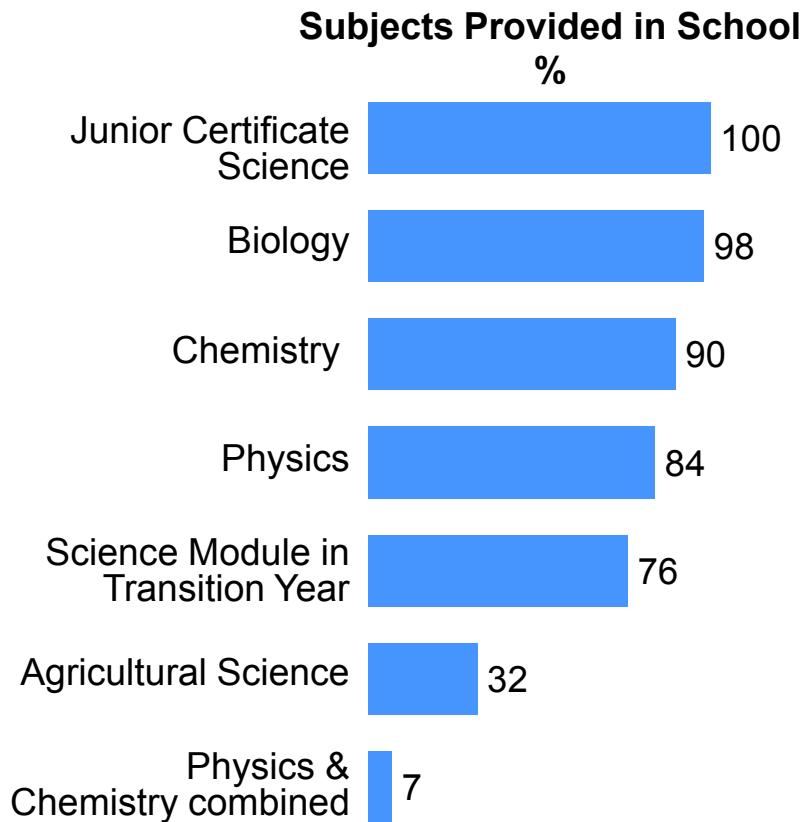
Having a laboratory assistant in school...



Teachers were unanimous in what they considered would be the benefits of having a Laboratory Assistant in schools.

Broaden The Range Of Qualifications Among Science Teachers

Base: All Junior Cycle Science Teachers



60% of the Junior Cycle Science teachers who responded to the survey stated that they teach Biology at Senior Cycle, followed by 40% teaching Chemistry and 22% teaching Physics. This finding raises the question of how to ensure that a greater number of Science teachers acquire the qualifications to teach the Physical Sciences to a greater number of students.

- Science uptake at second-level is strong with over 90% of all junior cycle students taking the subject. The figures for Leaving Certificate science in 2009 were Biology: 51.8%, Physics: 12.8%, Chemistry: 13.6%, Agricultural Science: 9% (www.examinations.ie)
- Revised Junior Cycle syllabus introduced in 2003
- Continuation from Primary Science, Influence of PISA
- First syllabus specifying “learning outcomes”
- Change to assessment – 35% for work outside written exam
- Coursework A = 10% : written record of ongoing practical work on 30 mandatory activities over 3 years
- Coursework B = 25% : investigation report submitted with written exam paper
- All practical work to be done in groups
- Written exam = 65% ; assess knowledge of science skills and content knowledge