



Evaluation of BBSRC Quota Doctoral Training Grant Competition

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This document represents the views and conclusions of a Review Panel of experts

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Contents

Abbreviations	4
Executive Summary	5
1. Introduction	10
1.1 BBSRC.....	10
1.2 Evaluation in BBSRC.....	10
1.3 Doctoral Training Grants.....	11
1.4 The Quota Doctoral Training Grant competition.....	11
1.5 Evaluation methodology	12
1.6 Data analysis.....	13
2. Overview of Quota DTG achievements	15
Summary.....	15
2.1 Performance of Quota DTGs	15
2.2 Outcomes and achievements arising from Quota DTGs	15
2.3 Students' views about their studentship experience.....	16
3. Quota DTG flexibility	20
Summary.....	20
3.1 Use of Quota DTG flexibility.....	20
3.2 Length of studentships at the outset	22
3.3 Co-funding of studentships	24
3.4 Studentships with enhanced stipends.....	26
3.5 Additional consumable or experimental costs	26
3.6 Students' recognition of BBSRC as their sponsor	27
3.7 Creation of CASE studentships	27
4. Balance and coverage of the studentship portfolio	30
Summary.....	30
4.1 Context.....	30
4.2 Criteria used to allocate Quota DTG studentships	31
4.3 Coverage of the BBSRC remit	33
4.4 Addressing BBSRC strategic priorities.....	36
4.5 Support for interdisciplinary training.....	38
4.6 Specialised and niche skills training.....	39
4.7 Addressing departmental strategic priorities	39

5. The quality of student training	40
Summary.....	40
5.1 Context.....	40
5.2 Training in research skills	41
5.3 Training in broader science skills.....	44
5.4 Training in generic professional skills	44
5.5 Balance between training and research.....	45
5.6 Quality of the training environment	46
5.7 Attendance at conferences	47
5.8 Participation in public engagement activities.....	47
5.9 Students submitting theses within four years	51
5.10 Publications	52
6. Supervision, mentoring and career development.....	54
Summary.....	54
6.1 Students' interactions with academic supervisors	54
6.2 Students' interactions with other researchers	55
6.3 Departmental training committees and thesis advisory committees	56
6.4 Addressing issues that arise during the studentship	57
6.5 Careers advice and careers-related training	57
6.6 CASE students' interactions with their industry partner.....	59
6.7 Support available to supervisors.....	62
6.8 Influence of the Quota DTG competition on doctoral training	64
7. Application and administration processes	65
Summary.....	65
7.1 Quota DTG application process.....	65
7.2 Assessment criteria	68
7.3 The use of a competition in awarding Quota DTG funding.....	69
7.4 Suggested improvements to the application process	70
7.5 Number and size of Quota DTG awards	71
7.6 Support for student cohorts	72
7.7 Student eligibility criteria	72
8. Conclusions and future perspectives.....	74
Summary.....	74
List of the Panel's recommendations	76
Appendices	80

Abbreviations

BBSRC:	Biotechnology and Biological Sciences Research Council
BIS:	Department for Business, Innovation and Skills
CASE:	Collaborative Award in Science and Engineering
DTG:	Doctoral Training Grant
EPSRC:	Engineering and Physical Sciences Research Council
EU:	European Union
FTE:	Full Time Equivalent
HEFCE:	Higher Education Funding Council for England
IP:	Intellectual Property
Je-S:	Joint Electronic Submission
MRC:	Medical Research Council
NABS:	Nomenclature for the Analysis and Comparison of Scientific Programmes and Budgets
NERC:	Natural Environment Research Council
QAA:	Quality Assurance Agency for Higher Education
QR:	Quality-related Research
RCUK:	Research Councils UK
RTSG:	Research Training Support Grant
SDP:	Studentship Details Portal

Executive Summary

This document sets out the views of a specialist Review Panel convened to provide an independent evaluation of BBSRC's Quota Doctoral Training Grant (DTG) competition. Specifically, the objectives were to:

- assess the quality and breadth of the doctoral training provided
- comment on the outcomes and achievements of the doctoral training and research
- examine how departments¹ are using the flexibility of Quota DTG funding, and identify the advantages and disadvantages of devolving funding decisions to departments
- comment on the balance and coverage of the studentship portfolio
- comment on the extent to which departments are using Quota DTG funding to maximum strategic effect, particularly in the context of departments' local strategic objectives, BBSRC's strategic priorities, and local and national priorities for research training
- comment on the application and administrative processes, including the effectiveness of using a competition as the method of Quota DTG allocation
- identify ways to build on successes and address identified gaps and issues

The evaluation focused on the 2005 Quota DTG allocation, which supported studentships starting in the 2006/07, 2007/08 and 2008/09 academic years. The Panel's analysis was based on the questionnaire responses from 85 Quota DTG grantholders, 21 Quota DTG applicants, 167 postgraduate student supervisors, and 876 postgraduate students. The questionnaires were devised, administered and subjected to preliminary analysis by BBSRC, but the Panel had access to the individual questionnaire responses.

Key conclusions

1. The Quota DTG competition is supporting high-quality doctoral training

Departments are using Quota DTG funding to support high-quality doctoral training programmes which develop specialist research skills, broader science skills and generic professional skills. Over the evaluation period, Quota DTGs facilitated the transition from a three-year to four-year model of studentship funding and this had a very positive impact on the student training experience. The Quota DTG competition has driven improvements to departments' training programmes and has contributed to wider cultural changes in doctoral training. Student supervision and mentoring are generally good, and postdoctoral researchers are making extremely valuable contributions to students' training. However, there is scope for departments to improve their internal training in some areas (e.g. commercial awareness, creative and critical thinking skills), and at several institutions there is insufficient emphasis on supervisor training. Overall, the quality and breadth of training and research supported by the Quota DTG

¹ Throughout the text, the term 'department' refers to departments, faculties, schools, institutions or other research units which were awarded Quota DTG funding.

competition are good, and the significant majority of students are positive about their studentship experience.

2. The training and research supported by Quota DTGs are delivering good quality outputs and outcomes

The majority of the studentships funded through the 2005 Quota DTG competition are still active, and so it is too early to assess their overall outcomes and achievements. Nevertheless, the evidence to date is promising. The primary outputs arising from Quota DTG funding are well-rounded, highly-skilled scientists who are able to pursue careers in academia, industry and the wider economy. In addition, there are already some good quality outputs and outcomes arising from students' research projects including exciting scientific discoveries, good quality publications in high-impact journals, and the development of new research directions. Students' training and research is also contributing to wider economic and societal impacts through, for example, contributions to patents, spin-out companies, and new commercial products, and student participation in public engagement and outreach activities.

3. The flexibility of Quota DTG funding is a major strength of the funding mechanism

Quota DTGs provide departments with considerable flexibility (financial and non-financial) in how they support doctoral training. This has contributed substantially to the success of the Quota DTG competition and has benefited students, supervisors, departments and BBSRC; however, the benefits of the flexibility are limited in small Quota DTG awards. Departments are generally using the flexibility effectively: there are many examples of good practice, although there are also a few inappropriate uses of the flexibility which BBSRC should discourage. Departments are generally reluctant to use the Quota DTG financial flexibility in ways which would reduce the total numbers of studentships supported. This is a concern, as simply maximising the number of studentships may not provide the best value for money, particularly if it leads to a reduction in the quality of individual studentships. The introduction of DTGs has produced an increase in the administrative burden on departments, but this is outweighed by the numerous advantages.

4. The Research Training Support Grant is not sufficient to meet studentship project costs

BBSRC's notional 'unit cost' for a four-year studentship includes a sum of £1K per annum as a Research Training Support Grant (RTSG); this is insufficient to meet the costs associated with students' research projects. Departments are able to draw higher amounts from the Quota DTG to cover consumable costs, but this flexibility is rarely used. Supervisors must therefore subsidise studentship costs through other research grant income or other funds, a disreputable and unsustainable practice which in some contexts is also a barrier to allocating studentships to new academic staff with limited grant income. BBSRC should use a more realistic figure to calculate the notional cost of a four-year studentship (e.g. a £5K per annum RTSG) to send a strong message about the real costs of good quality research training. Departments should still be permitted to adjust the level of the RTSG, as the costs of individual student projects will vary

according to the nature of the research. BBSRC should consider increasing the value of the RTSG and maintaining the overall number of studentships, although it is recognised that this is very challenging in the current financial climate. In reaching its decision BBSRC should prioritise the quality of the student training over the number of studentships. BBSRC should also make it clear that the notional number of studentships supported by each Quota DTG is not a requirement, and that departments are able to support fewer studentships with higher consumable costs.

5. The requirement to create CASE studentships within the Quota DTG competition should be removed

The 2005 Quota DTG competition's requirement that, overall, one third of the notional number of studentships created should be collaborative research training projects with industry partners (CASE) was not met. Although the requirement encouraged departments to seek partnerships with industry, on balance, the target for creating CASE studentships is unhelpful and it risks driving award holders to accept any CASE partner, irrespective of the quality of the proposed collaboration. Where CASE studentships were created, it appeared that many of the collaborations were not strongly embedded with the industrial partner (e.g. less than half of Year 4 CASE students reported participation in an industry placement). The Panel was also concerned that the CASE requirement may have skewed the creation of studentships towards a limited set of areas for research training where there is industrial demand and financial support. BBSRC should remove the CASE requirement from the Quota DTG competition. It would be more appropriate to support CASE studentships through a separate competition where the quality of the proposed interaction would be an integral part of the assessment process. BBSRC should also consider relaxing the rules for CASE partners, so that a wider range of organisations are eligible.

6. Departments are using Quota DTG flexibility responsibly to create and allocate studentships

Departments use a range of criteria to create and allocate studentships, with a very strong emphasis on the quality of the student, the quality of the supervisors' training record and the quality of the proposed project. Several other criteria are also used but not consistently across DTGs and they are usually less important than the 'quality' criteria. Departments are largely using the Quota DTG flexibility responsibly to support training and research within the BBSRC remit, although a small number of studentships were identified as being potentially out-of-remit. These were primarily straying too far into the biomedical research area, which may reflect difficulties with the interpretation by departments or supervisors of the boundary between BBSRC and the Medical Research Council remits. There was also a concern that, while Quota DTG flexibility has enabled departments to improve their provision for interdisciplinary training, the overall level of support for interdisciplinary training through Quota DTGs is still too low.

7. There are potential tensions between Quota DTG flexibility and other priorities for doctoral training

The balance and coverage of the Quota DTG studentship portfolio is driven by the academic interests of departments, supervisors and students. Departments' emphasis

on 'quality' criteria when allocating Quota DTG studentships is appropriate and ensures that the Quota DTG competition is successfully addressing BBSRC's overarching strategic priority of delivering world-class bioscience. However, the departmental autonomy provided by Quota DTGs can work against BBSRC's increasing need to ensure that its funding provides balanced coverage of the remit and addresses its strategic research priorities. The Panel was not convinced of the need for Quota DTG funding to address specifically BBSRC's strategic research priorities or to be closely aligned to the research grant portfolio. BBSRC should continue to recognise the importance of departmental autonomy to decide the areas in which to create studentships. However, the Panel also recognised that need for BBSRC to support the training of skilled scientists in strategically-important areas. There was no consensus on how to balance the importance of departmental autonomy and the need to address strategic research priorities, but the Panel agreed that BBSRC should continue to support a mixture of non-directed and directed studentship funding, and that the Quota DTG competition should remain a non-directed scheme which is focused on the delivery of excellent bioscience training and excellent bioscientists across the BBSRC remit. The Quota DTG competition's strong support for training in basic bioscience research is a major strength, as it enables students to pursue a wide range of research and related careers.

8. The use of a competition to allocate Quota DTG funding is effective

BBSRC awards Quota DTG funding through a competition, based on the quality of the training environment provided. It is the Panel's view that this is appropriate: a competition offers many advantages over a purely algorithmic allocation based on research grant income, and recognises that there is no simple link between excellence in training and excellence in research. The competition approach has had a notable influence on institutions' behaviour and has driven substantial improvements to their doctoral training programmes. Overall, the impact of the competition has been positive and it should be maintained for future Quota DTG funding rounds.

9. There is scope to improve the Quota DTG competition application and assessment processes

The main disadvantage of the competition approach is burden of the application process for the research community. BBSRC should minimise this, for example, by reducing the volume of qualitative information requested and by placing increased emphasis on the use of pre-existing data which institutions collect for other purposes. The balance between retrospective and prospective information should also be reviewed, and BBSRC should consider asking applicants to identify specific, measurable objectives by which their doctoral training programmes' success could be assessed. BBSRC should reduce the overall number of Quota DTGs awarded, encouraging applicants to submit larger-scale applications (e.g. at an institutional or multi-departmental level), as this could lead to more efficient working practices and minimise the administrative burden on institutions. BBSRC may also wish to consider the advantages and disadvantages of encouraging greater support for cohort- or programme-based approaches to doctoral training within Quota DTGs. Studentship eligibility criteria for non-UK EU students should be relaxed to enable these students to receive full support from the Quota DTG.

10. Support for doctoral training is an essential component of BBSRC's mission

Research training and skills development are vital to maintaining a healthy and vibrant UK bioscience sector. BBSRC's Quota DTG competition is a very important part of the UK funding landscape for training in the biosciences and it is highly valued by the research community. The Quota DTG competition is an effective mechanism for supporting doctoral training, which enables departments to provide high-quality training programmes to high-calibre students. BBSRC should maintain its strong support for the Quota DTG competition, which is successfully supporting the development of highly-skilled scientists who have the potential to make substantial contributions to the UK economy throughout their future careers.

1. Introduction

1.1 BBSRC

1. The Biotechnology and Biological Sciences Research Council (BBSRC) is one of seven Research Councils sponsored through the Department for Business, Innovation and Skills (BIS) of the UK government. Its principal aim is to foster a world-class biological science community in the UK. The mission of the BBSRC is to fund internationally competitive research, to provide training in the biosciences, to encourage opportunities for knowledge exchange and economic impact, and to engage the public and other stakeholders in dialogue on issues of scientific interest.
2. BBSRC supports research and training in a number of ways, including research grants, studentships, fellowships and strategic grants to BBSRC-supported institutes. In the 2008-09 financial year, BBSRC spent £50M on training awards and fellowships.

1.2 Evaluation in BBSRC

3. BBSRC is committed to the effective evaluation of the research and training it funds, as part of its strategy for evidence-based decision making. Evaluation plays a central role in:
 - enabling BBSRC to account to government, the public, the scientific community and other stakeholders for the funds it allocates
 - justifying BBSRC funding allocation and contributing to the evidence that all Councils are required to submit to BIS
 - informing internal funding decisions, providing evidence of progress and achievement, and facilitating the development of a strategic overview for future funding decisions
 - helping BBSRC to improve its policy and practice, through informal policy decisions and the design of new schemes, programmes and processes; and through identifying good practice, lessons learned and ways to improve processes
4. Formal evaluation of research is currently conducted at a number of levels in BBSRC:

Project:	<ul style="list-style-type: none">• evaluation of final reports from grants
Scheme:	<ul style="list-style-type: none">• evaluation of major research investments, for example, through responsive mode or research initiatives (time-limited research funding in strategically-important areas)• evaluation of funding schemes (e.g. international Partnering Awards, Research Industry Clubs, early-career fellowships, equipment grants, studentship funding)
Institution:	<ul style="list-style-type: none">• Institute Assessment conducted every five years at the BBSRC-supported Research Institutes
5. BBSRC's Evaluation Framework² outlines the Council's approach to evaluation and the methodology used.

² www.bbsrc.ac.uk/researchevaluation

1.3 Doctoral Training Grants

6. Doctoral Training Grants (DTGs) are a funding mechanism used to support postgraduate research training. They are grants awarded to universities and other research organisations, either to support specific PhD training programmes (e.g. in a specific department) or to be used flexibly for PhD training across the institution. All Research Councils use, or are planning to use, the DTG mechanism to support postgraduate training.
7. BBSRC awards DTGs through a number of competitions:
 - Quota Competition
 - Targeted Priority Studentship Competition
 - Industrial CASE Competition
 - Industrial CASE Partnership Competition

The DTG awarded in each case will sometimes be referred to in connection with the competition it was awarded through: for example, a 'Quota DTG'.

8. A key feature of DTGs is that they provided funding through a single profiled grant covering stipend payments to the students, students' fees and the research support grant to the institution. BBSRC awards its DTGs on the basis of a notional number of four-year studentships. A major benefit of Quota DTGs is that they provide institutions with substantial flexibility in how they deliver and fund postgraduate training, within the framework detailed in the application to the Quota DTG competition.

1.4 The Quota Doctoral Training Grant competition

9. The Quota DTG is BBSRC's principal mechanism for funding studentships, and it aims to support high-quality doctoral training relevant to BBSRC's mission. It provides funding in the form of flexible DTGs which allow departments considerable local autonomy in how the funding is used.
10. BBSRC awards Quota DTG funding through a competition, based on the quality of the training environment offered. Subject to reaching a competitive threshold, individual departmental allocations are informed by an algorithmic analysis of BBSRC grant funding and the number of eligible supervisors. This differs from other Research Councils who use an algorithmic allocation primarily based on research grant income. BBSRC uses a competition primarily because there is no simple connection between excellence in research and the ability to offer excellence in postgraduate training. Other advantages include:
 - the incentive for institutions to improve their training provision, and to adopt best practice
 - the potential to recognise and support innovations in postgraduate training provision
 - the potential to support interdisciplinarity by funding studentships in departments which receive the majority of their research income from non-BBSRC funding sources
 - supporting collaborative PhD training by allowing departments, faculties, schools, institutions or other research units to apply for funding in collaboration
 - supporting departments' training strategy and policy by avoiding the issue of major grantholders claiming automatic 'ownership' of studentship funding, a potential issue under the algorithmic approach

11. BBSRC normally uses the competition approach to award funding at the *departmental or school (multi-departmental)* level. Research Councils which use an algorithmic method to allocate DTG funding make awards as a single *institutional* grant.
12. BBSRC expects departments to use Quota DTG funding to provide a broad training programme which supports the development of specialist research skills, broader science skills, and professional skills. Although training in broader science skills was less prescribed when the competition started, in the 2007 competition, BBSRC emphasised three areas of 'core' bioscience skills where departments should be providing relevant training:
 - mathematical skills
 - computational and data handling skills
 - multi-disciplinary approaches to biological systems

 - public engagement and outreach opportunities
 - ethical awareness training
 - awareness of the social context of biological research

 - commercial awareness
 - business and management skills
 - entrepreneurial awareness

1.5 Evaluation methodology

13. The aim of the evaluation was to obtain an independent assessment of BBSRC's Quota Doctoral Training Grant competition, focusing on the 2005 Quota DTG competition, which supported studentships starting in the 2006/07, 2007/08 and 2008/09 academic years.
14. Information was gathered from a number of sources:
 - **Quota DTG grantholders:** a questionnaire was sent to all 107 departments, faculties, schools, institutions or other research units who were funded through the 2005 Quota Competition. The survey covered topics including the major outcomes and achievements of the grant, the use of DTG funding flexibility, the training environment, approaches for the allocation of studentships, supervisor support and training, and views on the application and administration processes. 85 responses were received (79% response rate).
 - **Quota DTG supervisors:** a questionnaire was sent to a sample of 210 supervisors of postgraduate students funded through the 2005 Quota DTG allocation, structured so that it was representative of the whole. The survey covered topics including the quality of training provided, the departmental training environment, the allocation of studentships, support for student supervisors, and achievements arising from individual studentships. 167 responses were received (80% response rate).
 - **Quota DTG postgraduate students:** a questionnaire was sent to 1331 postgraduate students funded by the 2005 Quota DTG allocation (i.e. all students

with active e-mail addresses in the Je-S Studentship Details Portal)³. The survey covered topics including the quality and scope of the training available, supervision and mentoring, interaction with industry (for CASE students), career development, research outputs, and public engagement activities. 876 responses were received (66% response rate), including 208 responses from CASE⁴ students.

- **Quota DTG unfunded applicants:** a questionnaire was sent to all 41 applicants in the Quota DTG competition whose application was not funded. The survey focused on the competition's application and assessment processes. 22 responses were received (54% response rate).
- **BBSRC data:** relevant data were collected from the Je-S Studentship Details Portal (SDP) and the BBSRC grants database.

15. The survey responses were received between June and September 2010. The questionnaires are reproduced at Appendix 3.

1.6 Data analysis

16. For the analysis of the data, Quota DTGs were placed into three categories based on the size of the award:

- **Small:** DTGs with an allocation of one or two studentships per annum (26 grants; 31% of sample by number; 10% of sample by value)
- **Medium:** DTGs with an allocation of three or four studentships per annum (33 grants; 39% of sample by number; 28% of sample by value)
- **Large:** DTGs with an allocation of five or more studentships per annum (26 grants; 31% of sample by number, 61% of sample by value)

This classification does not indicate the size of the host department or the amount of BBSRC research grant funding the department receives.

17. Students were placed into three categories based on the year of their PhD⁵:

- **Year 1 and 2:** students in the first or second year of their PhD (18 first year students, 2%; 324 second year students, 37%)
- **Year 3:** students in the third year of their PhD (282 students, 32%)
- **Year 4:** students in the fourth year of their PhD (244 students, 28%)

18. Some of the data in this report are provided as the average across all sample Quota DTGs. It should be noted that each Quota DTG was given equal weighting when calculating mean data values, irrespective of the value of the award or the number of studentships supported. As such, care should be taken when interpreting the data. For example, the statement "An average (mean) of 61% of studentships supported by the sample Quota DTGs were of four years duration" does not indicate that 61% of all studentships funded by the Quota DTGs were of four years duration. This issue is partly

³ 1425 students are known to be funded from the 2005 Quota DTG, based on information in the Je-S SDP. All of these were contacted for the evaluation but the e-mail address provided for 94 of these was no longer active.

⁴ CASE studentships are formal research training collaborations with an industry partner. See section 3.7, p. 27.

⁵ Eight students did not provide details of the current stage of their studentship.

mitigated by the provision of data by size of Quota DTG; it is likely that the data for 'large' Quota DTGs are the most representative of the whole.

19. The data in this report refer to the outputs, outcomes and performance to date of the 2005 Quota DTGs. It should be noted that the majority of the studentships funded through this competition are not yet complete; the final cohort of students are scheduled to submit their theses in the 2012/13 academic year.
20. The data in this report were obtained primarily through survey responses and, as such, care should be taken not to over-interpret the data. The Panel noted that, in some instances, the survey questions were not sufficiently explicit or were interpreted differently by individual respondents.
21. For conciseness, throughout the text:
 - Quota DTG grantholders are referred to as 'grantholders'
 - postgraduate student supervisors are referred to as 'supervisors'
 - postgraduate students are referred to as 'students'
 - unfunded Quota DTG applicants are referred to as 'applicants'
 - departments, faculties, schools, institutions or other research units which received Quota DTG funding are referred to as 'departments'
22. Additional information which was reviewed as part of the evaluation, but which is not included in the main body of the report, is provided at Appendix 1.

2. Overview of Quota DTG achievements

Summary

- The Quota DTG competition is very successful and is an effective mechanism for supporting high-quality doctoral training
- The standard of individual Quota DTGs is predominantly very good
- The training and research supported by Quota DTGs are delivering good quality outputs and outcomes
- The significant majority of students are positive about their studentship experience

2.1 Performance of Quota DTGs

23. Overall, the Quota DTG competition is very successful. Departments are using their Quota DTGs to support high-calibre students within training programmes which develop specialist research skills, broader science skills and generic professional skills. The quality of the doctoral training is high, endorsing the process of awarding Quota DTG funding by a competition based on the quality of the training environment offered.

2.2 Outcomes and achievements arising from Quota DTGs

24. As the majority of the studentships funded through the 2005 Quota DTG competition are still active, it is too early to assess their overall outcomes and achievements. Nevertheless, the evidence to date is promising. Grantholders and supervisors identified many important outcomes and achievements arising from their Quota DTGs, including:
- **high-quality doctoral training:** the primary outputs arising from Quota DTG funding are well-rounded, highly-skilled scientists who are able to pursue careers in academia, industry and the wider economy. Their success is demonstrated by high completion and thesis submission rates, students' good career development outcomes, and significant levels of personal development.
 - **high-quality student research projects:** departments are using Quota DTGs to support innovative and ambitious student research projects. Students' research is producing exciting scientific discoveries and contributing to good quality research outputs, such as publications in high-quality journals. Moreover, students' research projects are contributing to supervisors' and departments' wider research programmes, pump-priming new research directions, and underpinning future research grant funding.
 - **support for high-calibre students:** Quota DTGs support high-calibre doctoral students, a number of whom are invited to present their work at international conferences or are awarded prestigious prizes and awards.

- **interactions with industry, user groups and other stakeholders in research:** several departments are using their Quota DTG to foster successful interactions with industry partners, or are converting a high proportion of studentships to CASE. In addition, Quota DTG funding is facilitating successful interactions with user groups and other stakeholders in research, including charities, environmental groups, hospitals, landowners, public bodies, and veterinarians.
- **economic and societal impacts:** Quota DTGs support the development of highly-skilled scientists who are likely to make substantial contributions to the UK economy throughout their future careers. Students' training and research is also producing a range of economic and societal impacts through, for example, contributions to patents, spin-out companies and new commercial products, and student participation in public engagement and outreach activities.
- **improvements to doctoral training programmes:** the Quota DTG funding mechanism is driving wider improvements to departments' doctoral training programmes, benefiting Quota DTG students, other BBSRC students and non-BBSRC students.

Specific examples and highlights of these outcomes and achievements are included throughout the report.

2.3 Students' views about their studentship experience

25. Most Quota-DTG students were positive about their studentship experience. This was a further indication of the high quality of departments' doctoral training provision. Students' comments on the most positive aspects of their studentship were very diverse and reflected the unique experience of each student. Many students expressed their passion for their particular research area and others noted the exciting opportunities that had arisen during the studentship. In summary, students identified the following positive aspects of the studentship:

- **the student research project:** students were excited about their research projects and they enjoyed the intellectual and technical challenges associated with conducting research. They noted that the project gave them the freedom and independence to explore their research interests and ideas, as well as developing a detailed knowledge about a specific subject area.
- **interactions with supervisors:** many students commented on their supportive, enthusiastic, and constructive supervisors, as well as the support and encouragement from the supervisory team or the thesis advisory committee.
- **the breadth and quality of the training received:** students were pleased with their departments' training provision, noting that it enabled them to acquire a range of technical and transferable skills which would be attractive to future employers. They enjoyed participating in teaching and demonstrating, as well as mentoring undergraduates and assisting newer PhD students. Students also commented on how they had benefited from participation in external training courses.

- **the training environment:** most students stated that they were based in a well-resourced research environment, with access to state-of-the art equipment and facilities.
- **personal development:** students noted that they had developed confidence, independence, self-motivation and maturity during their studentship. They felt a sense of achievement and accomplishment as they progressed from a first-year student to an experienced, independent researcher. During the studentship, they learnt about their personal strengths and weaknesses, widened their horizons, and developed a firmer perspective on their future career choices.
- **interactions with colleagues:** students viewed their interactions with colleagues very positively. They enjoyed the opportunities to contribute to part of a larger team, learn from more experienced individuals, and have stimulating scientific discussions with colleagues. Students also enjoyed developing collaborations with other research groups and their industry partners. In addition, students commented that they had developed friendships with other PhD students, postdoctoral researchers and other colleagues in their department.
- **participation within the scientific community:** students were enthusiastic about participating in the wider scientific community, for example, through publishing their research, participating in international conferences, networking with other academics, and participating in public engagement activities.
- **the overall student experience:** students stated that their studentship was an exciting and stimulating experience, and recognised that it was a unique time in their career.

Examples of awards, prizes and grants received by Quota DTG students

Alpro Foundation Award for Masters: UK & Ireland winner

BBSRC Science Photo Competition: Category winner

Biochemical Society: Travel award

Biotechnology YES competition: Best Consideration of Intellectual Property Strategy

Biotechnology YES competition: Pfizer Prize for Innovation

British Institute of Radiology: Nic McNally Prize in Cancer Research

British Psychological Association: Lilly Fellowship award

British Science Association Perspectives competition: prize

British Society for Immunology: Travel award

British Society for Parasitology conference: Poster prize

British Society of Animal Science Conference: President's Prize for best highlight presentation

Cozzarelli Prize: Best *PNAS* paper (Behavioral and Social Sciences category)

Experimental Psychology Society: Grindley travel grant

EU ResistVir meeting: Best oral presentation prize

International Bone and Mineral Society: Young Investigator Award

International Genetically Engineered Machine Competition: First place

National Institute on Alcohol Abuse and Alcoholism: Merit award

Parliamentary Office of Science and Technology Award

Promega UK Young Microbiologist of the Year: Third place

Royal Entomology Society: Best thesis

Society of Biology: Science Communication award

Society of Experimental Biology meeting: Poster prize

Society for General Microbiology: Sir Howard Dalton Prize for the Young Microbiologist of the Year

Winter Neuropeptide Conference: Young Investigator Award

Zoological Society of London: Best thesis

Many other awards and prizes were reported by grantholders, supervisors and students (e.g. prizes for conference talks and posters, travel grants, grants to attend prestigious training courses). However, the questionnaire responses did not include specific details and so they are not included in the above list.

Examples of Quota DTG-supported training and research which has produced, or has the potential to produce, wider economic and societal impacts

As part of her doctoral training, a student at the University of Sheffield (Molecular Biology and Biotechnology) completed the structural analysis of a key enzyme in amino acid biosynthesis. Her work has now developed into a close collaboration with a major agri-business company for the development of a low-risk, non-toxic herbicide.

A student at University of Dundee (Life Sciences) developed a new drug design technology which has been patented. He used the technology to discover a new class of HT1A and Dopamine D4 ligands on which a second patent application is being considered.

Student research projects at the Institute for Animal Health have resulted in patentable findings, for example, in the development of a potential new vaccine for chickens against avian infectious bronchitis virus (IBV). This vaccine should be cheaper and give better protection than those which are currently available, and will contribute to improved animal welfare and a lower cost of egg production.

A student research project at the University of Birmingham (Biosciences) established the lack of overwintering potential in a non-native biological control agent. This was an essential component of its licensed release in the UK and the species has become one of the most successful control agents in the UK and Northern Europe.

During her PhD, a student at the University of Glasgow (Biomedical and Life Sciences) played a key role in developing a lipidic-sponge phase sparse matrix crystallization screen, in collaboration with researchers at Chalmers University in Sweden. The crystallization screen is now a commercial product for a UK company.

As part of his doctoral training, a student at the University of Sussex (Biological and Environmental Science) conducted research on acoustic communication behaviour in mosquitoes. His work, published in *Current Biology*, demonstrated that acoustic communication contributes to sexual recognition in mosquitoes. There may be potential to exploit the research for the control of mosquitoes which transmit malaria.

A student at Imperial College London (Bioengineering) used numerical modelling to increase the understanding of sinus gas exchange. She collaborated with Hammersmith Hospital to develop a new research method to quantify functional nasal sinus patency. Her work is being translated into a pilot patient study to establish a much needed clinical assessment of sinus function.

A student at Rothamsted Research investigated the production of exocellular polymeric substances from industrial biological waste. The research has implications for waste treatment: potential outcomes include methods to prevent the leaching of nitrate into the water supply, and a patent has been sought for this process.

A student at the University of Bristol (Chemistry) studied the fungus *Aspergillus oryzae* and how it produces a novel polyketide pyrone which may mediate pathogen signalling. His work has commercial applications and is currently being exploited in collaboration with an industry partner as a potential crop treatment to inhibit fungal pathogenicity.

3. Quota DTG flexibility

Summary

- The flexibility of Quota DTGs is a major strength of the funding mechanism
- Departments used the flexibility effectively and many examples of good practice were identified
- Departments were reluctant to use the financial flexibility in ways which would reduce the overall number of studentships
- Quota DTGs facilitated the transition from a three-year to four-year model of studentship funding
- The notional value of the Research Training Support Grant is not sufficient to support the costs associated with studentship research projects
- The requirement to create one third of studentships as CASE was not met

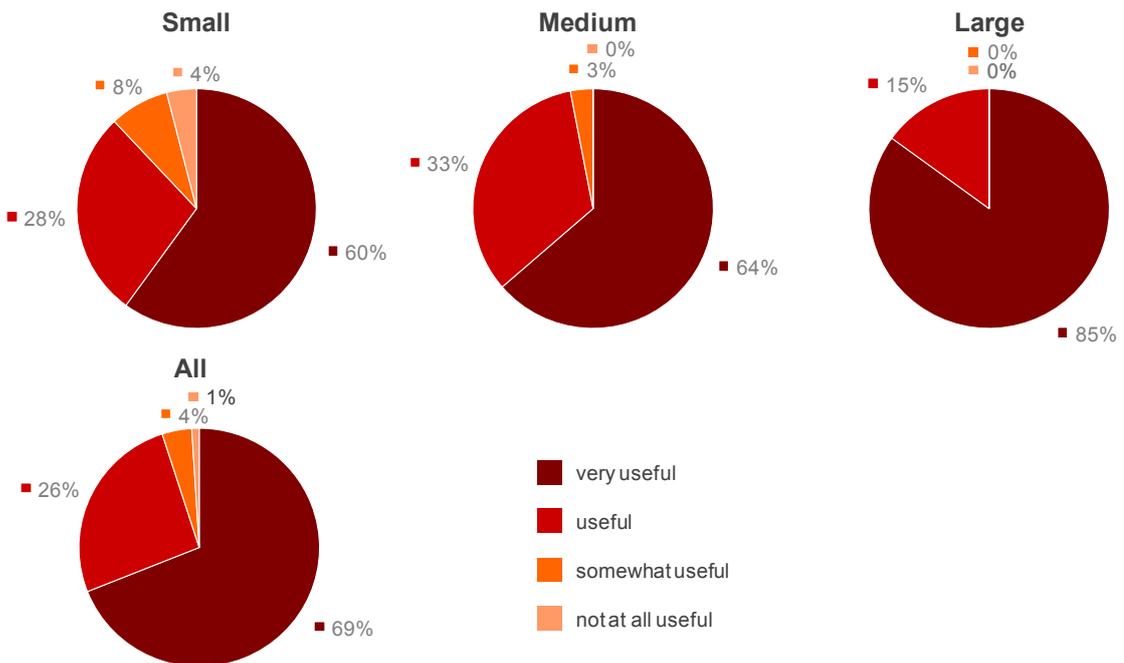
Key recommendations

- BBSRC should be more explicit that the notional number of studentships provided by each Quota DTG is not a requirement and that departments may use the flexibility of the reward to support fewer, better-resourced studentships
- BBSRC should provide departments with full flexibility in determining the length of studentships up to a maximum of four years (FTE)
- BBSRC should use a more realistic figure to determine the notional costs of a four-year studentship (e.g. a £5K per annum RTSG)
- BBSRC should remove the requirement to create CASE studentships from the Quota DTG competition

3.1 Use of Quota DTG flexibility

26. Quota DTGs provide departments with considerable flexibility and autonomy regarding how they use the funding to support doctoral training, within the framework outlined in their application to the competition. This flexibility is a major strength of the funding mechanism and it benefits students, supervisors, departments and BBSRC. The flexibility is highly valued by the research community; 95% of grantholders stated that it was useful (26%) or very useful (69%).
27. Departments used the financial flexibility in a wide variety of ways. They adopted their own strategies for using the flexibility and, for example, an approach used by one department was sometimes explicitly ruled out by another. There was greater scope to use the flexibility with large Quota DTGs compared with small or medium DTGs. The flexibility in small awards was substantially curtailed.

Grantholders' assessment of the usefulness of Quota DTG flexibility



Data are based on grantholders' response to the questions 'How useful is the flexibility provided by Quota DTG funding?' Data are shown by size of the Quota DTG award.

28. Departments used the financial flexibility of Quota DTGs to:
- deliver efficient use of funds and provide value for money
 - support high-quality student training
 - support a broader range of costs associated with a high-quality training experience
 - improve access to studentship training
 - support higher-quality student research projects
 - develop stronger interactions and collaborations with other academics
 - support interdisciplinary and multidisciplinary research
 - develop stronger interactions and collaborations with industry
 - vary the duration of the studentship
 - recruit the highest calibre students
 - reward exceptional student performance
 - react quickly to changes in students' personal circumstances or performance
 - stimulate good practice among students and supervisors
 - address BBSRC and departmental strategic priorities

Further details of specific activities are provided at Appendix 1.

29. In general, departments used Quota DTG flexibility effectively. The flexibility made it easier to support several aspects of the doctoral training programme and many examples of good practice were identified. These included: using co-funding arrangements to increase the overall number of studentships provided (e.g. through leveraging additional funding, or integrating other smaller sources of funding); supporting a broader range of training activities (e.g. training offered by external providers; additional support to attend international conferences); and recruiting the highest calibre students (e.g. varying uptake each year depending on the quality of the candidates). There were some Quota DTGs where the flexibility could have been used

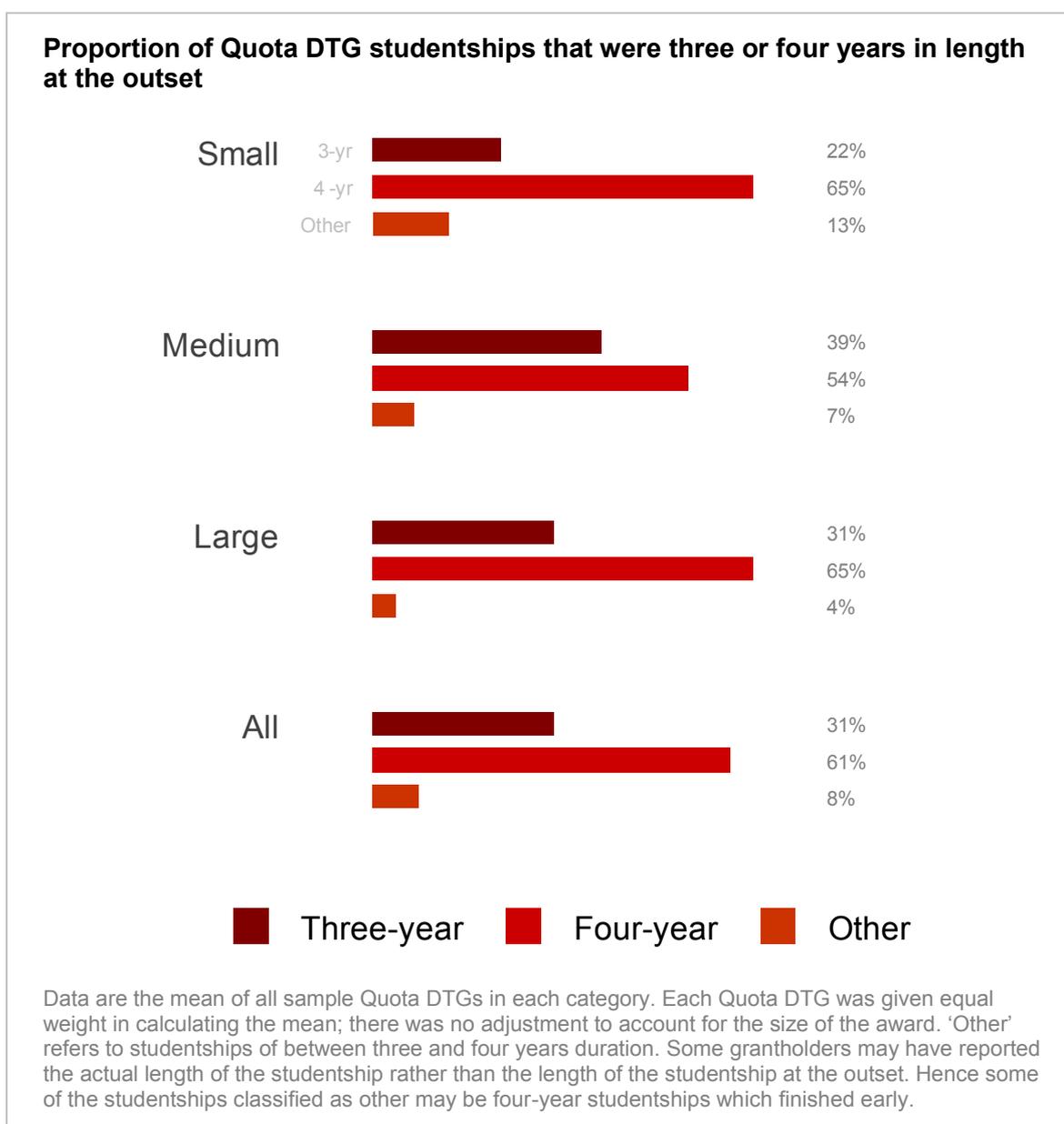
more extensively or creatively. However, it should be noted that the 2005 Quota DTG competition was many departments' first experience with DTGs and therefore they were exploring the limits and potential of the flexibility.

30. There were a small number of examples where the flexibility was used less appropriately. For example: incentivising behaviour which should be expected as the norm (e.g. completing transferable skills training or annual appraisals), or supporting activities which should be supported by other funding (e.g. repairing equipment).
31. Departments were generally reluctant to use Quota DTG financial flexibility in ways which would reduce the total number of studentships supported. Whilst it was good that departments may have been aiming to deliver the most efficient use of the funds, simply maximising the number of studentships supported raised concerns: this may not provide the best value for money, particularly if it leads to a reduction in the quality of individual studentships. BBSRC should be more explicit that the notional number of studentships funded by each Quota DTG is not a requirement, and that departments may use the flexibility of the award to support fewer, better-resourced studentships.
32. The DTG funding mechanism has resulted in an increase in the burden to host departments (e.g. through additional administration), but this is outweighed by the numerous advantages. Typically, grantholders who raised concerns about the flexibility stated that Quota DTGs were not sufficiently flexible to address all the issues or take advantage of opportunities that might arise during the course of the grant.

3.2 Length of studentships at the outset

33. The value of Quota DTGs is calculated on the basis of a notional number of four-year studentship packages, although the funding can be used to support studentships of three or four years duration. BBSRC's expects that studentships will normally be of four years duration unless the student has relevant previous experience.
34. A mean (average) of 61% of students supported by the sample Quota DTGs were of four years duration at the outset; 31% were of three years duration and 8% were between three and four years duration. Departments used the flexibility to vary the studentship durations in an appropriate manner. For example, three-year studentships were offered to applicants with a Masters degree or previous research experience. Several departments used their own Masters courses as a feeder for the doctoral training programme.
35. It was pleasing that departments used funding from the 2005 Quota DTG competition to support the transition from a three-year to a four-year model of studentship funding. Four-year studentships are very beneficial, providing time for a more extensive training programme without compromising the student research project. It also represents a correction of the endemic issue where students were supported for three years, despite requiring four years to complete their research project and write their theses.
36. BBSRC expects all students to be offered either a three- or four-year studentship at the outset. This requirement was appropriate in the context of past practice: it encouraged the sector to adopt four-year studentships as the standard, and facilitated a step-change in support rather than incremental improvements. Now that four-year studentships are embedded as the norm, BBSRC should provide departments with full flexibility in the determining the length of studentships up to a maximum of four years (FTE).

37. Departments used a wide variety of funding models to structure their doctoral training, including 3-yr, 4-yr, 1+3-yr, 2+2-yr, and 3+1-yr models. Some departments used just one or two of these models, whereas others used a wider range. The funding models were often designed to deliver specific objectives. For example, the 1+3 yr model was used to support a more intensive training programme in the first year, a lab-rotation programme, or provide an exit mechanism for students who were not suited to research (e.g. conversion to MRes or MPhil). Several departments offered a rotation programme as part of the studentship's first year, which could be very beneficial: they empower the students in the choice of their research project and their supervisor, encourage discipline hopping and provide greater scope to establish a successful student-supervisor relationship. However, BBSRC should not be prescriptive about the models used by departments to create studentships. The Panel noted that four-year studentships only provide three years of QR funding, implying the need for extra institutional support, whereas a 1+3-yr model can retain four years QR funding if year one is a separate research qualification.



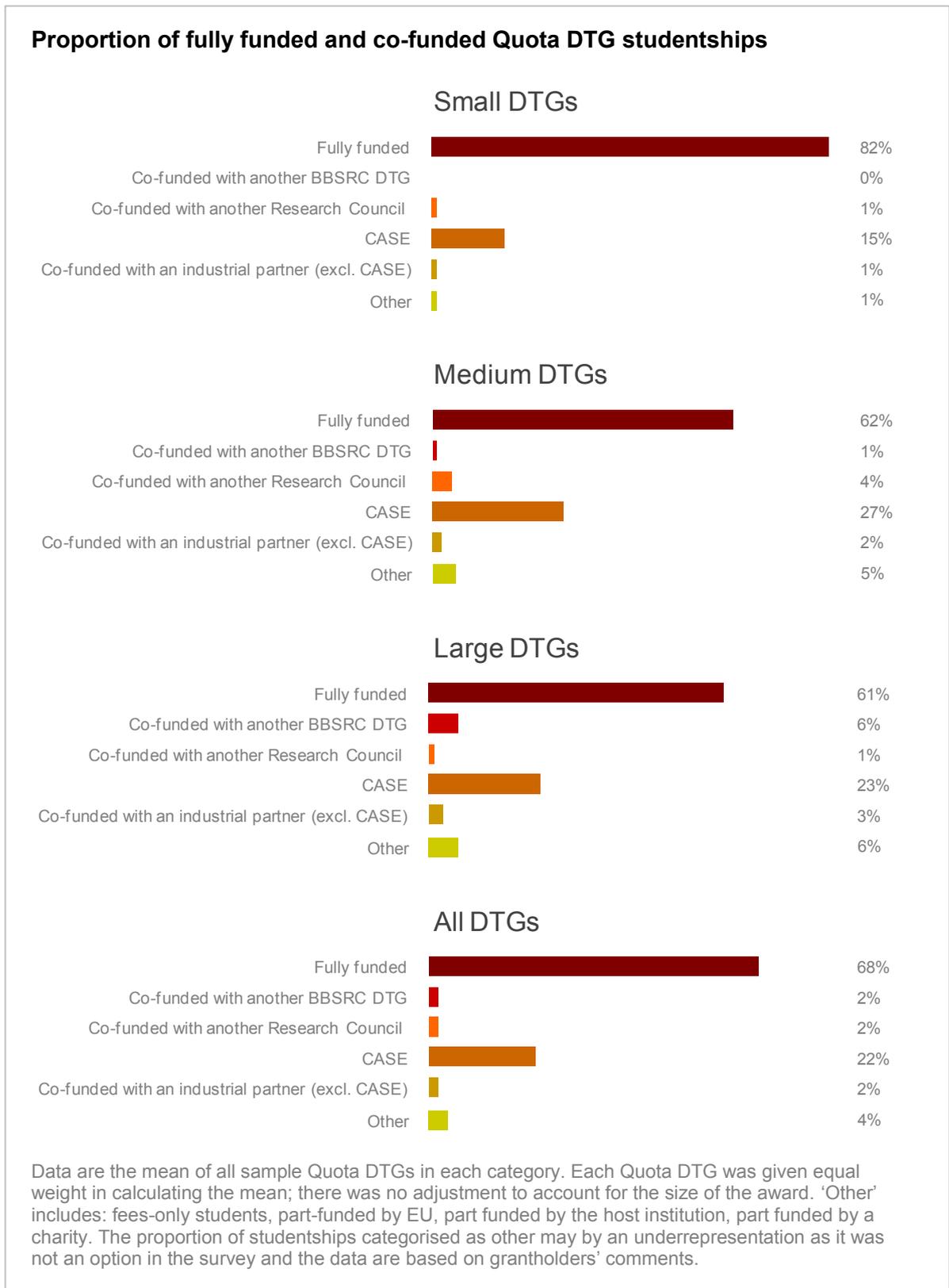
38. There is a need for careful and sensitive management of doctoral training programmes on an individual basis, whichever model is used. With the use of four-year studentships, it is important that the increased duration of the studentship is used to support a broader training programme and not only to increase the length of the student research project. In addition, when studentships are four-years at the outset, there can be pressure from supervisors to keep the student for the full duration of the studentship, even when earlier submission of the thesis would be appropriate.
39. There was a slight concern that some departments used the flexibility to adjust the length of the studentships based on students' ability rather than the students' training requirements or the scope of the research project. For example, a department might offer three-year support to all students but subsequently provide the most exceptional students with an additional year of funding. This may allow the most gifted students to obtain better publications and improve their career options. However, there is a risk that this flexibility could be used inappropriately and affect the morale and integrity of the wider student cohort. In future Quota DTG competitions, BBSRC should require departments to outline their policy for determining the length of studentships awards, making clear the criteria used to decide whether to fund three- or four-year (or in between) studentships in individual cases. It was the Panel's view that all students would benefit from four years postgraduate training, and that four-year studentship programmes should not be reserved for only the 'best' students. Moreover, where a department offered a rotation programme, it would be beneficial if this was available to all students.

3.3 Co-funding of studentships

40. The DTG funding mechanism allows studentships to be part funded by the DTG and part from another source. In all cases of co-funding, at least 50% of the total cost over the lifetime of the studentship should be funded from the DTG⁶, to ensure that all students funded under the DTG are 'recognised' as BBSRC students. 50:50 funding using DTGs from different Research Councils is also permitted.
41. An average (mean) of 32% of studentships supported by the sample Quota DTGs were co-funded: 22% were CASE studentships; 2% were co-funded by another BBSRC DTG; 2% were co-funded with another Research Council; 2% were co-funded with an industrial partner (excluding CASE); and 4% were co-funded by other funding sources (e.g. departmental funds, charities). In general, departments with medium or large DTGs made more effective use of co-funding arrangements.
42. Departments used co-funding arrangements to increase the number of studentships which could be supported by the DTG, and there were a few impressive examples where this increase was substantial. This use of co-funding was very positive and helped ensure that Quota DTGs provided good value for money. Departments used their award to leverage additional internal and external funding. In addition, they integrated smaller, fragmented sources of funding into the Quota DTG training programme, many of which were not sufficient to support a studentship on their own.
43. The use of co-funding with other Research Councils was relatively limited. This was disappointing, especially as such arrangements should facilitate the creation of studentships in interdisciplinary or cross-Council areas.

⁶ For students who are being funded on a fees-only basis, 100% of the fees should be met from the DTG over the lifetime of the studentship. These are cross-Council requirements.

44. To encourage greater or more effective use of co-funding, Research Councils should consider relaxing the requirement for at least 50% of the studentships costs to be supported by the DTG. There are potential benefits in allowing a greater range of co-funding arrangements (e.g. 40:30:30, or 60:40 between different Research Councils).



3.4 Studentships with enhanced stipends

45. There was reluctance among grantholders to use DTG funding to support enhanced stipends. Although 21% of Quota DTGs supported enhanced stipends, this was usually for a small number of studentships. Several grantholders reported that enhanced stipends were useful for increasing the number and quality of studentship applicants. However, in general, departments sought to maintain equity in stipend levels between Quota DTG students.

3.5 Additional consumable or experimental costs

46. Quota DTGs are awarded on the basis on an application which explains how the department has made arrangements for adequate facilities and resources to be available for the research or training proposed. BBSRC's notional 'unit cost' for a four-year studentship includes a sum of £1K per annum as a Research Training Support Grant (RTSG). This can be used towards the costs incurred in the training of the student (e.g. costs associated with the student research project, conference fees). The flexibility of the DTG allows departments to draw higher amounts from the grant.
47. The notional value of the RTSG is not sufficient to support the full costs associated with studentship research projects. For example, grantholders and supervisors noted that their student projects could incur costs of between £5K and £12K per annum. The notional RTSG figure does not represent the costs of students' access to equipment and facilities. In addition, it is challenging to create studentships in particularly expensive research areas (e.g. animal research, molecular biology, high-throughput genomics technologies).
48. 37% of Quota DTGs supported additional consumable or experimental costs above that provided by the RTSG element in the standard unit cost for a studentship. This was usually on a case-by-case basis for a very limited number of studentships. In general, departments did not use Quota DTG financial flexibility to support the full costs associated with student research projects, as this would reduce the total number of studentships which could be funded.
49. The unrealistic level of the notional RTSG figure, together with departments' reluctance to draw additional support from the DTG, means that supervisors are expected to subsidise studentships costs through their research grant and other income. This is undesirable:
 - it may adversely affect the success of other research projects
 - it is disreputable, and formally against BBSRC's and other funders' research grant terms and conditions
 - it limits the scope and ambition of student research projects
 - the students' training experience becomes dependent on the grant status of the supervisor
 - it acts as a barrier to allocating studentships to new academic staff (who often have no or limited research grant income)
 - it will become increasingly difficult to support students in this way as the funding climate tightens and grant income declines
 - it is ultimately unsustainable
50. It is unreasonable for BBSRC to suggest that the full costs of a studentship research project can be met through the current notional RTSG figure used in its unit cost for a

studentship. BBSRC should therefore use a more realistic figure (e.g. a £5K per annum RTSG)⁷. This would make a notable difference to students who are based in research groups with limited grant income, and would provide greater scope to allocate studentships to new academic staff. It would also send a strong message about the costs associated with good-quality student training.

51. In awarding DTGs, BBSRC informs departments of the notional number of studentships supported by the grant. Departments often view this notional number as a requirement, which may act as a disincentive to support fewer studentships with a higher RTSG element. To address this, it may be helpful to emphasise the financial value of the Quota DTG in the announcement letter. For example: “The value of this award is £X. This could support Y studentships with a nominal RTSG of £5K.” BBSRC should maintain the existing flexibility for departments to adjust the level of the RTSG, recognising that the costs of individual student projects will vary depending on the nature of the research.
52. It is the Panel’s view that BBSRC should increase the level of the RTSG whilst maintaining the current number of studentships. However, as a priority, BBSRC should emphasise the quality of student training over the number of studentships.

3.6 Students’ recognition of BBSRC as their sponsor

53. It is important that students are aware that their studentship is funded by BBSRC. Under the DTG funding mechanism, where stipends are not paid directly by Research Councils, there is a risk that students may not know their sponsor. However, of the 876 students who responded to the survey, 866 (99%) were aware that their PhD was funded or part funded by BBSRC.

3.7 Creation of CASE studentships

54. CASE are a type of doctoral studentship designed to incorporate an element of industrially relevant training. To count as a CASE studentship, the student’s research project should be agreed by the academic department and the industrial partner (or cooperating body), and the student should be supervised by staff from the academic and industrial partners. CASE awards attract additional payments from the industrial partner to both the student and the department.
55. The 2005 and 2007 Quota DTG competitions required that a minimum proportion of the notional allocation of studentships created to be CASE awards. In 2005, the overall requirement was that one third of studentships should be CASE, although some departments were not required to create any CASE studentships (these were determined on an individual basis and were primarily departments with small Quota DTG awards). In 2007, the requirement was that all departments should support 25% of their nominal allocation of awards as CASE⁸.

⁷ MRC has announced their intention to move to a £5K per annum RTSG for their studentship costing.

⁸ For Quota DTGs which supported a total of three studentships, one was required to be CASE.

Departments' use of Quota DTG funding to create CASE studentships

Size of Quota DTG award	Proportion of Quota DTGs which created CASE studentships at the stated level	
	25% 'target'	33% 'target'
Small	32%	20%
Medium	64%	39%
Large	40%	20%
All	47%	28%

The data are based on the total number of studentships supported by the Quota DTG. As such, they may underestimate a department's success in creating CASE studentships (e.g. if the department uses the award's flexibility to increase the number of studentships above the notional allocation, the proportion of CASE studentships will fall).

56. A large number of CASE studentships were created using the 2005 Quota DTG awards. An average (mean) of 22% of studentships supported by the sample Quota DTGs were CASE. Of the 1425 students in the Je-S SDP who were funded through the 2005 Quota DTG competition, 327 (23%) had a named CASE partner. 208 students (24%) identified themselves as CASE students in the surveys.
57. 28% of the sample Quota DTGs created a third or more of their studentships as CASE. 47% created a quarter or more of their studentships as CASE. Large and medium Quota DTGs were generally more successful in creating a higher proportion of their studentships as CASE. There were a few examples of Quota DTGs which were very successful in converting studentships to CASE. Overall, however, the requirement to create one third of studentships as CASE was not met.
58. 185 different organisations were listed as CASE partners in the Je-S SDP. The mean number of CASE studentships supported by each organisation was 1.8 (the median was one). The largest number of CASE studentships were supported by AstraZeneca (21 studentships), GlaxoSmithKline (20), Pfizer (20) and Unilever (9). There was a wide range of sectors represented by CASE partners, as well as a mix of large companies and small and medium enterprises, reflecting appropriate diversity. The pharmaceutical industry was strongly represented among Quota DTG CASE partners.
59. Responsibility for the choice of CASE partners is devolved to the department and BBSRC does not normally check the eligibility of organisations which act as CASE partners. The current requirements are that the CASE cooperating body must be a company registered in the UK with a UK research and/or manufacturing base. From the analysis conducted for this evaluation, it was apparent that a few of the CASE partners on Quota DTG studentships did not meet these current requirements. This highlights a need either for BBSRC to provide greater clarity on what constitutes an acceptable CASE partner or, more beneficially, to relax the rules for CASE partners to include a wider range of organisations.

60. Overall, the number of CASE studentships created within the 2005 Quota DTG competition was good and it was likely that the requirement to create one third of studentships as CASE studentships encouraged departments to seek partnerships with industry. However, the Panel identified several concerns with the CASE requirement. It was difficult for departments to meet the requirement and this risked driving departments to accept any CASE partner, irrespective of the quality of the proposed collaboration (see Chapter 6, p. 59). In addition, there were concerns that the CASE requirement may have skewed the creation of studentships towards a limited set of areas for research training where there was industry demand and where it was possible to attract industry support. On balance, BBSRC should consider removing the CASE requirement from the Quota DTG competition. It is more appropriate to award CASE studentships through a separate competition, where the quality of the proposed interaction would be an integral part of the assessment process.
61. The Panel was also concerned that negotiations between institutions and CASE partners regarding intellectual property (IP) could be too protracted. Grantholders and supervisors noted that CASE partners would often request a disproportionate share of the IP relative to their investment. BBSRC's general expectations regarding the exploitation of research results are described in the Studentship Handbook⁹. The responsibility of managing IP is devolved to institutions and BBSRC does not place prescriptive rules on the ownership of IP in collaborative research. A standard template for sharing the IP from CASE studentships is available¹⁰.

⁹ www.bbsrc.ac.uk/web/FILES/Guidelines/studentship_handbook.pdf

¹⁰ See the 'Russell Group Studentship Agreement' at: www.ipo.gov.uk/whyuse/research/lambert/lambert-resources.htm

4. Balance and coverage of the studentship portfolio

Summary

- The criteria departments use to create and allocate studentships place a strong emphasis on the quality of the student, the quality of the supervisors' training record and the quality of the proposed research project
- Departments are largely using Quota DTG flexibility responsibly to create studentships within the BBSRC remit
- However, departments tend not to emphasise the addressing of BBSRC *strategic research priorities* when allocating studentships
- There are potential tensions between Quota DTG flexibility and BBSRC's increasing need to ensure that its funding addresses its strategic research priorities and provides balanced coverage of its remit
- While Quota DTG flexibility has enabled departments to improve their support for interdisciplinary training, the overall level of support is still too low

Key recommendations

- BBSRC should maintain its position of supporting a mixture of non-directed and directed studentship funding
- The Quota DTG competition should remain focused on the delivery of excellent bioscience training and excellent bioscientists across the BBSRC remit
- BBSRC should continue to recognise the importance of departmental autonomy to decide the areas in which to create Quota DTG studentships
- BBSRC should increase the level of interdisciplinary training supported by Quota DTGs, for example, by encouraging institutional or multi-departmental level applications

4.1 Context

62. The application process for Quota DTGs asks applicants to outline their strategy and priorities for research training. However, once awarded, Quota DTGs allow departments considerable autonomy with respect to the precise areas of science in which studentships are created. Funding must only be used to support doctoral training within BBSRC's remit, and where a studentship is part-funded from the DTG of another Research Council, the department must ensure that sufficient research is within remit to justify the collaborative arrangement. Decisions on the specific areas of the BBSRC remit where studentships are created are devolved to departments.

63. BBSRC expects departments to use the flexibility of Quota DTG funding to maximum strategic effect, and to think strategically about how best to maximise the impact of BBSRC's investment in the department. For example, departments' processes for selecting supervisors and students should take account of:
- BBSRC's Strategic Plan¹¹, BBSRC's Delivery Plan¹² and BBSRC's strategic priorities¹³
 - departmental strategic objectives
 - local and national priorities for research training (including current and future needs of academia, industry and the wider economy)
 - interdisciplinary and interdepartmental research priorities

4.2 Criteria used to allocate Quota DTG studentships

64. Departments used a range of criteria to create and allocate Quota DTG studentships. There was a very strong emphasis on the quality of the student, the quality of the supervisors' training record and the quality of the proposed project. Departments incorporated these 'quality' criteria into two main models of allocation, which differ primarily with respect to the timing of student recruitment in the allocation process:
- **allocation pre-student recruitment:** studentships are allocated to specific projects or supervisors in advance of student recruitment.
 - **allocation post-student recruitment:** the highest-calibre students are recruited and are then matched to projects (often with an emphasis on student choice). For example, a large number of potential projects may be advertised and then the quality of the students interested in a particular project will determine which projects or supervisors are supported.
65. It was the Panel's view that the strong emphasis placed on the 'quality' criteria during the allocation process is appropriate: it ensures that studentships are awarded to high-calibre applicants and that students receive good quality training in the context of a high-standard research project. Both of the main models of allocation used by departments are effective.
66. Several other criteria were used by departments in the allocation of studentships, although many of these were not considered to be as important as the 'quality' criteria. The 'fit with BBSRC remit and BBSRC strategic priorities' was important, although much greater emphasis was placed on ensuring studentships were within remit compared with addressing BBSRC strategic research priorities (see sections 4.3 and 4.4). Researchers' grant income was used as a criterion, typically to ensure that students were placed with supervisors who could support the studentship through their other research grant income. The potential for industrial collaboration was also considered, but this was generally limited to the creation of CASE studentships.
67. Departments had different policies for using Quota DTG funding to support new academic staff (i.e. early career-researchers). Some departments prioritised the allocation of studentships to new academics, some would only award studentships to established staff, and others had no preference. It was the Panel's view that new academic staff should not be precluded from being allocated Quota DTG studentships.

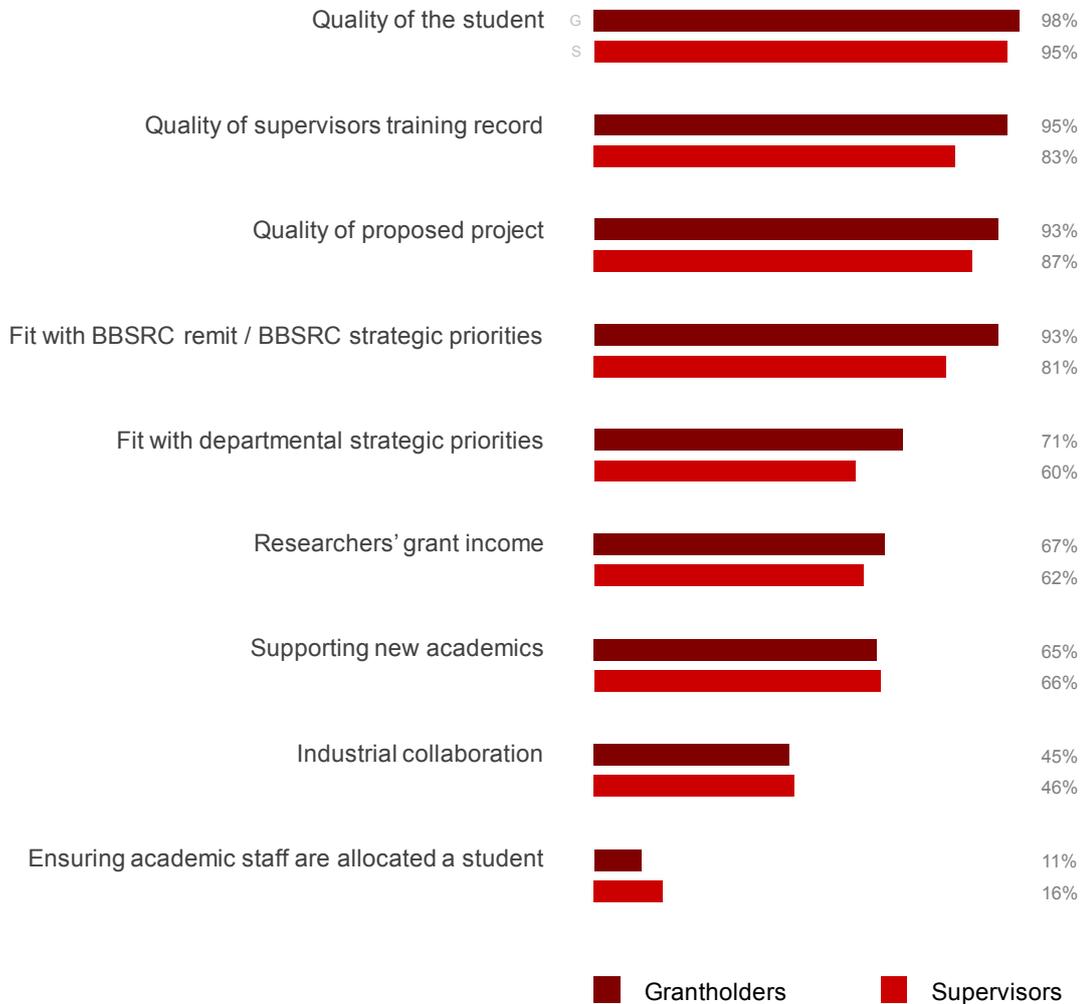
¹¹ See: www.bbsrc.ac.uk/strategy

¹² See: www.bbsrc.ac.uk/deliveryplan

¹³ See: www.bbsrc.ac.uk/funding/priorities.aspx

It was clear that some departments' decisions not to provide studentships to new academic staff were related to the low level of the RTSG, and the need for supervisors to have adequate resources for the students' research project.

Proportion of respondents who rated specific criteria as important or very important for the allocation of Quota DTG studentships within their department



Data by Quota DTG size are at Appendix 1. There were very few differences in the ratings depending on the size of the Quota DTG. The main exception was that departments with small Quota DTGs placed less emphasis on 'industrial collaboration'. They also placed slightly less emphasis on the 'quality of supervisor's training record' (i.e. it was rated as 'important' rather than 'very important').

Other criteria which were used in the allocation of studentships included: the number of students currently being supervised; allocations in previous years; supporting inter-departmental links and interdisciplinary projects; integrating students' wishes with those of the supervisor and departmental / BBSRC strategic objectives; supervisor's academic credentials (e.g. publication record, patents, honours and awards); whether the supervisor has BBSRC grant funding; success in attracting graduate students with non-Quota funding (e.g. overseas students); the supervisor's laboratory infrastructure; a vibrant research environment (e.g. critical mass of other expertise available to support the student); an appropriate supervisory team; and the candidate student's enthusiasm.

Supervisors rated the importance of individual allocation criteria in a similar way to grantholders. Most of the supervisors' comments indicated that they had a good understanding of the criteria used to allocate studentships within their department. Six (4%) wrote that the allocation process was not transparent.

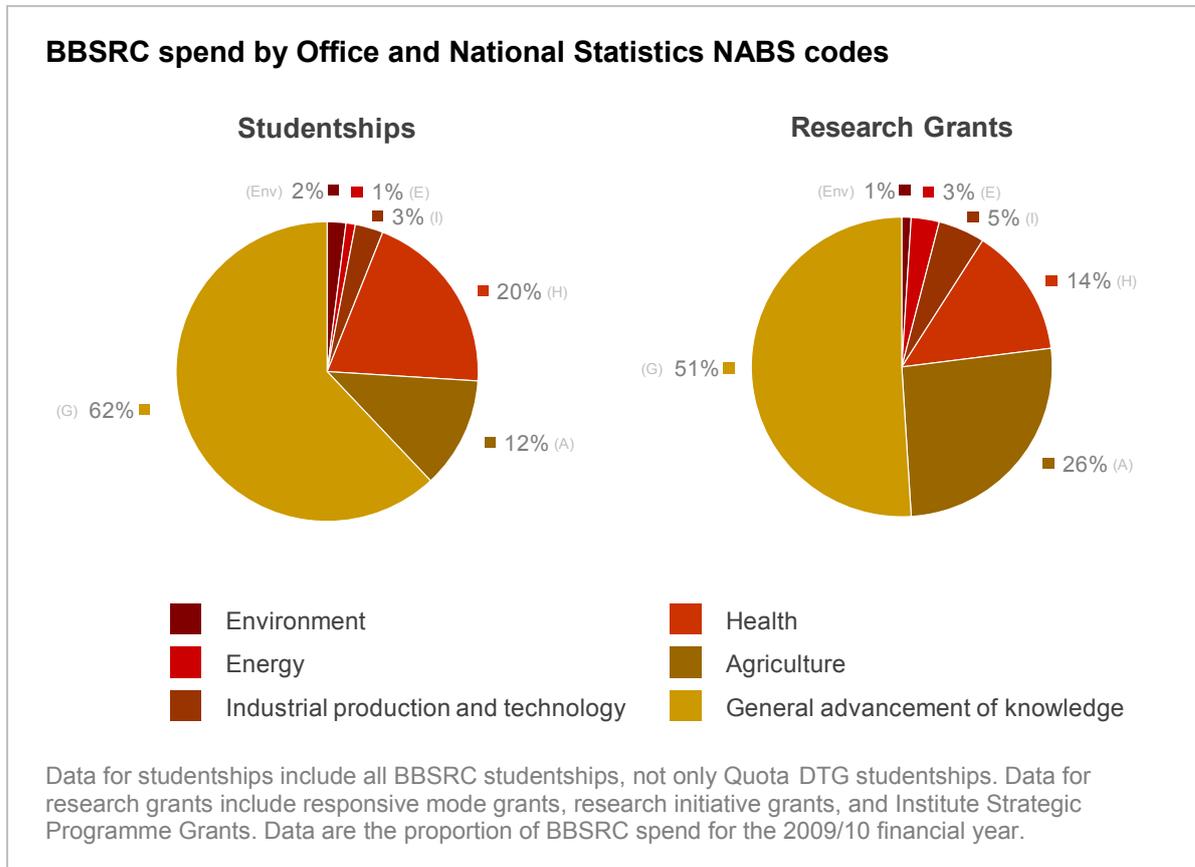
4.3 Coverage of the BBSRC remit

Balance and coverage of the studentship portfolio

68. The balance and coverage of the Quota DTG studentship portfolio is driven by the academic interests of departments, supervisors and students, and there is substantial support for high-quality training in basic bioscience from across the BBSRC remit. The focus on excellent training in basic bioscience is a strength of the competition and should be maintained. It enables students to pursue a wide range of research and related careers in academia and industry. The Panel felt that it is appropriate for departments to emphasise 'quality' criteria over considerations regarding the balance and coverage of the studentship portfolio when allocating studentships.
69. The Panel was provided with a breakdown of BBSRC's total studentship and research grant funding by Office of National Statistics NABS¹⁴ codes (i.e. the data included Quota DTG studentships as well as studentships supported by other BBSRC funding programmes) (see p. 34). The data indicate that there are differences in the balance and coverage of the studentship and research grant portfolios. However, care should be taken when interpreting these data as there are fewer details available to classify studentships compared with research grants and the NABS categories are relatively broad. Compared with BBSRC research grant spend, the areas of 'general advancement of knowledge' and 'health' are overrepresented in the studentship portfolio as a whole. Studentships in the areas of 'agriculture', 'energy' and 'industrial production and technology' are underrepresented. It is also likely that other science areas or disciplines are over- or underrepresented within the 'general advancement of knowledge' category, but it was not possible to identify these from the data provided.
70. The differences between the balance and coverage of the studentship and research grant portfolios are likely to have a number of causes. For example, the separate Industrial CASE and Industrial CASE Partnerships competitions may increase studentship representation in certain industrial sectors. In addition, the balance of the studentship portfolio will inevitably reflect the academic strengths of departments which were awarded funding in BBSRC's studentship competitions. There may be important departments for specific areas of research which were not successful in these competitions, and therefore the associated science areas may be underrepresented.
71. In general, the Panel felt that the differences between the studentship and research grant portfolios were reasonable and expected. However, the underrepresentation of some research areas was a concern, particularly for those areas where BBSRC is the only UK funder providing significant support (e.g. agricultural science). There is a risk that if these areas do not receive sufficient support, there will be a subsequent lack of skilled individuals for associated academia and industry. Moreover, a lack of training in particular disciplines could affect BBSRC's ability to address strategically-important scientific challenges in the future (see section 4.4). BBSRC should continue to monitor the balance and coverage of its studentship portfolio as a whole, to identify areas where skills shortages may be developing.
72. The Panel noted that MRC is planning to reduce slightly the number of studentships it supports in the biomedical science area (as it is increasing the Research Training Support Grant for its studentships). BBSRC should consider how this may affect the balance and coverage of its studentship portfolio, as departments may use a higher proportion of BBSRC Quota DTG funding to support biomedical research training in

¹⁴ NABS: Nomenclature for the Analysis and Comparison of Scientific Programmes and Budgets

response. However, it is also important to recognise that training in biomedical research is of national importance, and BBSRC should work together with MRC to ensure funding opportunities remain available.



Studentships and remit

73. The departmental autonomy provided by Quota DTGs limits BBSRC's ability to ensure at the outset that studentships are within remit. BBSRC expects departments to demonstrate good knowledge of the BBSRC remit when awarding studentships and to make appropriate decisions regarding projects at the interface of BBSRC's remit with those of other Research Councils and other funders. BBSRC checks the remit of individual studentships using data from the Je-S SDP, although this is post allocation. Under the previous 'directly-funded' mechanism of studentship support, supervisors had to be on a BBSRC-approved list and BBSRC checked the remit of every student project before it was funded. However, this was resource intensive.
74. Departments have generally used the Quota DTG flexibility responsibly to create studentships which are within the BBSRC remit. Data from the Je-S SDP and from survey responses indicated that a small number of studentships were potentially out-of-remit studentships (e.g. an out-of-remit abstract, research output or achievement had been reported). These were primarily straying too far into the biomedical research area. This may reflect difficulties with the interpretation by departments or supervisors of the boundary between BBSRC and the Medical Research Council (MRC) remits, or that many departments receive support for studentships from multiple funders. However, it is important to provide some scope for student projects to develop and to cross remit boundaries during the course of the studentship.
75. The increased cross-Council focus on the economic and societal impacts of training and research may have contributed to the number of apparently out-of-remit studentships. For example, for some studentships, there may be a temptation to emphasise the possible long-term medical impacts of the research project, even though the focus of the research is basic biology. The strong representation of the pharmaceutical industry as CASE partners also pushes studentships towards translational research training and towards area of private sector research activity. It is important that the biomedicine and health industries continue to support basic bioscience research training, and BBSRC should make representations to this effect to its senior contacts in industry.
76. There was an issue with the quality of information provided by departments through the Je-S SDP. The Panel was concerned that a studentship's title and abstract may not always make clear the extent to which the research project was within remit. In addition, too many studentships were supplied with potentially out-of-remit abstracts which had to be rewritten at BBSRC's request. It is encouraging that BBSRC monitors the information in the Je-S SDP and requests more accurate information where studentships appear to be out-of-remit. This reinforces the requirement that Quota DTG funding must only be used to support training and research within the BBSRC remit. BBSRC could consider stricter sanctions for departments which submit out-of-remit abstracts.

4.4 Addressing BBSRC strategic priorities

77. BBSRC's Strategic Plan 2010-2015 defines the research priorities and enabling themes which will drive the Council's investments over the period. The Plan is structured around the delivery of world-class bioscience and describes three major strategic research priorities: food security; bioenergy and industrial biotechnology; and basic bioscience underpinning health. In addition, BBSRC has a set of Council-wide research and policy priorities that are applicable to all aspects of BBSRC funding.
78. The Quota DTG competition is successfully addressing BBSRC's overarching strategic priority of the delivery of excellent, world-class bioscience. The training of excellent bioscientists is a major achievement of the competition, and departments' emphasis on 'quality' criteria when allocating studentships has contributed significantly towards this.
79. However, departments place less emphasis on the fit with BBSRC strategic research priorities when allocating studentships compared with many other criteria (e.g. quality of the student; quality of the supervisors training record; quality of the proposed research project; fit with BBSRC remit). Support for training in strategically important science areas is either a secondary consideration or departments consider Quota DTG funding as a useful means to broaden training from more overtly targeted strategic funding of studentships. In addition, departments place a very strong emphasis on recruiting the highest-calibre students and many stress the importance of student choice in determining studentship research areas. This is broadly appropriate: the success of doctoral training depends on attracting the best candidates who are enthusiastic about their research project, although the priority given to student choice may create a conflict with the delivery of other priorities for doctoral training.
80. The Panel is not convinced of the need for the Quota DTG competition to address specifically BBSRC's strategic research priorities or to be closely aligned with the research grant portfolio. Quota DTG funding should remain focused on the delivery of excellent bioscience training and excellent bioscientists across the BBSRC remit. BBSRC should continue to recognise the importance of departmental autonomy to decide the areas in which to create studentships. However, the Panel also agreed that BBSRC's strategic research priorities need to be addressed by investments in training. For example, there is a need to support the training of skilled personnel in strategically-important areas, to ensure a supply of qualified individuals for academia and industry or to build capacity in emerging areas. The Panel recognised that there are potential tensions between Quota DTG flexibility and BBSRC's need to ensure that studentship funding addresses its strategic research priorities and provides balanced coverage of its remit.
81. Several factors may limit the extent to which Quota DTG funding is aligned to BBSRC strategic research priorities and the research grant portfolio:
 - departments deliver training in research areas where they have academic strengths
 - the allocation of studentships within institutions will reflect the institutional demographics; these demographics reflect previous funding and are slow to change
 - student choice in the selection and development of research projects
 - funding stability is required for institutions to invest in specific research areas:
 - institutions will only recruit new academic staff in a priority area if they believe that it will receive long-term support
 - institutions will only establish dedicated training programmes in a priority area if long-term support is available

- if a department has many staff supported by non-BBSRC funding sources in a particular area (e.g. biomedical science), there is a risk that Quota DTG funding may be disproportionately drawn into this research area
82. However, several aspects of the Quota DTG funding mechanism contribute, or could contribute, to the alignment of the studentship portfolio with BBSRC strategic research priorities and the research grant portfolio:
- Quota DTG studentships are indirectly aligned to the research grant portfolio through the algorithm used to determine funding allocations; BBSRC research grant funding is itself influenced by strategic priority science areas
 - the Quota DTG competition includes alignment with BBSRC strategy as a significant part of the assessment process¹⁵:
 - BBSRC could give high weighting to how a department will use, or has used, the Quota DTG to address BBSRC strategic research priorities
 - BBSRC can target Quota DTG funding to departments whose training is closely aligned to BBSRC's strategic research priorities
83. BBSRC supports a wide range of research and training programmes and each of these addresses BBSRC strategy to a different extent. For example, research initiatives and Institute Strategic Programme Grants are more directly aligned to specific BBSRC strategic objectives compared with responsive mode funding. It is the Panel's view that there is less need for studentships to be directed to specific priority areas, especially as it is not possible to guarantee the link between studentship funding and the delivery of broad strategic outcomes (e.g. training a specific student in a particular research area does not guarantee they will choose to pursue a career in that area). Moreover, BBSRC's Strategic Plan is refreshed every five years and specific research priorities also change frequently; good doctoral training programmes should not 'chase' these changing priorities, but concentrate instead on producing highly-skilled, creative and well-rounded scientists. It is also important to provide institutions with sufficient scope to make their own funding cases regarding the extent to which their training programmes will address BBSRC's strategic research priorities within their Quota DTG applications. These will then be considered by TAC during the assessment process.
84. There are risks associated with being too prescriptive about the research areas where departments should support doctoral training. Without close monitoring, more stringent requirements to address BBSRC strategic research priorities may only result in the misleading branding, or forced fit, of studentship research projects within priority areas. It may also limit the ability of doctoral training to deliver skilled personnel who can address emerging and future strategically important science areas, some of which are not yet known.
85. The Panel did not reach a consensus on how to balance the importance of departmental autonomy and the need to address strategic research priorities, and a number of different options were identified:
- BBSRC could find ways to encourage departments to place greater emphasis on addressing BBSRC strategic research priorities when allocating studentships
 - addressing BBSRC strategic research priorities could be given greater weight in the assessment of Quota DTG applications
 - BBSRC could require departments to use a proportion of Quota DTG funding to address strategic research priorities
 - BBSRC could provide additional funding to departments whose training is closely aligned with BBSRC strategic research priorities

¹⁵ The fit with BBSRC's strategic plans was an assessment criterion in the 2007 Quota DTG competition.

- BBSRC could fund separate studentship competitions to support training in strategically-important science areas
 - BBSRC should recognise that closer alignment with BBSRC strategic research priorities cannot be achieved without sacrificing other priorities for doctoral training (e.g. training excellence; support for the highest-calibre students)
86. The Panel agreed that BBSRC should maintain its position of supporting a mixture of non-directed and directed studentship funding. Quota DTG funding should remain a non-directed scheme which is focused on the delivery of excellent bioscience training. Quota DTG students explore a wide range of science, and new and exciting scientific discoveries are likely to emerge from studentship projects, some of which may address current and future priorities in unexpected ways. Focused support for student training in priority science areas or areas with skills shortages would be better addressed outside the Quota DTG competition.
87. The training supported by Quota DTGs provides students with a broad range of research skills. As such, addressing strategic research priorities may not require a large shift in studentship allocations. Instead, students could be exposed to a wider range of career options or research opportunities in strategically-important areas throughout their studentship. The proposed 'Professional Internships for Postgraduate Students' (PIPS) scheme may be useful in this context. It should also be noted that undergraduates tend to follow their interests when selecting a PhD position, but are more influenced by what projects are available when seeking employment as a postdoctoral researcher. It is likely that a notable proportion of PhD students shift to more strategic science areas when making the transition to postdoctoral researcher.

4.5 Support for interdisciplinary training

88. Many of the most exciting advances in biology are likely to occur at the interfaces with other disciplines. Moreover, modern bioscience often involves the coordination of large multidisciplinary research teams and interactions with a variety of project partners and stakeholders. As such, it is important that Quota DTGs are used to support interdisciplinary training.
89. The Quota DTG funding mechanism can, and in some cases has, enabled institutions to improve their support for interdisciplinary research. The financial flexibility facilitates interdisciplinary training through, for example, enabling studentship co-funding with other Research Councils, departments or institutions. Four-year studentships also provide greater scope for interdisciplinary training: more ambitious research projects can be supported, and students with non-biological backgrounds can be recruited and still have time to complete a high-quality biological research project.
90. There were good examples of interdisciplinary training and research within the Quota DTG portfolio, and several grantholders noted that support for interdisciplinary training was prioritised within the studentship allocation process. However, the Panel considered that the overall level of support for interdisciplinary training was too low. There could have been more effective use of Quota DTG flexibility to support collaborations with other non-biology departments at the host institution. There was also potential for greater use of cross-Council co-funding to support interdisciplinary studentships. Some departments and institutions had multiple, small Quota DTGs. This suggested a lack of coordination in the departmental or institutional training strategy, and this may have limited the provision of interdisciplinary training.

91. Several applicants from non-biology departments expressed concern that the introduction of the Quota DTG competition had adversely affected BBSRC's support for interdisciplinary training and research. They noted that under the 'Committee Studentship' scheme, which ended in 2004, they were able to apply for BBSRC studentships; under the Quota DTG funding mechanism, they had not obtained studentship funding. BBSRC encourages smaller departments or those with low levels of BBSRC research grant income to apply in conjunction with another department or institution, or to collaborate with them on joint training programmes. However, several applicants stated that this approach is not effective in practice and there are barriers which prevent large biology departments from collaborating with non-biology departments. For example, large departments may preferentially use Quota DTG funding to deliver their own strategic objectives and address internal tensions, over developing interdisciplinary collaborations with other departments. There is also a risk that, in the current financial climate, individual departments may become more introspective in their support for doctoral training. Encouraging larger-scale Quota DTG applications at the institutional or multi-departmental level may help address this issue (see Chapter 7, p. 71).
92. There were, however, slight reservations on the Panel over the extent to which doctoral training should deliver interdisciplinary training. Students are at a relatively early stage in their research career, and there can be a conflict between developing a depth of knowledge in a specific research area and a breadth of knowledge which covers several disciplines.

4.6 Specialised and niche skills training

93. Departments adopted a range of approaches to support specialised and niche research skills training. A few had a clear strategy for using the Quota DTG to provide such training. However, it was evident that the majority of departments did not have a strategy for providing niche skills training. Several departments had supported studentships which incorporated niche skills training, but this typically happened without explicit planning (e.g. it was a consequence of placing the best students with the best projects).

4.7 Addressing departmental strategic priorities

94. The use of Quota DTG funding to address departmental strategic priorities was mixed and, in general, there was less emphasis on the 'fit with departmental strategic objectives' in the allocation of studentships than other criteria (e.g. student calibre). Some grantholders stated that they did not use Quota DTG funding to address their departments' strategic objectives, whereas others used the funding to address their wider training and research objectives to varying degrees. Examples of the strategic use of Quota DTG funding included:
- reinforcing the training and research strengths of the department
 - providing training to cohorts of students in specific skills areas
 - providing studentships to new academic staff (who had been recruited to meet departmental strategic objectives)
 - pump-priming new research areas
 - supporting studentship research projects which could result in subsequent applications for research grant funding

5. The quality of student training

Summary

- The quality of research skills training was very good, as demonstrated by the quality of the outputs and outcomes arising from student research projects
- The quality of broader science skills and generic professional skills training was good, although commercial and entrepreneurial awareness should be improved
- Students had access to the equipment, facilities and resources they need to complete a high-quality research project
- Approximately half of Quota DTG students had participated in public engagement activities
- Quota DTG funding is supporting the training of highly-skilled scientists who are able to pursue careers in academia, industry and the wider economy

Key recommendations

- BBSRC should take steps to ensure that departments provide all students with high-quality training in 'core' bioscience skills areas (e.g. ethical awareness, commercial awareness)
- BBSRC should recognise 'creative and critical thinking' within its list of 'core' bioscience skills, and encourage departments to provide specific training opportunities in these areas
- BBSRC should ensure that the quality and quantity of research and generic skills training are maintained and, where appropriate, encourage further enhancements and innovations in postgraduate training provision.
- BBSRC should ensure that a larger proportion of students are enabled to participate in public engagement activities

5.1 Context

95. BBSRC uses the Quota DTG competition to invest in doctoral training programmes which support the development of specialist research skills, broader science skills and professional skills. For this evaluation, supervisors and students were asked to rate training provision in the following areas:

- research skills
 - technical or practical skills
 - scientific writing
 - teaching and demonstrating
- broader science skills, including multidisciplinary skills which underpin modern bioscience research
 - mathematics, computational and bioinformatics skills
 - ethical awareness and understanding the social context of research

- commercial and entrepreneurial awareness
- public engagement
- generic professional skills
 - communication skills
 - time management
 - project management¹⁶

96. Unless otherwise stated, the student data provided in this chapter are for all students; analyses by student year are provided in Appendix 1. There were no major differences between student cohorts, which is likely to reflect that most of the dedicated formal training occurred in the early stages of studentships. There are clear benefits and conveniences for departments to 'front load' formal training in doctoral training programmes, and there were very few examples where students' formal training was more evenly distributed.

97. Some training needs are very specific to individual students. As such, it is difficult to assess the quality of training provided through Quota DTGs using collated survey data. Overall, it appeared that the departments were providing good quality training. However, it is likely that there was a mixture of good, very good and excellent training, as well as some training which did not meet the expected standard.

5.2 Training in research skills

98. Training in technical and practical skills is an essential part of doctoral training. This was generally provided through informal 'hands-on' approaches, which are appropriate approaches for learning practical skills. For some areas of research, more formal training courses were provided (e.g. 'omics, systems biology, *in vivo* animal research, microscopy). A few students did not receive sufficient support to develop their technical skills and pointed out that they had to use 'trial and error' to learn new techniques. Some students benefited from training in specific experimental technique whilst based in research groups other than the host research group (e.g. within other departments at the host institution, or at other institutions). Postdoctoral researchers had a critical role in the delivery of technical and practical skills training (see Chapter 6, p. 55).

99. The quality of training in scientific writing was reported as being variable. Some courses were very helpful and provided a relatively broad perspective (e.g. covered the peer-review process, or the preparation of fellowship applications) whereas other were too generic and not particularly useful (e.g. focused on document layout). The BBSRC technical writing course was well regarded. For many students, scientific writing skills were developed informally through, for example, feedback on reports, thesis outlines, and literature reviews. Students expressed an interest in receiving more formal training to prepare fellowship applications and grant proposals.

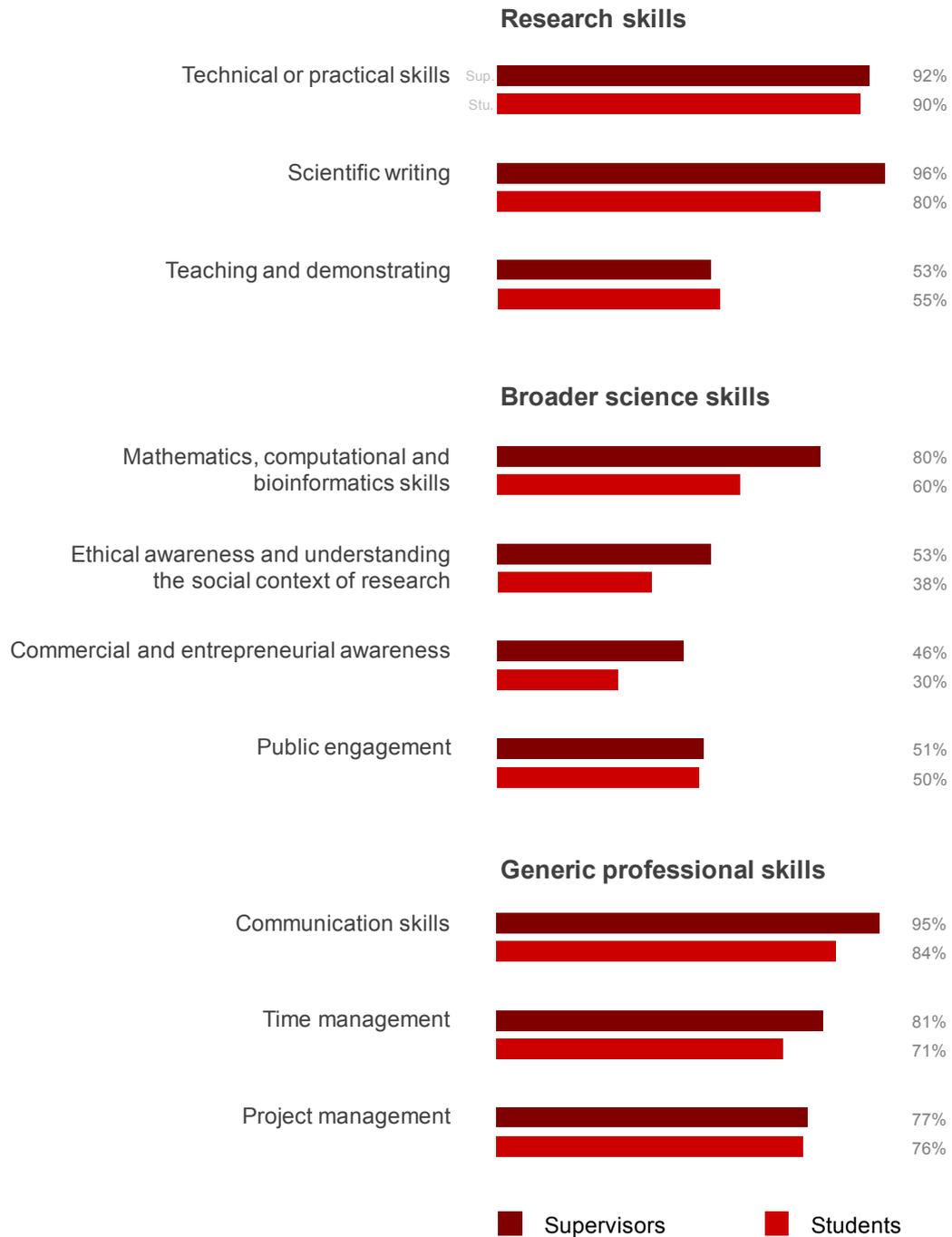
100. Students who participated in teaching and demonstrating found the experience very valuable. However, several noted that the focus was on demonstrating activities and there were limited opportunities to have a more substantive role in undergraduate teaching (e.g. designing undergraduate practicals, undergraduate tutorials, assessment

¹⁶ The list is a condensed set of skills based on (i) the 'core' bioscience skills identified by BBSRC for the 2007 Quota DTG competition and (ii) the skills training requirements in the QAA's revised Code of Practice on Postgraduate Research Programmes. It should be noted that the evaluation focused on the 2005 Quota DTG competition, when BBSRC's expectations for broader scientific skills training were less explicit.

of undergraduates' work). Many other students commented that there were no opportunities to participate in teaching or demonstrating within their institution, although some were based at an institution with no undergraduates. Supervisors had mixed views on teaching and demonstrating as part of the studentship. Some regarded these activities as an integral part of students' development. Others thought that they were of little benefit, although interactions with undergraduate project students within the research group were regarded as useful.

101. Overall, the quality of training in research skills was very good. The high-quality of the training was demonstrated through the outputs and outcomes of studentships research projects.
102. Research skills training could be improved by providing more opportunities for students to develop creative and critical thinking skills. There is an assumption that training in critical thinking will occur informally during the course of the studentship, but there can be considerable benefits from providing specific opportunities for this (such as journal clubs and seminars). BBSRC should recognise creative and critical thinking within its list of 'core' bioscience skills, and encourage departments to support related training within their doctoral programmes.

Proportion of supervisors and students who rated the provision of specific types of training as important or very important to students' overall development



Data are based on the response to the questions: 'How important has the training in research skills / broader science skills / generic professional skills provided to postgraduate students been to their overall development' (supervisors); and 'How important has the training in research skills / broader science skills / generic professional skills provided during your studentship been for your overall development?' (students). Respondents answered this question with reference to whether any training was provided, the quality of the training provided, and the benefits of the training. Respondents considered both formal and informal training.

5.3 Training in broader science skills

103. The training in broader science skills was generally good. However, there were clear differences in supervisors' and students' assessment of broader science skills training provision: students rated the training less highly and requested that additional training should be provided. Students stated that there was less emphasis on providing training in broader science skills compared with research skills.
104. Training in mathematical, computational and bioinformatical skills were recognised as being important by both supervisors and students, especially as bioscience is becoming more complex and data intensive. Typically, students had been provided with some training in these areas. However, many students indicated that they would benefit from additional or more in-depth training to develop these skills.
105. The provision of commercial and entrepreneurial awareness training was variable. Several students reported that the internal training was poor. However, other students were very positive about external training such as *Biotechnology YES* or *Biosciences KTN* events. Interactions with CASE partners were also valuable for developing commercial and entrepreneurial awareness. In general, the Panel identified a need for departments to improve the quality of their internal commercial and entrepreneurial awareness training.
106. Students' participation in public engagement is covered in section 5.8, p. 47.

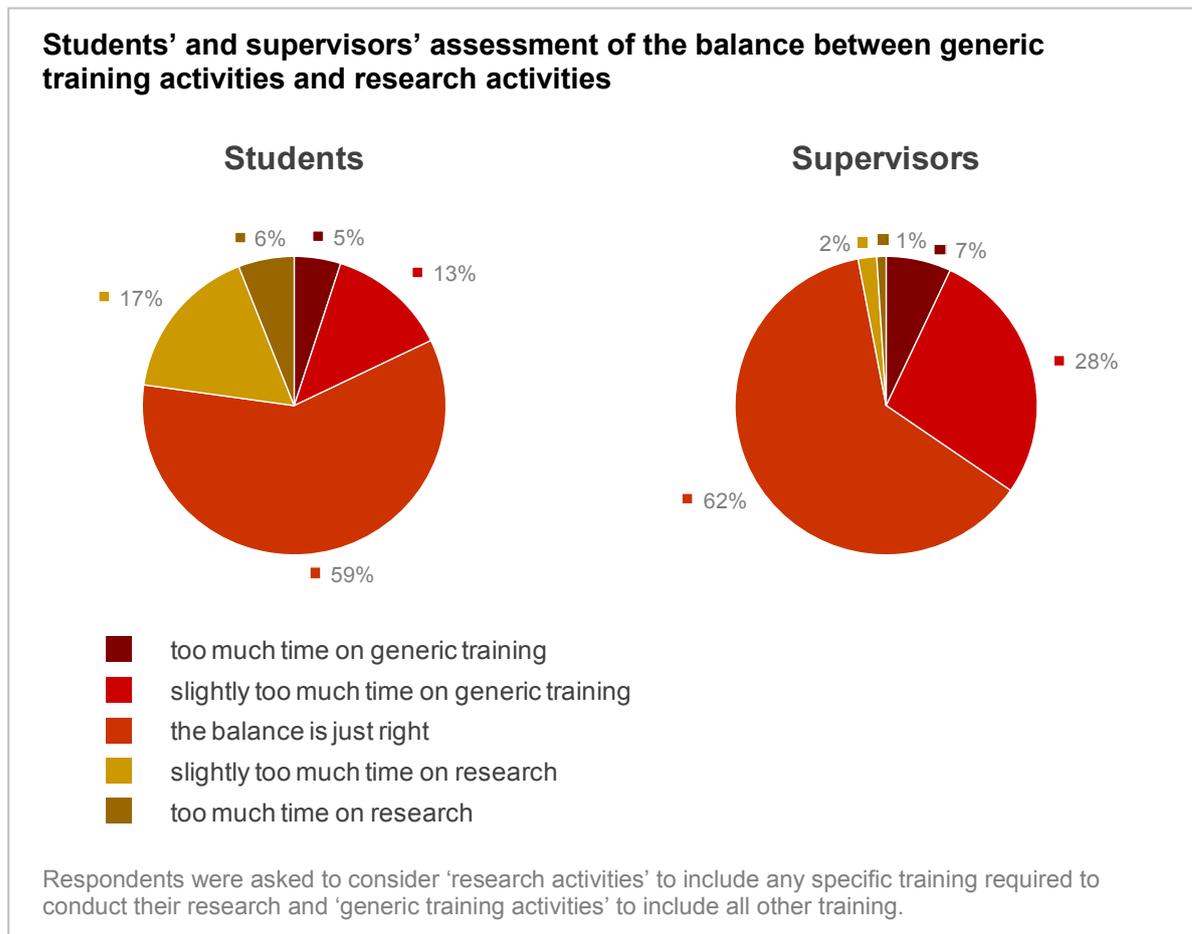
5.4 Training in generic professional skills

107. Students and supervisors stated that the development of generic professional skills was an important aspect of the studentship. Dedicated Research Council funding (Roberts Funding) was provided to institutions following the 2002 *Roberts Review: SET for Success*¹⁷ to enhance the provision of generic professional skills training for PhD students and postdoctoral researchers. The Research Councils also funded the national UKGrad programme and Vitae programme (from 2008) to support institutions in providing this broader training. Students and supervisors noted, however, that generic professional skills were primarily acquired through informal training during the studentship, and they regarded this as appropriate. For example, communication skills were developed through participation in group meetings, departmental seminars, conference presentations and public engagement activities. Students identified opportunities to participate in non-research activities as being very useful for developing professional and transferable skills (e.g. student committees; local scientific societies; organising local symposia, conferences or meetings; public engagement activities).
108. Overall, the training in research skills, broader science skills and generic professional skills supported by Quota DTGs is supporting the development of highly-skilled scientists who are able to pursue careers in academia, industry and the wider economy. BBSRC should ensure that the quality and quantity of research and generic skills training are maintained and, where appropriate, encourage further enhancements and innovations in postgraduate training provision.

¹⁷ http://webarchive.nationalarchives.gov.uk/+http://www.hm-treasury.gov.uk/set_for_success.htm

5.5 Balance between training and research

109. The majority of supervisors (63%) and students (60%) stated that the balance between generic training and research activities was 'just right'. 35% of supervisors and 18% of students thought that there was too much emphasis on generic training. 3% of supervisors and 23% of students thought that there was too much emphasis on research.



110. Students had strong and often divergent opinions on the balance between research and training. Some students were highly focused on the success of their research project and were only interested in receiving training that was directly related to this research. Other students were very keen to develop a broader set of skills. These views were often driven by career aspirations: students who wished to pursue a high-level academic career recognised that their success would be dependent on the production of high-quality publications, whereas students who wished to pursue a career outside of academia recognised the importance of acquiring transferable skills. Several students commented that they felt pressured by their supervisor to concentrate on research.
111. Supervisors also expressed different views on the balance between research and training. Many stated that a studentship should be a vehicle for preparing the student for an academic career and, as such, the focus should be on conducting a high-quality research project. Others stated that there was value in students developing a broader set of transferable skills.

112. 269 students (31%) stated that they would benefit or would have benefitted from additional training that is not offered by their department. 5% requested specific training which was directly related to their research interests (e.g. crystallography, microscopy, molecular biology, chemistry, *in vivo* skills). A number of more generic areas were also identified:
- bioinformatics and computing (5%)
 - mathematics and statistics, particularly with reference to biological datasets (5%)
 - scientific writing, particularly with reference to fellowship and grant applications (4%)
 - careers-related training, particularly with reference to careers outside academia (3%)
 - commercial and managerial skills (1%)
 - a short-term industry placement (1%)
113. 81 students (9%) had requested specific additional training from their supervisor. 53 (6%) stated the additional training was approved; 28 (3%) stated the training was refused.
114. Training should be flexible and take into account, for example, the students' previous experience, students' career aspirations, and the needs of the research project. The Panel felt it was appropriate that BBSRC does not prescribe detailed requirements for the training in its 'core' bioscience skills. Nevertheless, there are several 'core' skills areas where BBSRC should take steps to ensure that departments provide all students with high-quality training (e.g. ethical awareness, commercial awareness). Conversely there are other areas where training requirements can be more relaxed or more targeted at the individuals who will benefit the most from it (e.g. business skills).

5.6 Quality of the training environment

115. The quality of the departmental training environment was part of the assessment criteria used to award Quota DTG funding and, as expected, this was generally very good as described in the survey responses. Supervisors noted that the strength of their departments' training environments included: the design of the training programme; the opportunities for external training; the range and quality of training provided; the infrastructure at the institution; students' supervision and mentoring; and the critical mass of doctoral students.
116. Most students had good access to the equipment, facilities and resources they needed to complete their research project. Students' main concerns included: insufficient provision of computers and software licences; insufficient office and desk space; patchy access to electronic journals; or that the availability of some equipment and facilities did not meet the demand. Supervisors were satisfied with the availability and accessibility of equipment and facilities within their departments. However, there were concerns about the costs associated with accessing equipment and research facilities, which could not be met from a £1K per annum RTSG (see Chapter 3, section 3.5)

5.7 Attendance at conferences

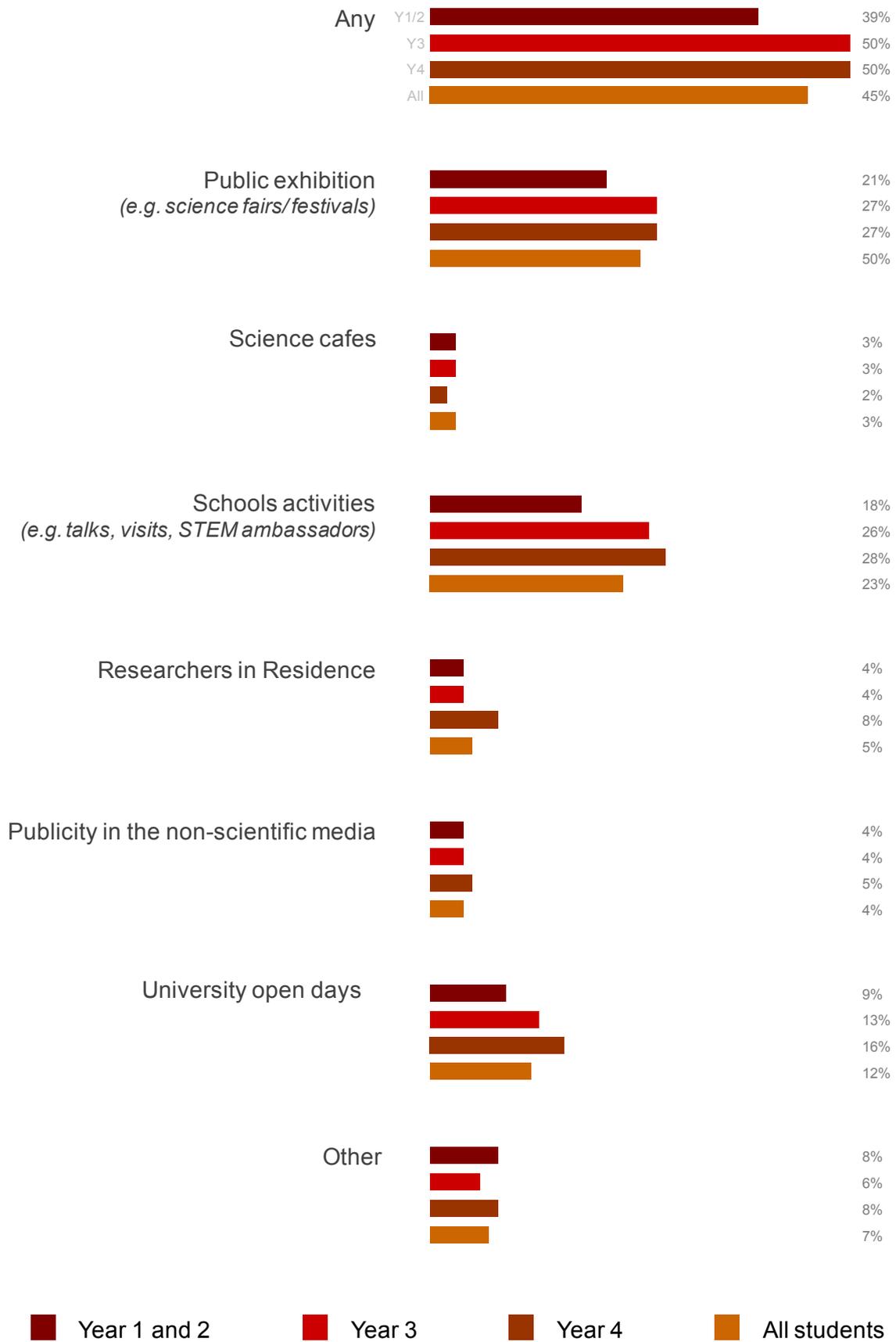
117. The opportunity to attend scientific conferences is an important aspect of the doctoral training experience and the Quota DTGs' provision for student travel was welcomed. 97% of Year 4 students had attended at least one conference; 92% had attended a UK conference and 73% had attended an international conference. The mean number of UK conferences attended by Year 4 students over the course of their studentship was 2.8 (median = 2; range = 0 to 12); the mean number of international conferences attended was 1.3 (median = 1; range = 0 to 5).

5.8 Participation in public engagement activities

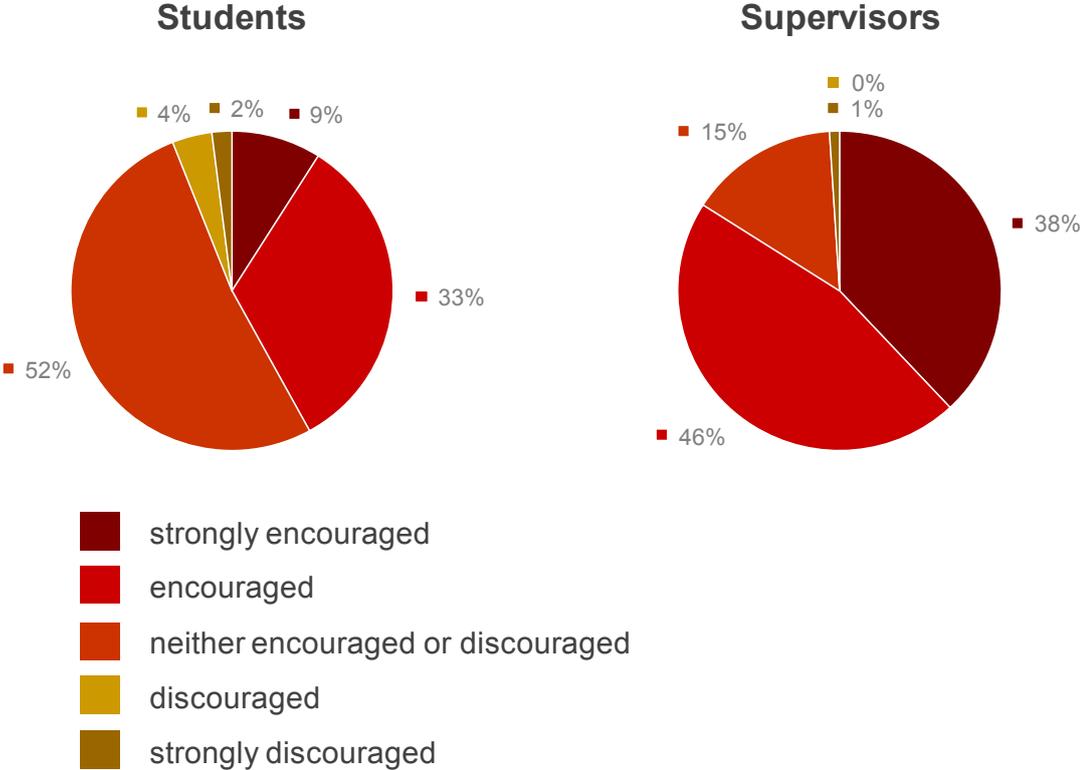
118. Public engagement and outreach opportunities form part of the 'core' bioscience skills identified by BBSRC as essential for doctoral training. 50% of Year 4 students had participated in at least one public engagement activity. The most common activities were public exhibitions (e.g. science fairs) and schools activities. Students' participation in public engagement activities has delivered societal impacts, and there were some very impressive examples of student involvement.
119. There were notable examples of good practice where supervisors had actively encouraged greater involvement in public engagement for students who enjoyed and had an aptitude for this work, and such practice needs to be disseminated. However, there is also a need to ensure that a larger proportion of Quota DTG students are enabled to participate in public engagement activities. While BBSRC should not be too prescriptive about requirements to participate in public engagement, it remains important that opportunities are available and that students are encouraged to exploit them.
120. Many departments were providing students with sufficient support and training to participate in public engagement activities. For example, of the students who participated in a public engagement activity: 67% stated that the time available for planning and conducting the activity was sufficient or more than sufficient; 78% stated that access to the necessary resources to conduct the activity was sufficient or more than sufficient; and 65% stated that the training to prepare them to participate in the activity was sufficient or more than sufficient. However, the disparity between the views of supervisors and students with respect to student participation in public engagement activities was a concern. 94% of supervisors stated that student participation was encouraged; the figure for students was 42%. Many students commented that public engagement was not considered a priority by their supervisor, or that participation was only permitted if the activity was directly related to, or did not interfere with, the research project.
121. In general, the culture surrounding researchers' participation in public engagement is improving, but it will take several rounds of funding before it is fully embedded in doctoral training programmes. There are still several barriers which limit participation, including a notable lack of recognition and rewards for students and supervisors. Of note in this context is RCUK's recently published *Concordat for Engaging the Public with Research*¹⁸. This sets out a statement of the expectations and responsibilities of research funders in the UK with regards to public engagement with research, and may help to encourage further participation.

¹⁸ See: www.rcuk.ac.uk/per/Pages/Concordat.aspx

Proportion of students who participated in public engagement activities



Students' and supervisors' assessment of the culture towards participation in public engagement activities



Data are based on the response to the questions: 'To what extent is your supervisor supportive of your involvement in public engagement activities?' (students); 'What is your view on your department's culture with respect to students' participation in public engagement activities during their PhD?' (supervisors).

Examples of student participation in public engagement and outreach activities

A student at the University of Edinburgh (Infectious Diseases) developed a novel cell culture method for Hepatitis C virus. Her work, published in the *Journal of Virology*, received extensive media coverage which included the *BBC*, the *Financial Times*, *The Herald*, the *Metro*, *The Press and Journal*, *The Scotsman* and *The Times*. Another student at the Centre confirmed that broiler chickens contracted *Staphylococcus aureus* from humans approximately forty years ago, leading to extensive pathogenesis among industrially-reared chickens. She published a first-author paper in *Proceedings of the National Academy of Sciences of the USA* which also received wide media coverage.

Quota DTG students at the University of Manchester (Life Sciences) participated in the Faculty's 'Lay Summary' writing competition. The University has since launched an institutional-wide competition which is judged by local school students.

Students at the University of Aberdeen (Medical Sciences) participated in public events designed to communicate scientific research. Two students received RCUK awards to develop the public engagement schemes 'Car Boot Science' and 'Bugs That Go Bang', contributing to public awareness of science and the students' particular research areas. One student has become an Ambassador for Schools (STEM), visiting primary schools to communicate with children about cell biology.

A student at Rothamsted Research was the winner of the Agriculture, Food, Diet and Health category of BBSRC's inaugural Science Photo Competition. Her winning photo was of mites, springtails and other insects collected from a soil sample.

A student at the University of Bristol (Biological Sciences) is investigating how mass flowering crops affect bumblebee behaviour, providing evidence-based data on how land use affects bumblebee foraging success. He is making a video diary about his fieldwork.

A student at the University of Nottingham (Biology) benefitted from an initiative supported by 'Roberts funding' in which doctoral students visited local schools to raise scientific awareness. Her considerable involvement in outreach activities during her PhD led her to train as a secondary school biology teacher.

A student at Queen Mary, University of London (Biological and Chemical Sciences) participated and won the university's 'Junk the Jargon' competition. She has also co-founded WISE@QMUL (Women in Science and Engineering) which host talks at QMUL by distinguished female scientists.

As part of his doctoral training, a student at the University of East Anglia (Biological Sciences) participated in a lot of outreach and public engagement work. He subsequently secured a job as a Press Officer for the British Science Association.

A student at the University of Aberdeen (Biological and Environmental Sciences) conducted research into risk factors for incidence of Lyme disease. She gave presentations about Lyme disease and avoidance at many different meetings, including talks to groups of doctors, veterinarians, landowners and walkers.

5.9 Students submitting theses within four years

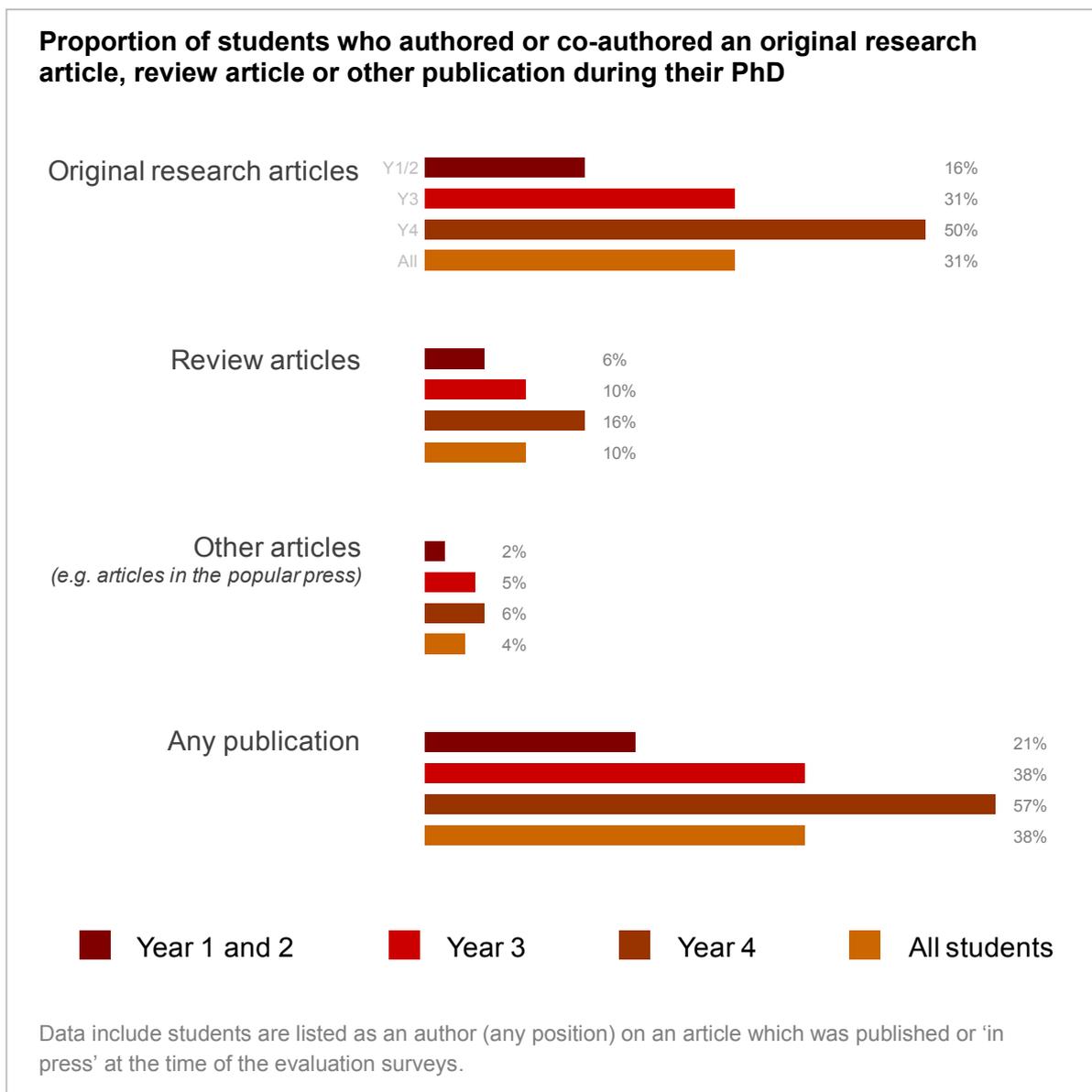
122. The majority of studentships funded by the 2005 Quota DTG are not yet complete, and so data on theses submission rates are unavailable. However, the data for BBSRC's previously supported doctoral students were good, with approximately 80% of students submitting their thesis within four years of the start of their PhD.

Year degree started	Proportion of students submitting by the end of their:		
	4 th year	5 th year	6 th year
2002-03	79%	92%	95%
2003-04	80%	90%	94%
2004-05	80%	94%	
2005-06	83%		

Data are for all BBSRC-supported doctoral students, not only those funded by the Quota DTGs. The data do not cover students funded through the 2005 Quota DTG competition (the first intake was during the 2006-07 academic year).

5.10 Publications

123. 50% of Year 4 students had authored or co-authored an original research article during their PhD. The mean number of original research articles published by Year 4 students was 0.9 (median = 0; range = 0 to 11). There were some very good examples of high-quality publications, including research articles in high-impact multidisciplinary journals or prestigious journals in specific scientific fields.
124. Many supervisors reported publications as the primary achievement arising from studentships. While this may reflect a lack of clarity in the question supervisors were asked, it is a relatively narrow view, which does not recognise the broader ambitions of doctoral training.



Examples of high-quality publications arising from Quota DTG studentships

A student at the University of Exeter (Biosciences) was trained in the multiple disciplines of molecular biology, embryology, mammalian cell culture and bioinformatics. For his student research project, he studied the molecular mechanisms of early neural patterning in zebrafish. He published his work in a first-author paper in the prestigious journal *Proceedings of the National Academy of Sciences of the USA*.

As part of her research project, a student at the University of the West of England (Health and Life Sciences) demonstrated a novel mechanism of horizontal transfer of DNA between plant pathogenic bacteria. She published a first-author paper in the high-impact journal *Current Biology*.

A student at the University of Edinburgh (Biomedical Sciences) revealed novel crosstalk between two fundamental posttranslational signalling pathways: palmitoylation and phosphorylation. He contributed to four papers during his PhD, including three papers in the high-quality *Journal of Biological Chemistry* (one as first author) and co-authored a paper in *Proceedings of the National Academy of the USA*.

As part of her doctoral training, a student at the University of Sussex (Life Sciences) conducted research into individual recognition in domestic horses. She demonstrated that horses possess a cross-modal representation of known individuals containing unique auditory and visual/olfactory information. Her results were published in a first-author paper in the *Proceedings of the National Academy of Sciences of the USA*, which won the 2008 Cozzarelli Prize for best *PNAS* paper (Behavioral and Social Sciences category). She also published three other first-author papers in the more specialised journals *Animal Behaviour* and *Animal Cognition*.

A student at the University of Birmingham (Biosciences) investigated the role of plasticity in the cryoprotection of arthropods at low temperatures. He published ten papers during his PhD, including nine as first author. In addition, he was awarded prizes from the Zoological Society of London and the Royal Entomological Society for the best PhD thesis.

A student at the John Innes Centre studied a gene cluster involved in the production of the lantibiotic microbisporicin. She produced a first-author paper in the high-impact journal *Proceedings of the National Academy of Sciences of the USA* and was a co-author on two additional papers.

A student at the University of Bristol (Henry Wellcome LINE) developed novel live cell high-content imaging based readouts for cellular responses to pulsatile hormone stimulation. His work was remarkably productive, resulting in three first-author papers in the *Journal of Biological Chemistry*, as well as contributions to five other papers as a co-author. In addition, the work led to a collaboration with colleagues in the Department for Mathematical Engineering and provided much of the preliminary data for a successful MRC project grant application.

6. Supervision, mentoring and career development

Summary

- The quality of student supervision and mentoring was good
- Students benefited considerably from interactions with postdoctoral researchers
- The quality of careers advice and careers-related training was variable, and in many cases was focused on the needs of undergraduates rather than doctoral students
- Good quality CASE placements were very beneficial for students' training, but it was concerning that less than half of Year 4 CASE students had participated in an industry placement
- At several institutions there is insufficient emphasis on supervisor training
- The Quota DTG competition has facilitated improvements to the quality of departments' doctoral training

Key recommendations

- BBSRC and institutions should seek ways of formally recognising postdoctoral researchers' extremely valuable contributions to doctoral training
- BBSRC should place greater emphasis on whether departments have effective mechanisms in place for supervisor training in the Quota DTG assessment process
- BBSRC should consider providing additional guidance to institutions on its expectations for supervisor training

6.1 Students' interactions with academic supervisors

125. The quality of student supervision was generally good. 76% of students had formal¹⁹ contact with their main academic supervisor at least once a month; 78% of students had informal contact with their supervisor at least once a week. Most students were satisfied with the frequency of contact with their supervisor: 73% of students stated that the frequency of formal contact with their supervisor was 'just right'; for informal contact the figure was 81%.

126. Students noted that supervisors often had many competing demands on their time and that this could be a particular issue for supervisors in more senior positions. Students and supervisors adopted a flexible approach to arranging formal meetings, and most students were able to request additional meetings as required. Some students experienced a change in the frequency of contact with their supervisor during their PhD due to changes in their supervisor's circumstances (e.g. career breaks, promotion or relocation). Students stated that this was not ideal, but in most cases the appointment of, or increased interaction with, a co-supervisor ensured that they continued to receive adequate supervision and support.

¹⁹ Formal contact refers to, for example, updates, progress meeting, and review meetings. Informal contact refers to, for example, 'pop-ins', discussions over coffee, and e-mails.

127. The student-supervisor relationship is essential to the success of the studentship, and the number of students who experienced poor supervision was very small. Only five students (<1%) wrote that the quality of their supervision was very poor, although it is likely that a slightly higher proportion were dissatisfied to some extent.

6.2 Students' interactions with other researchers

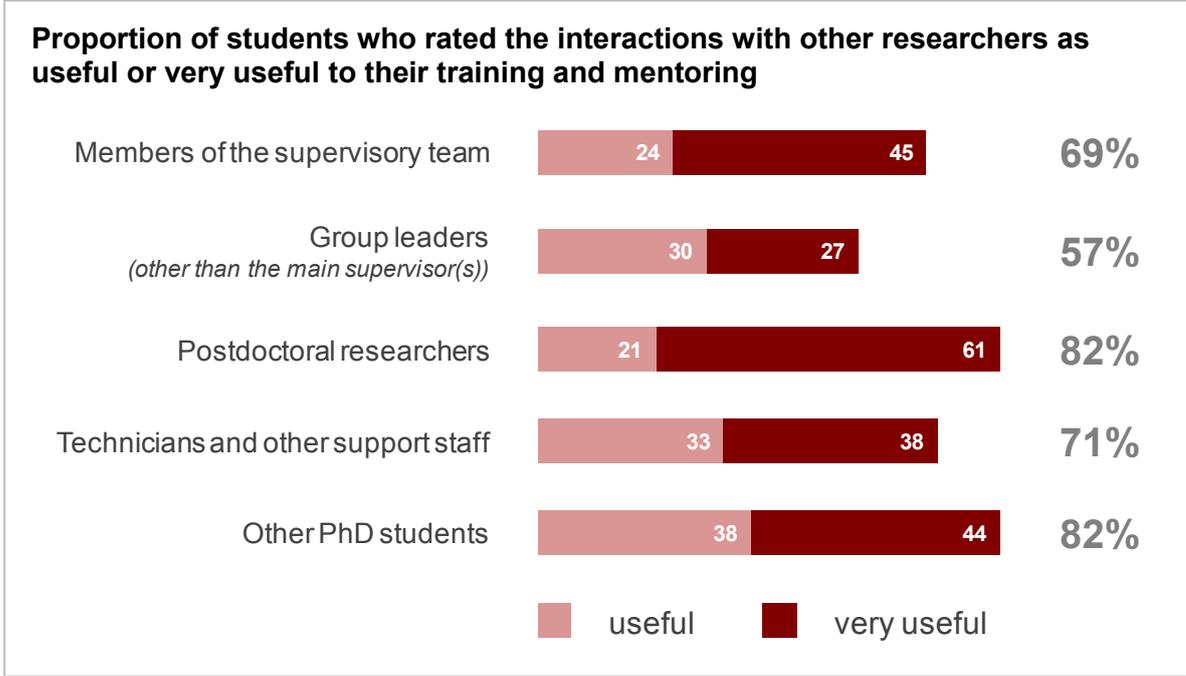
128. Students interact with a wide range of other researchers during the course of their PhD, including members of their supervisory team, other group leaders, postdoctoral researchers, technicians and other support staff, and other PhD students. Of these, students identified interactions with postdoctoral researchers and other PhD students as the most useful.

129. Students benefited considerably from the presence of postdoctoral researchers in their research group and elsewhere in the department. For example, postdoctoral researchers provided invaluable advice and 'hands on' training in experimental techniques, which was particularly useful in the early stages of the studentship. Several students stated that their studentship would not have been successful without the generous support and guidance from postdoctoral researchers. Students based in small research groups where there were no or few postdoctoral researchers felt disadvantaged as they had limited access to advice or expertise. Similar comments were received from students whose research project was not strongly aligned to other research conducted in their group, department or institutions.

130. BBSRC and institutions should seek ways of formally recognising the enormous contributions made by postdoctoral researchers to doctoral training. They should also place greater emphasis on ensuring students are based in research environments where they are able to receive support from postdoctoral researchers. This does not mean that supervisors must have research grant funding, as students could be aided by postdoctoral researchers based elsewhere within the department.

131. Students' interactions with other PhD students were also very important to the success of the studentship: students helped one another develop technical expertise, they discussed their science and research ideas, and they discussed the broader issues which may arise during the course of the studentships. Students noted that they benefited from the critical mass of other students within the department, or that the lack of other PhD students within the department was limiting.

132. Students' comments revealed differences in the research cultures of research groups and departments. Some students were based in research environments with an open and collaborative culture, and this was identified as being very beneficial to students' training (e.g. students could seek advice from researchers from across the department, or share equipment owned by other research groups). However, other students were based in research environments with a more closed, insular or competitive culture where the sharing of knowledge was limited; such cultures adversely affected students' training opportunities. Students stated that a lack of advice or interaction with colleagues could affect their self-confidence and leave them feeling isolated. Although it is very difficult to collect data on this aspect of the research environment, the reports of less open research cultures were a cause for concern.



6.3 Departmental training committees and thesis advisory committees

133. 89% of supervisors stated that their department’s training committee was effective (42%) or very effective (48%) in meeting the training and research needs of the students. It was encouraging that supervisors noted a growing emphasis on the role of departmental training committees in recent years. For example, more attention has been given to monitoring student progress, identifying students’ training needs at both the individual and collective level, adjusting the training programme to incorporate best practice, and communicating with students. There was scope to improve the role of the departmental training committee in collecting and using student feedback. For example, there was some concern that while many institutions collect student feedback, the use of this feedback to improve the training programme was variable.

134. Students’ expressed different views on their departmental training committees and thesis advisory committees. 51% of students stated that the committee(s) were effective (40%) or very effective (11%) in addressing their research and training needs; 28% stated that they were somewhat effective (24%) or not at all effective (4%)²⁰. Many students wrote positive comments about these committees noting, for example, their roles in ensuring a good provision of training courses, identifying students training needs, and monitoring progress. However, other students expressed concerns noting, for example, that the committees sometimes adopt a ‘tick box’ approach to training with limited consideration of students’ individual needs.

²⁰ 21% of students stated that they did not know the effectiveness of their department’s training committee or thesis advisory committee. Many students wrote that they did not know if their department had a departmental training committee or a thesis advisory committee, or that they did not know the function of these committees.

6.4 Addressing issues that arise during the studentship

135. 62% of students stated that the mechanisms for addressing problems and issues which may arise during a studentship were good or very good. The overwhelming majority of students had not experienced any serious problems during their studentship. However, there was some recognition that if a problem did arise, the mechanisms for dealing with it could be fragile. A common cause of concern among students was the perceived asymmetry between the power of the supervisor or department and the student. It was disappointing that a number of students identified potential conflicts of interest within their departments' mechanisms for addressing problems and issues which may arise during the studentship.

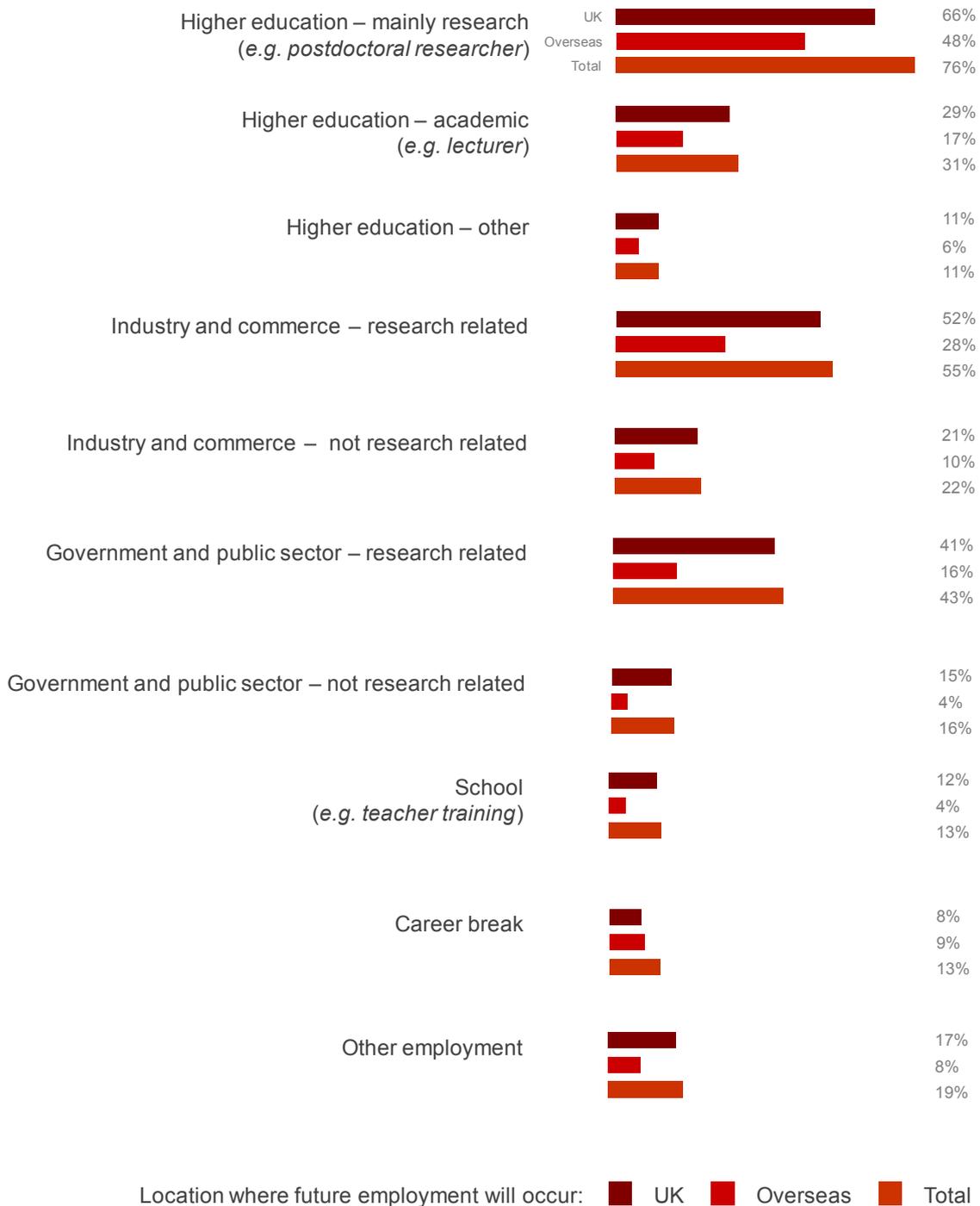
6.5 Careers advice and careers-related training

136. A range of careers advice and careers-related training was available to students, including careers workshops, careers courses, university careers services, e-mail updates, and informal conversations with supervisors, mentors and colleagues. The quality of careers advice and training was mixed and, in general, there appeared to be substantial scope for institutions to improve their provision of careers services. A common issue was that institutional careers services were focused on addressing the needs of undergraduates rather than doctoral students. Students were very positive about external careers events (e.g. Vitae, BBSRC Next Generation Conference), noting that they were helpful and reassuring. However, it could be difficult for students to secure a place at these events, because of limited numbers and funding.

137. Informal conversations with supervisors, mentors and other colleagues were regarded as very valuable for careers advice. However, given the focused nature of the student-supervisor relationship, there can be significant value in students seeking independent advice from careers services. It should also be noted that advising a student that they are not suited for a research career can be helpful.

138. Students were asked what type of employment they would seek after completing their PhD. The most popular choices were research-based employment in academia (76%) or industry (55%). The Panel was concerned that students' career aspirations could be unrealistic (e.g. 31% stated that they were considering a lecturer-level position), indicating that students are not receiving sufficient guidance regarding their future careers.

Proportion of students considering different employment options as their next position after their PhD

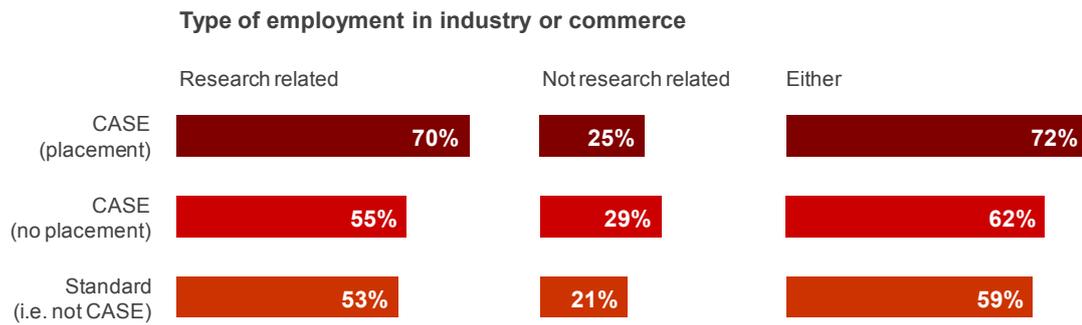


Students were asked 'After completing your PhD, what type of employment will you seek as your next position?' Students were able to choose more than one option. The 'total' data are derived from students who indicated either UK, overseas or both as the location for their future employment.

6.6 CASE students' interactions with their industry partner

139. BBSRC would normally expect CASE students to spend at least three months of their studentship on a placement with the industry partner. It was therefore a major concern that only 38% of Year 4 CASE students reported that they had participated in an industry placement. Students and supervisors commented on why a placement had not been provided:
- the industry partner went into administration or experienced financial difficulties
 - the industry partner's priorities changed (e.g. because of restructuring or new data)
 - the industry partner was not interested in providing a placement (e.g. because the student project had no commercial value to them)
 - the industry partner did not respond to contact from the student or supervisors
 - the industry supervisor left the company
 - current instabilities in particular sectors are affecting industry's ability to support placements
 - health issues (student or supervisor)
140. The low level of CASE student participation in industry placements suggests that many of the CASE partnerships are not strongly embedded with the industry partner. For example, if a partnership is adversely affected by the industry supervisor leaving, this suggests that it was not highly valued by more senior management. The data for Quota DTG CASE student participation in industry placements provide further evidence that it would be more effective to support CASE studentships through a separate competition, where the quality of the collaboration would be assessed (see Chapter 3, p. 29).
141. Where students participated in a CASE placement, the median length of the placement was three months. Of the 56 students who provided details on the length of their placement, 36 (64%) stated that it was three months or longer. 67% of CASE students stated that the length of their placement was 'just right'; 21% stated it was too short and 13% too long. For students who stated that the length of the placements was 'just right', the median length of the placement was three months.
142. A high proportion of students (82%) stated that the overall training experience provided by their placement was important or very important to their skills development. The role of a placement in providing a further high-quality training experience is vital; it would be better for students not to participate in a CASE placement than participate in a poor-quality placement. Students developed a range of research skills, broader science skills and generic professional skills during their placement. Supervisors noted that the placement enabled students to experience a research culture which was very distinct to that of academia (e.g. greater emphasis on project management, timelines, deliverables). They also noted that students developed particular relevant skills sets during their placement (e.g. communication skills, commercial awareness) and that access to the partners' specialised equipment, facilities and expertise was beneficial.
143. In general, CASE placements improved students' perceptions of industry careers. 66% of CASE students who participated in an industry placement stated that this had made them more likely (51%) or much more likely (15%) to consider a career in the bioscience industry. This was reflected in the data regarding the type of employment students will seek as their next position: 70% of CASE students who participated in a CASE placement would consider a research related position in industry compared with 53% of non-CASE students.

Proportion of students considering employment in industry or commerce as their next employment position



144. Supervision by the industry supervisor during the CASE placement was good; i.e. whilst on a placement, CASE students met with their industry supervisor regularly, either on a formal or informal basis. 76% of students had formal contact with their supervisor at least once a month; 72% of students had informal contact with their supervisor at least once a week.
145. Outside the placement, the supervision by industry supervisors was more variable. For students who had participated in a CASE placement: 71% had formal contact with their industry supervisor at least once every six months; 50% had informal contact at least once every two to three months. The frequency of interaction was lower for students who had not participated in a CASE placement: 47% of these students had formal contact with their industry supervisor at least once every six months; 34% had informal contact at least once every two to three months.

Examples of successful Quota DTG CASE studentships

A CASE student at the University of Cambridge (Biochemistry) published three highly cited papers in metabolomics and obesity research. His work led to the funding of a BBSRC project grant in collaboration with two industry companies: a pharmaceutical company and an equipment manufacturer. Another CASE student supported by the DTG studied mechanisms of bacterial resistance to bacteriophage infection. His work led to papers in *Journal of Bacteriology* and *Proceedings of the National Academy of Sciences of the USA*, both of which have co-authors from the industrial CASE partner. He was awarded the Society for General Microbiology Sir Howard Dalton Prize for the Young Microbiologist of the Year and a patent application has also been submitted.

A CASE student at the Royal Veterinary College published an important paper explaining how the hind limb of broiler chickens evolved, revealing how selective breeding has modified limb form and function. Her work is a critical first step towards unravelling how the high tendency to develop lameness in broiler chickens has arisen. The research will inform the chicken breeding industry, including the work of the CASE partner (a poultry research and development company).

CASE studentships at the University of Southampton (Biological Sciences) have resulted in the development of commercial assays. For example, a student characterised an organotypic model of cerebral function from neuronal/glial co-cultures. Her work has contributed to the development of a standardised system for the high-throughput primary screening of neuropharmacological agents.

A CASE student at the University of St Andrews (Biology) formed a team which took part in the *Biotechnology YES* competition. The team's plan was based loosely on his PhD research project, and with guidance from experts in the field, they formed a sound commercial model. The business model is currently being developed, and the student's research will form part of the intellectual property of a university spin-out company.

A CASE student at Birbeck College (Biological Sciences) is undertaking research to characterise and optimise the physical properties of enzymes in a novel process for ethanol production from biomass. As part of his student training, he participated in a seven month placement with his CASE partner, a company developing second-generation biofuels. The collaboration will facilitate the translation of his work on alternative fuels.

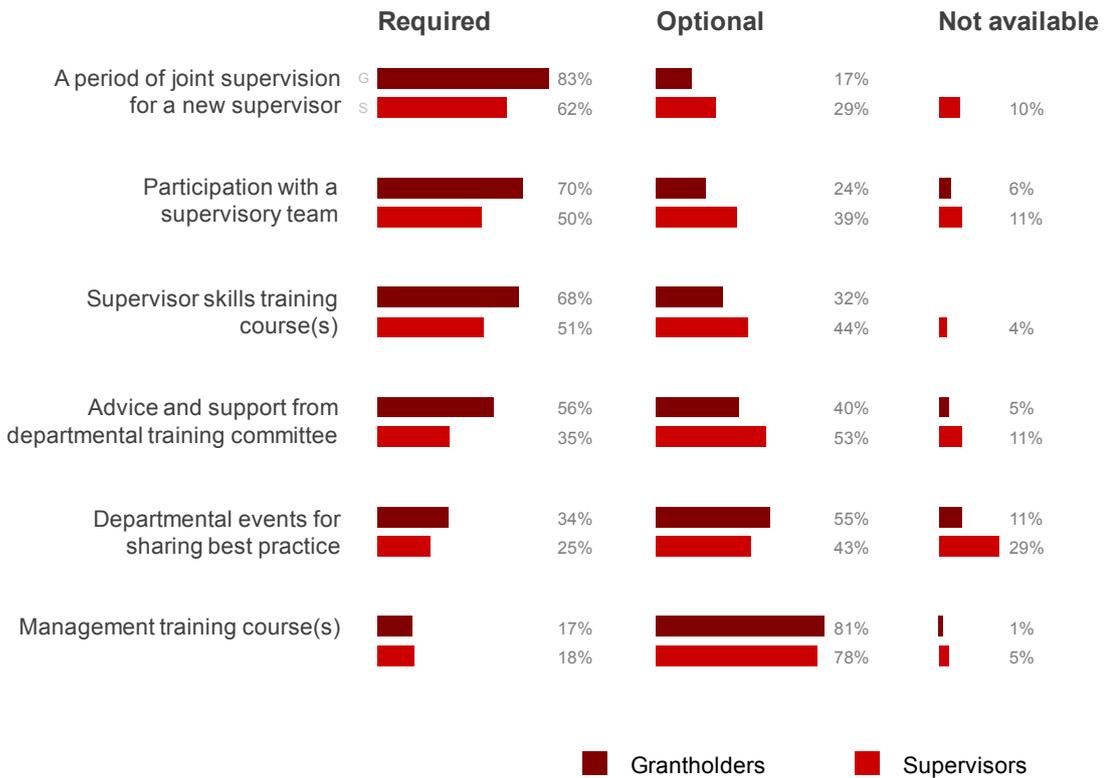
CASE studentships at Cardiff University (Biosciences) are producing high-quality novel findings which, through interactions with industry partners, are likely to result in translational outcomes in areas such as food safety, drug development and biosensor development. For example, one student demonstrated that exposure to Gram negative bacteria to isothiazoline preservatives is linked to increased resistance to the fluoroquinolone group of antibiotics. Her research has ramifications in terms of the types of biocides and preservatives used in industry.

6.7 Support available to supervisors

146. BBSRC expects institutions to provide supervisors with appropriate support, training and resources to enable them to deliver effective supervision. 89% of supervisors stated that the support they received from their department was sufficient (60%) or more than sufficient (29%) to enable them to meet their supervisory responsibilities. However, the Panel was concerned that the availability and quality of support were very variable, and in some cases did not meet the expected standard. For example, whilst some departments demonstrated good practice (e.g. formalised mechanisms of information flow from training committees to supervisors), others provided limited support (e.g. a guidance pamphlet). The training and support provided to supervisors was often reported as 'optional'. It was therefore not clear whether supervisors were routinely offered this training, or the extent to which supervisors participated in these training opportunities. This was disappointing given that departments' arrangements for the training of supervisors was an assessment criterion for the 2005 competition.
147. The Panel had particular concerns regarding the support for new academic staff who were supervising students for the first time. 82% of departments and 62% of supervisors stated that a period of joint supervision was required for new academic supervisors. These figures are too low: new academic supervisors need training and support early in their career, and training and co-supervision arrangements should be mandatory for all new supervisors. The use of a supervisory team or co-supervision arrangements are effective methods of spreading best practice to both new and established supervisors.
148. Institutional cultures surrounding the provision of supervisor training are in the process of change, and it is clear that there have been positive developments. Overall, however, there is still a need for institutions to improve their support, and BBSRC should place greater emphasis on whether departments have effective mechanisms in place for supervisor training in the Quota DTG assessment process. Ultimately, the responsibility for training supervisors lies with institutions. It would not be appropriate for BBSRC to insist on a particular model for supervisor training, but it may wish to consider providing additional guidance to institutions on its expectations. It should also be noted that the *QAA Code of Practice for postgraduate research programmes*²¹ also has expectations regarding supervisor training.

²¹ www.qaa.ac.uk/academicinfrastructure/codeOfPractice/section1/postgrad2004.pdf

Proportion of respondents who identified training, resources or support as being available to Quota DTG supervisors



Approaches used by supervisors to ensure that they are kept up to date with the expectations regarding the development and training needs of research students



6.8 Influence of the Quota DTG competition on doctoral training

149. The past decade has seen considerable improvements to the quality of doctoral training provision across the bioscience sector. The 2002 *Roberts' Review: SET for Success* made a number of recommendations regarding training and career development for research students and staff, and led to major improvements in the transferable skills training of postgraduates. The 1999 *QAA Code of Practice for postgraduate research programmes* (revised 2004) has also been influential.
150. It is difficult to determine the extent to which BBSRC's Quota DTG competition has over the years contributed to improvements to postgraduate training, especially in the context of these other major drivers. However, it is the Panel's view that the Quota DTG competition has enhanced the quality of departments' doctoral training provision, and this has benefited Quota DTG students as well as other doctoral students based within Quota DTG-funded departments. In particular, the DTG funding mechanism has facilitated the development of integrated training programmes where there is a much stronger emphasis on addressing students' training needs. This is very positive as it represents a move away from past practice where students could be perceived as being 'owned' by supervisors and, in the worst cases, being exploited by supervisors as an additional 'pair of hands' for their own research. The use of a competition to award Quota DTG funding has played an important role in driving these improvements to doctoral training.

7. Application and administration processes

Summary

- The Quota DTG application and administration processes are effective
- The assessment criteria for the Quota DTG competition are appropriate
- The competition approach offers many advantages over a purely algorithmic allocation based on research grant income, but the application process imposes a burden on the research community
- Too many Quota DTGs supported a relatively small number of studentships

Key recommendations

- BBSRC should continue to award Quota DTG funding through a competition
- BBSRC should reduce the burden of the application process on the research community
- BBSRC should encourage larger-scale applications in future competitions (e.g. at the institutional or multi-departmental level)
- BBSRC should consider encouraging greater support for cohort- or programme-based approaches to doctoral training within Quota DTGs
- Studentship eligibility criteria for non-UK EU students should be relaxed, so that these students can receive full support from the Quota DTG

7.1 Quota DTG application process

151. BBSRC awards Quota DTG funding through a competition, based on the quality of the training environment offered. Subject to reaching a competitive quality threshold, individual departmental allocations are informed by an algorithmic analysis of BBSRC grant funding and the number of eligible supervisors. This differs from other Research Councils, such as EPSRC, MRC and NERC, who use a purely algorithmic allocation without training quality assessment, and base it primarily on research grant income.

152. The competition's application processes were effective and were well regarded by the research community. 77% of grantholders rated the overall process as good (61%) or very good (16%); for applicants, the figure was 44% (33% good, 11% very good). Grantholders' and applicants' comments about specific aspects of the application process included:

- **application form:** a large number of respondents stated that the Quota DTG application process is too complex and, in particular, the application form covers too many different areas and requires too much information. The preparation of applications is very time-consuming and imposes substantial costs on departments. Some respondents noted that the level of detail requested is often disproportionate to its use in ranking individual applications. There is also a lack

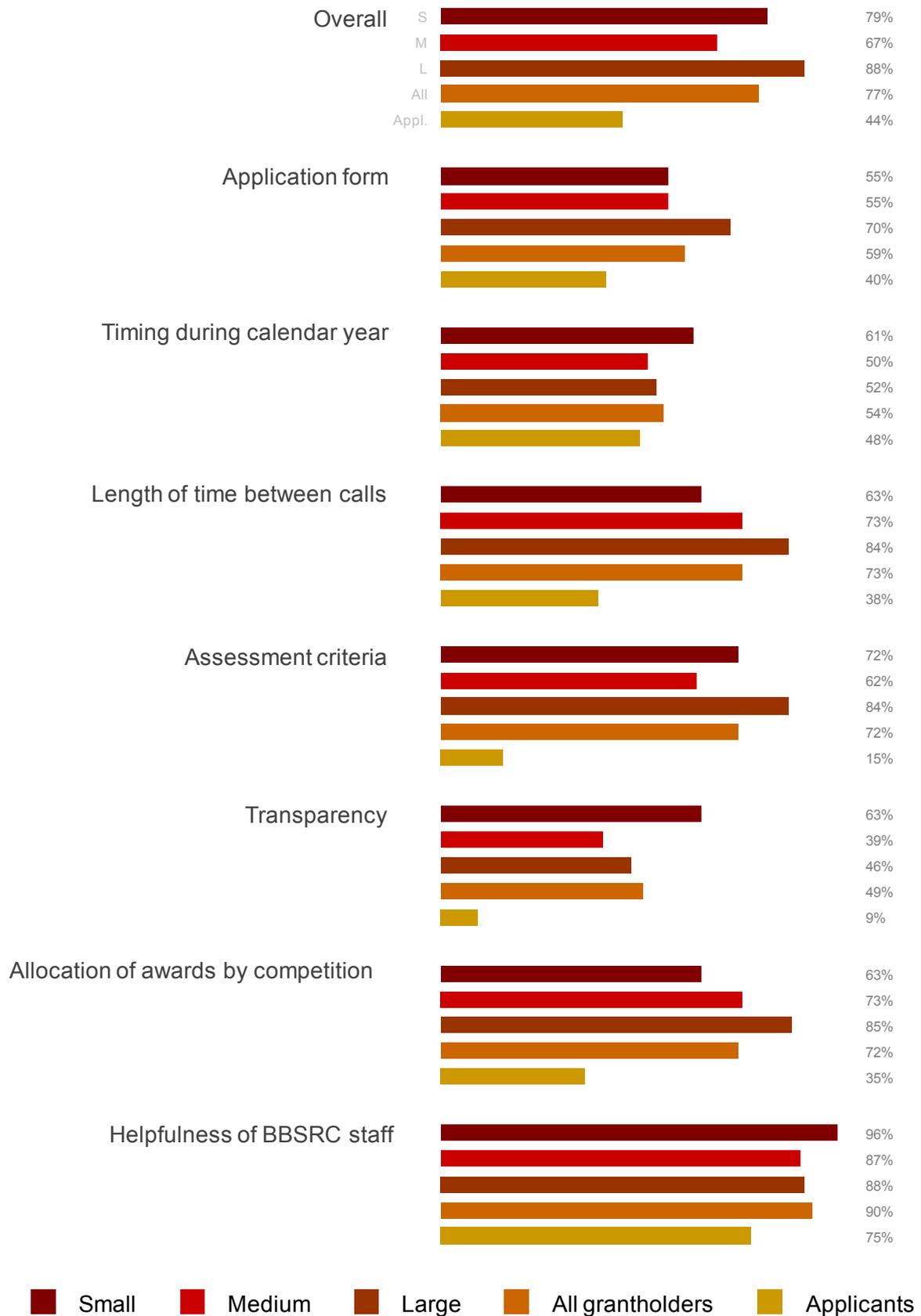
of harmonisation in the information requested by different Research Councils which adds to the burden on institutions.

- **timing during the calendar year:** several respondents stated that the timing of during the calendar year is not ideal. The early autumn application deadline requires the department to collate information over the summer vacation / conference period, when many academic and administrative staff are not available. In addition, autumn is the main university registration period when administrative staff are very busy.
- **length of time between calls:** the majority of grantholders stated that the three-year funding cycle is appropriate, particularly as it provides greater scope for forward planning. Moreover, it was noted that the complex application process required by a competition would not be cost-effective with a shorter funding cycle. A few grantholders suggested that the funding cycle should be longer (e.g. five years). Others stated that a three-year cycle may 'lock out' unfunded applicants for too long.
- **transparency:** the transparency of the application process was perceived as being relatively low, especially by unfunded applicants. Respondents stated that there was insufficient information provided on the weighting of individual assessment criteria²² and it was not clear how robustly the assessment criteria were applied. In addition, it was not explicit whether there were minimum requirements in any of the criteria; providing this information would reduce the number of applications received which have little chance of success.
- **feedback:** the majority of applicants stated that the feedback received about their application was not very useful. It was not sufficiently specific as to why the application was not funded, and it did not provide enough detail on how to improve future applications. One applicant stated it was difficult to see how complex applications of this nature could be radically revised. However, one applicant stated that they had been successful in a subsequent Quota DTG competition, in part because of the feedback they received.
- **helpfulness of BBSRC staff:** grantholders and applicants were very positive about the BBSRC staff involved in the Quota DTG application and administration processes.

There were also extensive comments regarding the assessment criteria and the use of a competition to award Quota DTG funding, which are covered in sections 7.2 and 7.3, respectively.

²² These comments refer to previous practice. BBSRC now publishes the weightings of the assessment criteria.

Proportion of grantholders and applicants who rated specific aspects of the application process as good or very good



7.2 Assessment criteria

153. The assessment criteria for the 2005²³ Quota DTG competition were:
- relevance of the department's research activity to BBSRC's mission and remit
 - quality and volume of research within the department
 - quality of the training programme provided
 - submission rates for students submitting within four years
 - department's internal arrangements for planning, managing and monitoring its postgraduate research programmes
 - department's systems and processes for selecting suitable research projects and assessing the suitability of supervisors
 - department's arrangements for the training of supervisors and the monitoring of supervisory practice
 - first destination of former PhD students
 - the extent and scale of industrial contacts and cooperative research activity within the department (only for departments requesting CASE studentships)
154. The assessment criteria were appropriate, focusing on the department's ability to provide high-quality doctoral training within the BBSRC remit. However, grantholders and applicants raised a number of issues about specific assessment criteria as well as broader aspects of the assessment process.
155. There was some concern about the use of qualitative information in the application process, as it is not easily verifiable without site visits. In addition, the Panel noted that as doctoral training programmes improve, it becomes more difficult to distinguish between applications without requiring increasingly detailed information to be provided.
156. The current theses submission rate expectation (proportion submitting within four years) of 70% also raised questions. In particular, there could be tensions between the four-year deadline and the wider objectives of doctoral training. For example:
- the deadline may drive undesirable behaviour:
 - students may be prevented from entering a rotation programme as it may impact on their theses submission
 - it can encourage a culture where students are 'directed' through their doctoral training programme, reducing the opportunity to develop as independent scientists
 - the deadline may limit opportunities for interdisciplinary training
 - the deadline does not reflect the different objectives of departmental training programmes; in some institutions a high-proportion of students will pursue an academic career and so may require additional time to produce a high-quality research publication
 - the proportion of students submitting their theses does not necessarily indicate the proportion of students who are awarded a doctorate
 - it is not clear how exceptional circumstances (e.g. career breaks) should be incorporated into submission rate data

²³ The assessment criteria for the 2007 competition were similar to the 2005 competition. However, there was greater emphasis on (i) the strategic use of the funding flexibility and (ii) training provision in a set of core bioscience skills (see p. 12).

157. Nevertheless, the Panel felt that it is still important to incentivise timely theses submission, particularly as there will always be pressure for students to continue working on their research project. A relaxation of the submission rate expectation risks a return to the undesirable past practice of students not being paid whilst writing their theses. It was noted that institutions with strong sanctions against thesis submission beyond the four-year deadline had very good submission rates. Overall, the current expectation of 70% of students submitting within four years provides sufficient flexibility for departments.
158. Concerns were also expressed about how first destination data were used in the assessment process. To an extent, students' first destinations are outside departments' control and do not necessarily reflect the quality of training received. Moreover, it is not clear what constitutes 'success' under this criterion, and there are potential inconsistencies in the use of the data given BBSRC's recognition that many students pursue careers outside of academia. While it is important for departments to monitor student destinations, the information should not form part of the assessment process.

7.3 The use of a competition in awarding Quota DTG funding

159. Grantholders and applicants had mixed views on BBSRC's use of a competition to award Quota DTG funding, compared with using a purely algorithmic method of allocation. The issue was contentious and, to an extent, the views expressed were influenced by how individual departments were likely to fare under different funding mechanisms. Overall, however, 72% of grantholders stated that BBSRC's use of a competition was good or very good.
160. The perceived advantages of a competition compared with an algorithm were:
- a competition allows a wider range of factors to be considered than an algorithm based on grant income
 - a competition is an incentive for departments to provide the highest quality training
 - a competition provides greater assurance that students are placed in high-quality training environments
 - a competition provides greater scope to ensure funding is used to address BBSRC and departmental strategic priorities
 - a competition may encourage collaboration and interdisciplinary research
 - a competition provides greater scope for small departments or non-biology departments to be supported
 - a competition is a more flexible method of allocation
 - a peer-reviewed competition is more consistent with the mechanisms used to allocate research grant funding
161. The perceived disadvantages of a competition compared with an algorithm were:
- a competition requires a complicated and costly application process
 - a competition may not result in a substantially different funding profile compared with an algorithm
 - a competition is perceived as less transparent than a algorithm
 - a competition with a three-year funding cycle provides less opportunity to respond to new developments
 - a competition does not guarantee studentships are aligned with BBSRC-funded research projects

- a competition may not provide consistent levels of funding between rounds

Further details of the perceived advantages and disadvantages of a competition are provided at Appendix 1.

162. The Panel reviewed data on the extent to which studentships allocations to institutions and departments might vary under a competition compared with a hypothetical algorithm based on BBSRC research grant income without a training quality assessment. The analysis indicated that the competition produced a funding profile which in some respects was distinct from that of grant income-based algorithm. However, whilst there were some institutions and departments which would receive significantly more or less studentships under an algorithm, broadly speaking, the allocations would remain similar.
163. It was the Panel's view that the competition is an effective mechanism of awarding Quota DTG funding. It is appropriate to assess departments on their ability to provide high-quality training environment for doctoral students, and a competition recognises that there is no simple link between excellence in research and excellence in training. Although the competition has a relatively small influence on the studentships allocations to specific departments, it has influenced behaviour and has driven notable improvements to doctoral training programmes. Overall, the impact of the competition has been positive and this approach should be maintained.

7.4 Suggested improvements to the application process

164. There is scope to improve the Quota DTG competition's application and assessment processes. In future competitions, BBSRC should minimise the burden of the application process on the research community, for example, by reducing the volume of qualitative information which must be provided. Where appropriate, BBSRC should place greater emphasis on quantitative data, preferably using pre-existing information which institutions collect for other purposes. Research Councils should work together to ensure that there is greater harmonisation regarding requested information. The burden of the application process could also be reduced by encouraging institutions to submit fewer, larger applications (see section 7.5).
165. The balance of retrospective and prospective information in Quota DTG assessment process should be examined. Applicants should indicate how they used previous Quota DTG funding, as well as their future plans for the doctoral training programme. There are potential benefits in asking applicants to identify specific, measurable objectives by which their training programmes' success could subsequently be assessed. This need not limit the scope for new applicants to be supported through the Quota DTG competition, who could instead provide details of the outcomes of non-BBSRC studentship funding.
166. The next Quota DTG competition should place increased importance on the quality of supervisor training as an assessment criterion. It may also be useful to ask departments to describe the specific mechanisms in place to ensure that their studentship portfolios are within BBSRC remit, fit with BBSRC strategy, and support interdisciplinary research. The extent and scale of industrial contacts and cooperative research activity should remain an assessment criterion, despite the Panel's recommendation that CASE studentships be removed from the Quota DTG competition.

167. The Quota DTG competition would benefit from a programme of site visits to Quota DTG-funded institutions (e.g. on a triennial basis). These would provide additional assurance that Quota DTG funding is supporting high-quality doctoral training programmes, and it would enable the level of information requested in applications to be reduced for these institutions. However, it is recognised that site visits are resource-intensive for BBSRC, and would only be practical if Quota DTGs were concentrated in a smaller number of institutions.

7.5 Number and size of Quota DTG awards

168. In the 2005 competition, 107 separate Quota DTGs were awarded to 45 institutions:

- twenty three institutions were awarded more than one Quota DTG
- fourteen institutions were awarded Quota DTGs to three or more individual departments
- six departments were awarded two or more Quota DTGs

169. The Panel was concerned that the overall number of Quota DTGs was too high. In particular, there were too many Quota DTGs which supported a relatively small number of studentships, which did not represent the most effective use of Quota DTG funding. The advantages of Quota DTG flexibility were notably curtailed in small awards. Moreover, where institutions and departments had several small awards, it suggested a lack of coordination of doctoral training programmes across the institution, potentially limiting the opportunities for interdisciplinary training. The number of small awards was lower in the 2007 Quota DTG competition, but it was still an issue.

170. For the next Quota DTG competition, BBSRC should substantially reduce the number of awards relative to 2005. Applicants should be encouraged to submit larger-scale applications, for example, at the institutional or multi-departmental level. However, BBSRC should not be too prescriptive, as it would not be appropriate for all applicants to submit institutional-level proposals, and Quota DTGs awarded to single, large departments are often very effective. But the practice of an individual department submitting more than one application should be strongly discouraged. If necessary, BBSRC should integrate multiple, small applications from an institution into a single application. It may also be helpful to specify a minimum level of BBSRC research grant income which would normally be expected for an application to be successful.

171. Encouraging fewer, larger applications will help reduce the administrative burden of the Quota DTG competition on the research community and BBSRC. However, there is a risk that this may adversely affect funding for high-quality studentships in small departments or non-biology departments. BBSRC should encourage these departments to apply as part of larger applications and should use the competition's assessment process to incentivise this behaviour. For example, there could be increased emphasis on how the Quota DTG will support interdisciplinary training or how it will be coordinated with other doctoral training across the institution.

7.6 Support for student cohorts

172. Other funders have realised benefits from cohort- or programme-based approaches to doctoral training, where students develop a collective identity through participation in a joint training programme or joint events (e.g. EPSRC's Doctoral Training Centres or the Wellcome Trust's PhD Programmes). This approach appeared to be particularly successful for training programmes which were focused on a specific research area or discipline. It is recognised that it is more difficult to identify unifying themes for students in the biological sciences, who will be studying a wide range of subjects from across the BBSRC remit. Nevertheless, BBSRC may wish to examine the advantages and disadvantages of such approaches within the Quota DTG competition.
173. BBSRC should take into account a number of issues when considering whether to encourage greater support for cohort- or programme-based doctoral training programmes. The Panel believed a flexible approach is the most appropriate, noting that institutions are best-placed to define the identity of student cohorts. It is important that cohorts are inclusive and that students' collective identity is not simply based on the studentships' funder. It was noted that non-BBSRC students in Quota-DTG supported departments often feel excluded from BBSRC-supported training events (e.g. the Next Generation Conference). Moreover, there are clear benefits from ensuring students are included in student cohorts where there is a potentially greater risk of a student becoming a 'pair of hands' for the supervisor's own research (e.g. self-funded students from overseas).
174. There may be a number of advantages for BBSRC in encouraging greater support for cohort- or programme-based approaches within the Quota DTG competition. It could enhance the positive 'ripple effects' which emanate from Quota DTG funding and drive improvements to the wider doctoral training programme within institutions. It may also help to train scientists who look beyond the boundaries of their specific research areas, and could be used to create greater awareness of BBSRC's strategic priorities. However, there are also disadvantages, particularly if such approaches result in reduced support for excellent training and research in smaller, more isolated disciplines or groups.

7.7 Student eligibility criteria

175. The student eligibility criteria for Research Council studentships are complex and candidates are required to meet residence and qualifications criteria²⁴. EU students without UK residence can be supported by Quota DTG funding on a 'fees only' basis and this provision has been used successfully to recruit high-calibre students into departments' doctoral training programmes. There was strong consensus among the research community that the eligibility criteria for students from elsewhere in the EU should be relaxed and that non-UK EU students should be eligible for full support, irrespective of prior residence in the UK.

²⁴ BBSRC requires candidates for doctoral training to satisfy two principal eligibility conditions: (i) **Residence criteria**: for EU nationals (whether UK or non-UK), eligibility rests on residency and not nationality. Candidates should have been ordinarily resident in the UK for three years immediately prior to the start date of their course. (ii) **Qualifications criteria**: Candidates must normally hold a first or upper second class UK honours degree, or the equivalent qualifications gained outside the UK, in an appropriate area of science or technology. See www.bbsrc.ac.uk/web/FILES/Guidelines/studentship_eligibility.pdf for further details.

176. The Panel endorsed this view. It would enable UK institutions to attract the highest-quality students from across the EU to their doctoral training programmes. It would also be consistent with the eligibility of non-UK EU nationals for postdoctoral research positions in the UK (which also incorporate a strong training element). The Panel noted that the UK's vibrant science community benefits considerably from high-calibre foreign nationals who chose to pursue their research careers in the UK. Moreover, relaxing the eligibility criteria would reciprocate existing arrangements which allow UK candidates to obtain studentships from many other EU countries.
177. There were perceived inconsistencies among the research community in the approaches adopted by individual Research Councils regarding eligibility of non-UK nationals for studentship funding. Where appropriate, BBSRC should coordinate any changes to studentship eligibility criteria with other Research Councils.
178. The relaxation of the eligibility criteria for Research Council studentships is a potentially sensitive issue. The Research Councils' investment in doctoral training needs to provide high-skilled personnel to UK academia and industry, and it is important that PhD funding builds UK capability by ensuring that UK students are encouraged to pursue the highest levels of training and expertise. Therefore, it would be important to monitor the extent to which non-UK EU students remain in the UK after they complete their training, and whether the changes affect the flow of UK candidates into PhD studentships.
179. There are also potential benefits to increasing studentship eligibility beyond non-UK EU students. This would enable recruitment of the highest-calibre students from a worldwide pool, and may help address some institutions' wider strategic objectives. For example, where training and research are closely aligned to the needs of developing countries, it would be advantageous to support students from these countries using the Quota DTG.
180. The Panel also perceived that issues concerning the quality of UK undergraduate training underpin the research community's desire to recruit non-UK nationals. The depth of knowledge developed on UK undergraduate courses is often insufficient to prepare students for doctoral training compared with more specialised degree courses provided by other countries. The quality of UK undergraduate training is not the responsibility of BBSRC, but it impacts on BBSRC's long-term ability to foster a world-class UK bioscience research community.

8. Conclusions and future perspectives

Summary

- The Quota DTG competition is very successful
- Support for doctoral training is an essential component of BBSRC's mission
- BBSRC should maintain its strong support for the Quota DTG competition
- The Quota DTG competition supports the development of highly-skilled scientists who have the potential to make substantial contributions to the UK economy throughout their future careers

182. The Quota DTG competition is very successful. Departments are using Quota DTG funding to support high-calibre students within high-quality doctoral training programmes, which develop students' specialist research skills, broader science skills and generic professional skills. The training and research supported by Quota DTGs are producing good quality outputs and outcomes, the most important of which is the delivery of the next generation of skilled scientists who are able to pursue a wide range of careers in academia, industry and the wider economy.

183. The overall quality of training provided through Quota DTGs is good. Over the evaluation period, Quota DTGs have facilitated the transition from a three-year to four-year model of studentship funding, and this has been very beneficial to the student training experience. However, there is a need for departments to improve their doctoral training programmes in some areas, for example, by increasing support for interdisciplinary training, improving the quality of internal commercial and entrepreneurial awareness training, and placing greater emphasis on the development of creative and critical thinking. There is also a need for some institutions to place greater emphasis on supervisor training. Students benefit considerably from interactions with postdoctoral researchers; BBSRC and institutions should identify ways of formally recognising their extremely valuable contribution to students' training.

184. The flexibility of Quota DTGs is a major strength of the funding mechanism, producing benefits for students, supervisors, departments and BBSRC. Departments are largely using this flexibility effectively and responsibly to support high-quality training within the BBSRC remit, and there are many examples of good practice. However, there is a concern that departments are seeking to maximise the number of students supported as a priority, and that they are reluctant to use the Quota DTG financial flexibility in ways which would reduce the overall number of studentships. This may not provide the best value, particularly if it leads to a reduction in the quality of individual studentships.

185. There are tensions between Quota DTG flexibility and other priorities for student training. The departmental autonomy provided by Quota DTGs can work against BBSRC's increasing need to ensure that its funding provides balanced coverage of the remit and addresses its strategic priorities. The Panel was not convinced however of the need for Quota DTG funding to address specifically BBSRC's strategic priorities or to be closely aligned to the research grant portfolio; although it recognised the need for BBSRC to support the training of skilled scientists in strategically important areas. There was no consensus on how this tension might be reconciled, but the Panel agreed that BBSRC should continue to support a mixture of non-directed and directed studentship funding, and that the Quota DTG competition should remain a non-directed

scheme which is focused on the delivery of excellent bioscience training and excellent bioscientists across the BBSRC remit.

186. There are opportunities for BBSRC to improve the Quota DTG funding mechanism. There is scope to increase the level of Quota DTG flexibility in particular areas (e.g. in determining the length of studentships). BBSRC should also use a more realistic figure to calculate the notional costs of a four year studentship, (e.g. increasing the RTSG element to £5K per annum). In addition, the requirement to create CASE studentships within the Quota DTG competition should be removed; CASE studentships should be supported within a separate competition where the quality of the proposed interaction with the industry partner can form an integral part of the assessment process.
187. The use of a competition to allocate Quota DTG funding is effective. The competition offers many advantages over a purely algorithmic allocation based on research grant income, and recognises that there is no simple link between excellence in training and excellence in research. The competition has driven substantial improvements to departments' training programmes and BBSRC should continue to use the competition approach for future Quota DTG funding rounds. However, the competition's application process is burdensome for the research community. BBSRC should minimise this burden, for example, by reducing the volume of qualitative information requested and placing increased emphasis on the use of pre-existing quantitative data which institutions collect for other purposes. BBSRC should also reduce the overall number of Quota DTGs awarded by encouraging applicants to submit larger-scale applications (e.g. at an institutional or multi-departmental level).
188. Support for doctoral training is an essential component of BBSRC's mission. Research training and skills development are vital to maintaining a healthy and vibrant UK bioscience sector, and BBSRC's Quota DTG competition is a very important part of the UK funding landscape for doctoral training, which is highly valued by the bioscience research community. BBSRC should maintain its strong support for the Quota DTG competition. It is recognised that this will be challenging in the current financial climate and, as a priority, BBSRC should emphasise the quality of student training over the number of studentships. BBSRC's investment in doctoral training through the Quota DTG competition is very valuable and it produces long-lasting outcomes and impacts. In particular, it supports the development of highly-skilled scientists who have the potential to make substantial contributions to the UK economy throughout their future careers.

List of the Panel's recommendations

Chapter 3: Quota DTG flexibility (p. 20)

- **3.1 Use of Quota DTG flexibility**
 - BBSRC should be more explicit that the notional number of studentships is not a requirement and that departments may use the flexibility of the award to support fewer, better-resourced studentships (para. 31, p. 22)
- **3.2 Length of studentships at the outset**
 - Now that four-year studentships are embedded as the norm, BBSRC should provide departments with full flexibility in determining the length of studentships up to a maximum of four years (FTE) (para. 36, p. 22)
 - BBSRC should require departments to outline their policy for determining the length of studentship awards, making clear the criteria used to decide whether to fund three- or four-year (or in between) studentships in individual cases (para. 39, p. 24)
- **3.3 Co-funding of studentships**
 - To encourage greater or more effective use of co-funding, Research Councils should consider relaxing the requirement of at least 50% of the studentships costs to be supported by the DTG (para. 44, p. 25)
- **3.5 Additional consumable or experimental costs**
 - BBSRC should use a more realistic figure to determine the notional cost of a four-year studentship (e.g. £5K per annum Research Training Support Grant) (para. 50, p. 26)
 - It may be helpful to emphasise the financial value of the Quota DTG in the announcement letter (e.g. "The value of this award is £X. This could support Y studentships with a nominal RTSG of £5K per annum") (para. 51, p. 27)
 - BBSRC should maintain the existing flexibility for departments to adjust the level of the RTSG, recognising that the costs of individual student projects will vary depending on the nature of the research (para. 51, p. 27)
 - BBSRC should increase the level of the RTSG whilst maintaining the current number of studentships. However, as a priority, BBSRC should emphasise the quality of student training over the number of studentships (para. 52, p. 27)
- **3.7 Creation of CASE studentships**
 - BBSRC should provide greater clarity on what constitutes an acceptable CASE partner, or more beneficially, relax the rules for CASE partners to include a wider range of organisations (para. 59, p. 28)
 - BBSRC should consider removing the CASE requirement from the Quota DTG competition. It is more appropriate to award CASE studentships through a separate competition where the quality of the proposed interaction would be an integral part of the assessment process (para. 60, p. 29)

Chapter 4: Balance and coverage of the studentship portfolio (p. 30)

- **4.3 Coverage of the BBSRC remit**
 - BBSRC should continue to monitor the balance and coverage of the studentship portfolio as a whole, to identify areas where skills shortages may be developing (para. 71, p. 33)
 - MRC is planning to reduce slightly the number of studentships it supports in the biomedical science area. BBSRC should consider how this change will affect its studentship portfolio, as departments may use a higher proportion of Quota DTG funding to support biomedical research training in response (para. 72, p. 33)
 - It is important that the biomedicine and health industries continue to support basic bioscience training, and BBSRC should make representations to this effect to its senior contacts in industry (para. 75, p. 35)

- **4.4 Addressing BBSRC strategic priorities**
 - The Quota DTG competition should remain focused on the delivery of excellent bioscience training and excellent bioscientists across the BBSRC remit (para. 80, p. 36)
 - BBSRC should continue to recognise the importance of departmental autonomy to decide the areas in which to create studentships (para. 80, p. 36)
 - BBSRC should maintain its position of supporting a mixture of non-directed and directed studentship funding; Quota DTG funding should remain a non-directed scheme (para. 86, p. 38)
 - Focused support for student training in priority areas or areas with skills shortages would be better addressed outside the Quota DTG competition (para. 86 p. 38)

- **4.5 Support for interdisciplinary training**
 - BBSRC should increase the level of interdisciplinary training, for example, by encouraging institutional or multi-departmental level applications (para. 90-91, p. 38-39)

Chapter 5: The quality of student training (p. 40)

- **5.2 Training in research skills**
 - BBSRC should recognise creative and critical thinking within its list of 'core' bioscience skills, and encourage departments to support related training within their doctoral programmes (para. 102, p. 42)

- **5.4 Training in generic professional skills**
 - BBSRC should ensure that the quality and quantity of research and generic skills training are maintained and, where appropriate, encourage further enhancements and innovations in postgraduate training provision (para. 108, p. 44)

- **5.5 Balance between training and research**
 - BBSRC should take steps to ensure that departments provide all students with high-quality training in certain 'core skills' (e.g. ethical awareness, commercial awareness), whilst recognising that there are other areas where training requirements can be more relaxed or more targeted at the individuals who will benefit the most from it (e.g. business skills) (para. 114, p. 46)

- **5.8 Participation in public engagement activities**
 - BBSRC should ensure that a larger proportion of students are enabled to participate in public engagement activities (para. 119, p. 47)

Chapter 6: Supervision, mentoring and career development (p. 54)

- **6.2 Students' interactions with other researchers**
 - BBSRC and institutions should seek ways of formally recognising the enormous contributions of postdoctoral researchers to doctoral training (para. 130, p. 55)
 - BBSRC should place greater emphasis on ensuring students are based in research environments where they are able to receive support from postdoctoral researchers (para. 130, p. 55)
- **6.7 Support available to supervisors**
 - BBSRC should place greater emphasis on whether departments have effective mechanisms in place for supervisor training in the Quota DTG assessment process (para. 148, p. 62)
 - BBSRC should consider providing additional guidance to institutions regarding its expectations for supervisor training (para. 148, p. 62)

Chapter 7: Application and administration processes (p. 65)

- **7.2 Assessment criteria**
 - While it is important for departments to monitor student destinations, the information should not form part of the assessment process (para. 158, p. 69)
- **7.3 The use of a competition in awarding Quota DTG funding**
 - BBSRC should continue to award Quota DTG funding through a competition (para. 163, p. 70)
- **7.4 Suggested improvements to the application process**
 - BBSRC should minimise the burden of the application process on the research community, for example, by reducing the volume of qualitative information which must be provided (para. 164, p. 70)
 - Where appropriate, BBSRC should place greater emphasis on quantitative data, preferably using pre-existing information which institutions collect for other purposes (para. 164, p. 70)
 - Research Councils should work together to ensure that there is greater harmonisation regarding requested information about doctoral training (para. 164., p. 70)
 - Applicants should indicate how they used previous Quota DTG funding, as well as their future plans for the doctoral training programme; there are potential benefits in BBSRC asking applicants to identify specific, measurable objectives by which their training programmes' success could subsequently be judged (para. 165, p. 70)
 - The next Quota DTG competition should place increased importance on the quality of supervisor training as an assessment criterion (para. 166, p. 70)
 - BBSRC should consider asking departments to describe the specific mechanisms in place to ensure that their studentship portfolios are within BBSRC remit, fit with BBSRC strategy, and support interdisciplinary research (para. 166, p. 70)
 - The extent and scale of industrial contacts and cooperative research activity should remain an assessment criterion, despite the Panel's recommendation that CASE studentships be removed from the Quota DTG competition (para. 166, p. 70)
 - BBSRC may wish to consider a programme of site visits to Quota DTG-funded institutions; these would provide additional assurance that Quota DTG-funding is supporting high-quality doctoral training programmes, and it would enable the level of information requested in applications to be reduced for these institutions (para. 167, p. 71)

- **7.5 Number and size of Quota DTG awards**
 - For the next Quota DTG competition, BBSRC should substantially reduce the number of awards relative to 2005, particularly the number of Quota DTGs which support a relatively small number of students (para. 170, p. 71)
 - BBSRC should encourage applicants to submit larger-scale applications, for example, at the institutional or multi-departmental level (para. 170, p. 71)
 - BBSRC should not be too prescriptive, as it would not be appropriate for all applicants to submit institutional-level proposals and Quota DTGs awarded to single, large departments are often very effective (para. 170, p. 71)
 - The practice of individual departments submitting more than one application should be strongly discouraged (para. 170, p. 71)
 - If necessary BBSRC should integrate multiple, small applications from an institution into a single application (para. 170, p. 71)
 - BBSRC should consider specifying a minimum level of BBSRC research grant income which would normally be expected for an application to be successful (para. 170, p. 71)
 - BBSRC should encourage small departments or non-biology departments to apply as part of larger applications and should use the competition's assessment criteria to encourage this behaviour (e.g. by placing increased emphasis on how the Quota DTG will support interdisciplinary training) (para. 171, p. 71)

- **7.6 Support for student cohorts**
 - BBSRC should consider encouraging greater support for cohort- or programme-based approaches to doctoral training within Quota DTGs (para. 172-174, p. 72)

- **7.7 Student eligibility criteria**
 - Studentship eligibility for non-UK EU students should be relaxed, so that these students can receive full support from the Quota DTG (para. 176, p. 73)
 - Where appropriate, BBSRC should coordinate changes to studentship eligibility criteria with other Research Councils (para. 177, p. 73)
 - If studentship eligibility criteria are relaxed, it will be important to monitor the extent to which non-UK EU students remain in the UK after they complete their training and whether the changes affect the flow of UK candidates into PhD studentships (para. 178, p. 73)

Chapter 8: Conclusions and future perspective (p. 74)

- BBSRC should maintain its strong support for the Quota DTG competition (para. 188, p. 75)