Deutsche
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Quality of the Supervision and Research Environment in the DFG's Research Training Groups

Report on a Survey of Doctoral Students

Bonn 2003

Deutsche Forschungsgemeinschaft (DFG – German Research Foundation):
Quality of the Supervision and Research Environment in the DFG's Research Training Groups. Report on a Survey of Doctoral Students – Bonn 2003

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in collaboration with
the Division of Research Training Groups and Research Careers

An online version of this report is available at the following web address:

http://www.dfg.de/forschungsfoerderung/koordinierte_programme/graduiertenkollegs/programm_info/zahlen_info/index.html

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Preface

The Deutsche Forschungsgemeinschaft (DFG – German Research Foundation) has funded doctoral students within the framework of the Research Training Group Programme (*Graduiertenkollegs*) since 1990.

The focus of this report is on the young scientists and academics currently funded by the Research Training Groups (RTGs). Whereas the DFG's peer reviewers normally evaluate the RTGs in terms of research performance and quality, the aim of the study is to find out more from the doctoral students' perspective. Students were asked to comment on the supervision that they receive for their doctorate through the Research Training Groups and from the senior researchers involved in the programme, and evaluate the support for their further career advancement.

This report does not represent the general day-to-day procedure of pursuing a doctorate in Germany as a whole, but rather takes an in-depth look at the supervision and research environment within the Research Training Groups of the DFG. The survey that was carried out through the internet in the summer of 2001 was specifically directed to doctoral students who are part of these Research Training Groups.

The results of that survey are summarized in this report. A detailed version was published in German, entitled: *Qualität der Förderung in Graduiertenkolleg. Ergebnisse eine Kollegiatenbefragung. Standpunkte; WILEY-VCH Verlag, Weinheim 2003.*

I Research Training Groups – "*Graduiertenkollegs*"

1. The historical background of the programme

Obtaining a doctorate is the starting point for nearly every research career and is a requirement in Germany for any person applying for the position of Junior Professor. In addition, it is the only degree offered that is recognized worldwide, not only in the academic sector, but also in the economic, industrial and public sectors. The doctoral degree combines the research and education mandate of universities in Germany and provides the first major step towards the development of young future researchers, which the scientific and academic communities need and are dependant upon. Promoting doctoral students, therefore, plays a vital role.

The German Science Council (*Wissenschaftsrat*)[1] pointed out in several recommendations that a considerable amount of reform was necessary in support structures for doctoral students. The standard model, "one student, one thesis, one advisor", was pushed to its limits when the number of students in Germany pursuing doctoral degrees rose to a five-digit figure. This situation was complicated further by the rapidly growing demand outside of universities for researchers with doctorates.

At the end of the 1980s, the German government (*Bund*) and the federal states (*Länder*) agreed to the creation of the Research Training Group Programme (*Graduiertenkollegs*) to offer financial support to young outstanding researchers. The first Research Training Groups, established in October 1990, served mainly as reform models. The results have so far proven that the RTGs have fulfilled their function as a role model in an exemplary way. They have revealed deficits in the doctoral funding programmes and have created new ways to improve these programmes.

2. Statistical information about the programme

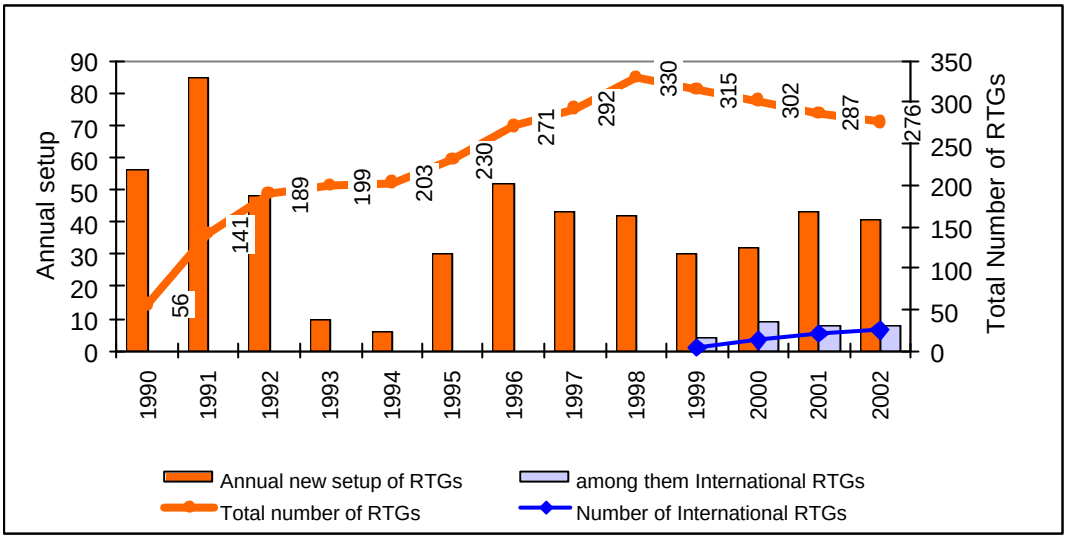
The DFG is allocating a sum of 72 million Euros per year to fund the Research Training Groups; this sum constitutes about six per cent of the DFG's total budget. As of 2003, the DFG funds a total of 276 RTGs, 25 of which are International Research Training Groups. Although the International Research Training Groups are based on research cooperation between German and mainly European universities, there is growing interest in cooperating with non-European partners as well.

Approximately 6600 doctoral students, 36% of whom are women, are currently funded in the Research Training Groups. The number of foreign students is high; 20% of the doctoral students have a foreign citizenship, of which two-thirds are European. Every tenth doctorate recipient in Germany has a foreign citizenship. There are about 4000 senior researchers, 8% of whom are women, who supervise the doctoral students. The competition for a place in the Research Training Group Programme differs according to research area; however, on average, there are three applicants for every fellowship granted. Half of these applications come from abroad.

[1] According to the recently published *'Wissenschaftsrat': Empfehlungen zur Doktorandenausbildung*, November 2002.

The following chart illustrates the development of the programme over the last few years.

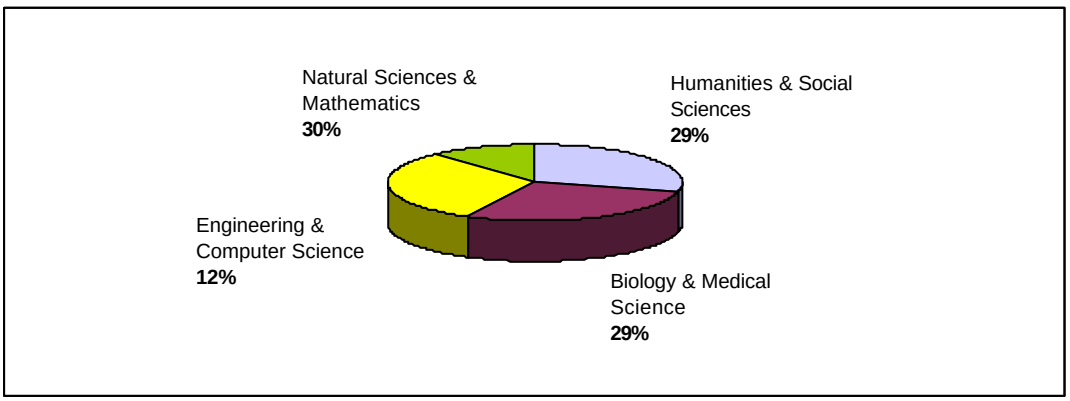
Diagram 1: The number of Research Training Groups (RTGs) since 1990



The DFG serves all branches of science and the humanities and thus the Research Training Groups are represented in all research areas accordingly. Since the programme's inception, the number of RTGs in the humanities and social sciences has remained constant at approximately 30%. The percentage of RTGs in the fields of biology and medicine has risen steadily from 20% to the current figure of 29%. Engineering and computer science RTGs constitute the smallest representation with 12%.

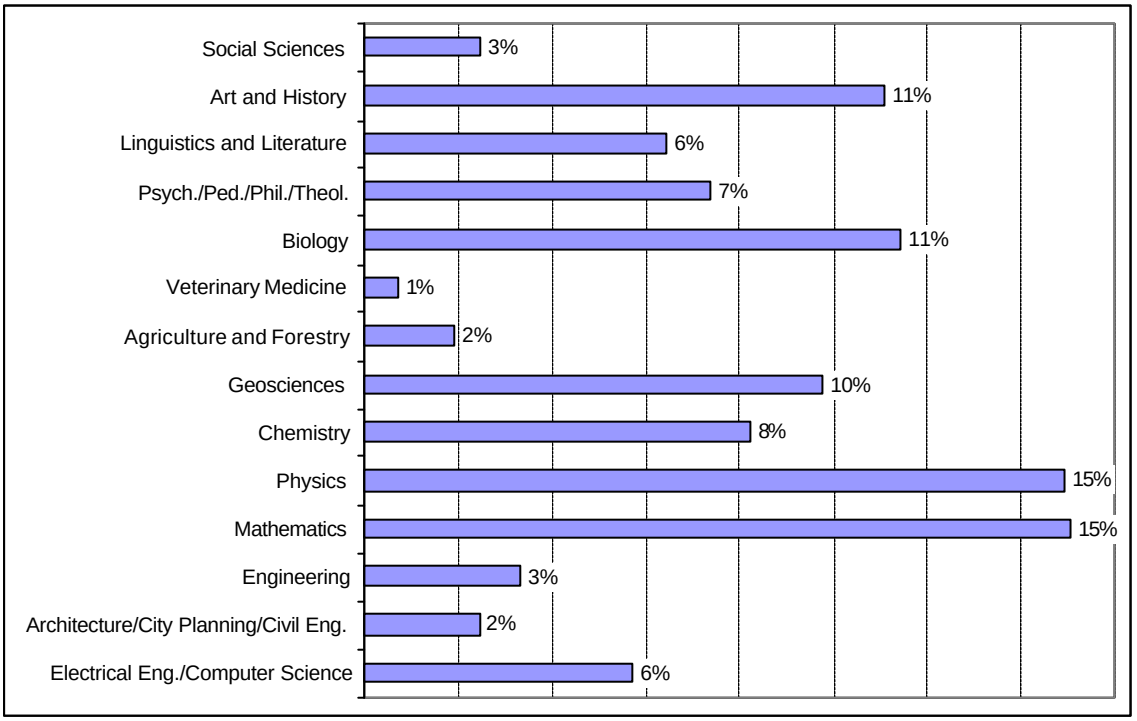
The following pie chart shows the distribution of the Research Training Groups according to their main research area.

Diagram 2: Research Training Groups according to their main subject areas



The number of doctorate recipients in Germany has risen dramatically in the last few years. In 2000, 15,827 doctorates were conferred, compared to 12,834 in 1992 and a mere 7,085 in 1982[2]. Almost 10% of the doctorates are completed within the Research Training Groups.
The role that the Research Training Groups play in the different disciplines in Germany varies. The percentage of doctorates completed within the RTGs in the natural sciences is relatively high compared with other research areas. The Research Training Groups are most important for mathematics and physics as every seventh doctoral thesis is completed within the RTGs. (See *diagram 3)*

Diagram 3: The percentage of doctoral students who received their doctorate within the Research Training Group Programme in relation to those who obtained their doctorate in the whole of Germany in 2000[3].



Over half of the doctoral students who are in the Research Training Group Programme have completed their doctorate by the age of 30, compared to the nationwide average age of 32.7 years.

More than fifty per cent of the doctoral students who have participated in the programme are still active in research.

An overview of the Research Training Group Programme can be found on the DFG's homepage at
http://www.dfg.de/forschungsfoerderung/koordinierte_programme/graduiertenkollegs

[2] Based on data from the German Federal Statistical Office (*Statistische Bundesamt*), excluding doctorate degrees in human medicine. The figures for 1982 und 1992 refer only to the former Federal Republic of Germany.
[3] The diagram is based on data of the German Federal Statistical Office (*Statistische Bundesamt*), doctorates awarded at German universities in 2000 and annual surveys of the Research Training Groups.

3. The profile of a Research Training Group

Research is the essential part of a doctorate. Without high quality research, an attractive and thorough doctoral programme cannot be offered. For this reason, Research Training Groups are located in areas well known for excellent research. A Research Training Group is composed of a group of renowned researchers, as well as young up-and-coming scientists and academics, who usually come from varying disciplines. In the future, the DFG intends to limit the group of actively involved senior researchers to approximately five to ten.

The research programme is dedicated to a specific innovative topic that can be worked on by the doctoral students within the funding period of RTGs (2 x 4.5 years). This should provide the framework for the production of excellent dissertations.

It is characteristic of each Research Training Group to develop a tailor-made study programme for the doctoral students in their group. The goal is to complement and expand on the specialisation of each individual student by involving the student in the development of this programme. This method encourages the students' cooperation and their integration within the international research arena. However, a balance has to be found between the senior researchers' desire to share a part of their wealth of knowledge and experience and the necessity of allowing the doctoral students enough free room for independent work on their dissertation.

A well thought-out and structured funding programme is a vital part of a strong study programme.

The financing of the Research Training Groups includes the following areas:

- Funding for doctoral students (there are special procedures for doctoral students from the medical sciences and those with an Applied Science or a BA degree)
- Funding for postdocs
- Funding for research students
- Funding for research material (consumables/smaller equipment, etc.) necessary for the research project
- Funding for the implementation of the study programme
- Travel expenses for doctoral students, and, for the International Research Training Groups, also for senior researchers
- Funding of sabbaticals for the senior researchers involved
- Funding for publications
- Funding for the coordination of the Research Training Groups

II The Survey

Comments

The survey was carried out in the summer of 2001 among the doctoral students participating in the Research Training Groups at that time.

The survey,[4] which consisted of 84 mainly multiple choice questions, included the following areas:

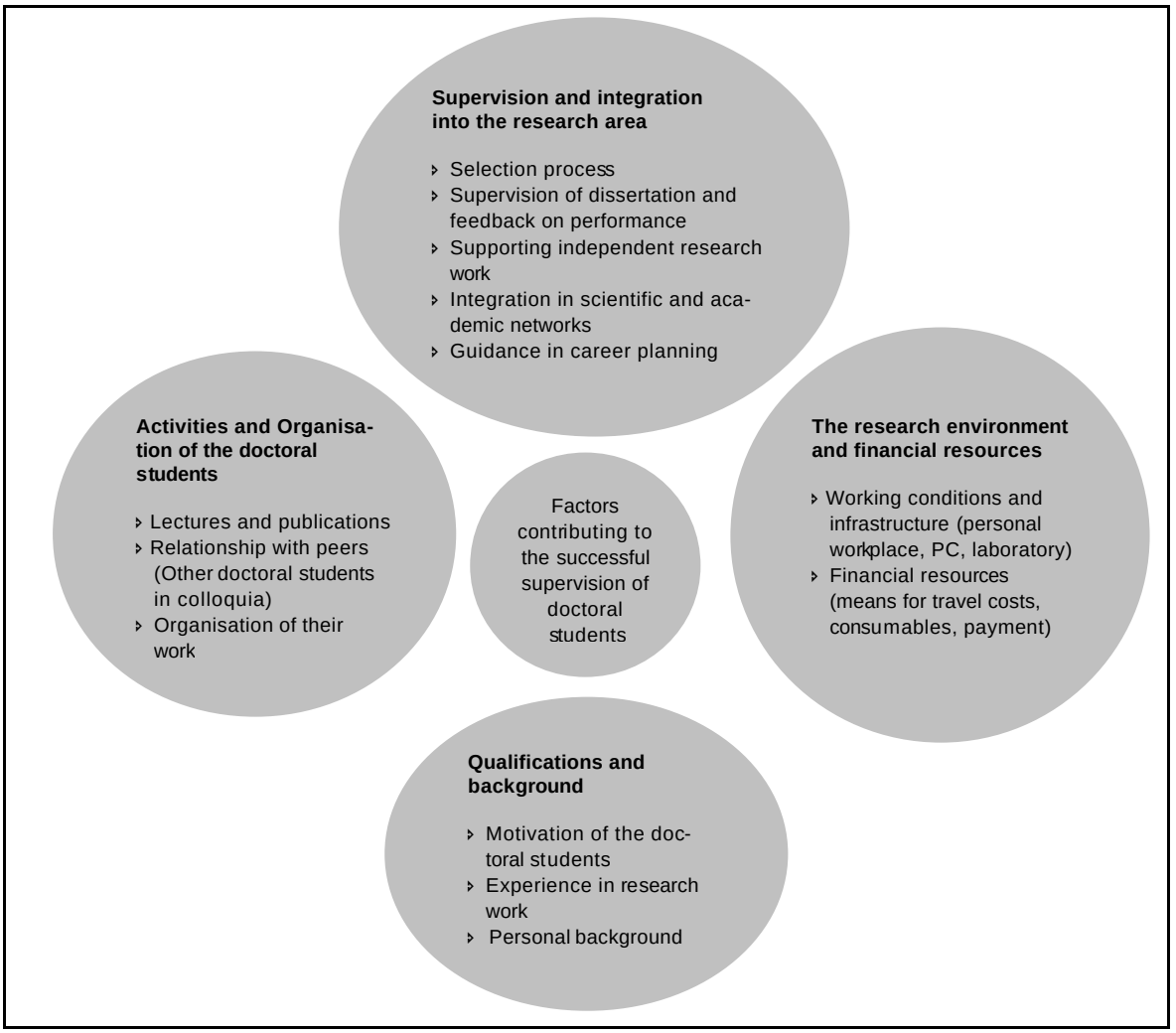
- Scientific and academic background: Reasons for entering research and the expectations of a research career; activities as a student and research assistant; experience in project work before beginning the doctoral thesis; university entrance exam (city, year, grade); the beginning of university studies and the subjects chosen; graduation (city, year, grade,) and second degree.
- General questions about the Research Training Groups: Selection process; guidelines for the supervision; funding opportunities; group size; working conditions; infrastructure; time budget; study programme; quality of supervision and different forms of cooperation; and the evaluation of key qualifications.
- The dissertation: The beginning; dissertation subject; the students' personally-set and the externally-set time frame; motivation for doing the dssertation; integration in the community and delay in completion of the dissertation.
- Individual supervision: Contact with the supervisor; change of supervisor; mentors; mechanisms for evaluating supervision; evaluating the student's relationship with his/her supervisor; and additional comments about the supervision.
- Research activities: Publishing, taking part in research conferences and congresses within Germany and abroad and doing research abroad.
- Personal information: Gender, age, citizenship, and number of children.
- Career plans: Personal expectations, description of desired employer, knowledge about the DFG's funding possibilities, mentors, and additional comments.

This report takes into account the responses of 1,131 doctoral students (percentage of completed questionnaires received: 19%).

The quality of funding programmes for doctoral students in general and especially within the Research Training Group Programme is influenced by different factors that are determined by the doctoral students themselves, the supervising senior researchers and the infrastructure that is provided. The degree of success while doing the doctorate is a direct result of a combination of these factors and how they work together. These factors are illustrated in diagram four, which, in our opinion, influences and determines the extent of this success. They have been summarized into four sections and provide the structure in which the doctoral students' feedback about the quality of their supervision can be analysed.

[4] The survey can be viewed at:
http://www.dfg.de/forschungsfoerderung/koordinierte_programme/graduiertenkollegs/download/quality_of_graduate_studies.pdf

Diagram 4: Factors that contribute to the successful supervision of doctoral students



A fifth area which does not play a major role in the evaluation process, but still deserves mention, is the effect that doctoral degrees have on further careers of doctoral students. A DFG-funded study conducted by Jürgen Enders and Lutz Bornmann provides information about careers of those who have obtained their doctorates[5].

The overall picture that we have received about the quality of doctoral support within the Research Training Group Programme has been formed by the subjective evaluation of all those doctoral students who answered the survey. Their comments are influenced by the different expectations that each of them has about the type of supervision and training they should receive. This report, therefore, does not represent an objective view of the conditions and work of the Research Training Groups, but rather presents the different comments of the doctoral students, who gave open, albeit, anonymous, feedback about the support they have each received in their individual Research Training Group. This report is thus aimed at those responsible for supervising and supporting doctoral programmes so

[5] Jürgen Enders, Lutz Bornmann: *Karriere mit Doktortitel? Ausbildung, Berufsverlauf und Berufserfolg von Promovierten*. Frankfurt/New York 2001.

that they can be made aware of and become sensitised to the needs of the young researchers and, in turn, improve the doctoral funding programmes.

III The Most Important Results

1. Motivation of the doctoral students

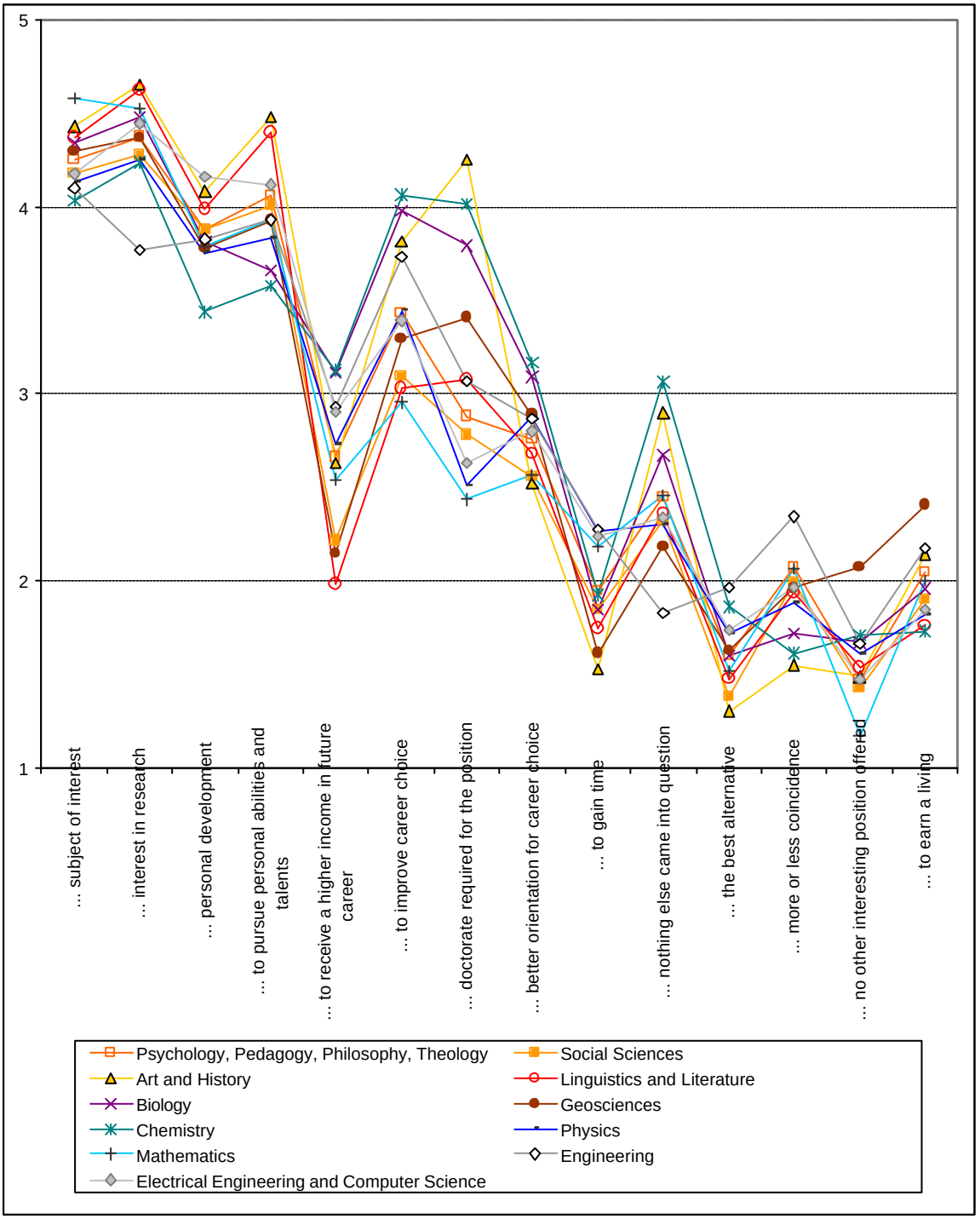
The most important reasons for pursuing a doctorate commonly given by the doctoral students are an interest in research in general, an interest in a particular subject and the opportunity to independently explore one's own abilities and strengths in that field. All other reasons given were placed on a lower rank of priority by the students.

The reason for pursuing a doctorate to improve career prospects or to receive a higher income depended strongly on the subject area of each particular doctoral student. Such expectations were mainly observed in the fields of chemistry and biology. In contrast to the other disciplines, students in these subjects did not place the opportunity for personal development as a high priority.

The reasons given by the students in engineering are particularly interesting in that their interest in research plays a minor role in comparison with the other students. Earning a doctorate to them was just choosing to do one of the several options that were open to them. However, once the decision to pursue a doctorate has been made, the engineering students do not differ much from the other students in terms of motivation.

No noticeable differences in the form of motivation can be ascertained between the doctoral students who are funded by a DFG fellowship, those who finance their doctorates trough research assistantships at their universities and those who are funded by a third party. The same is true for this comparison between genders.

Diagram 5: Reasons for motivation according to chosen subject (average)



2. Time period between the completion of a degree and the start of the dissertation

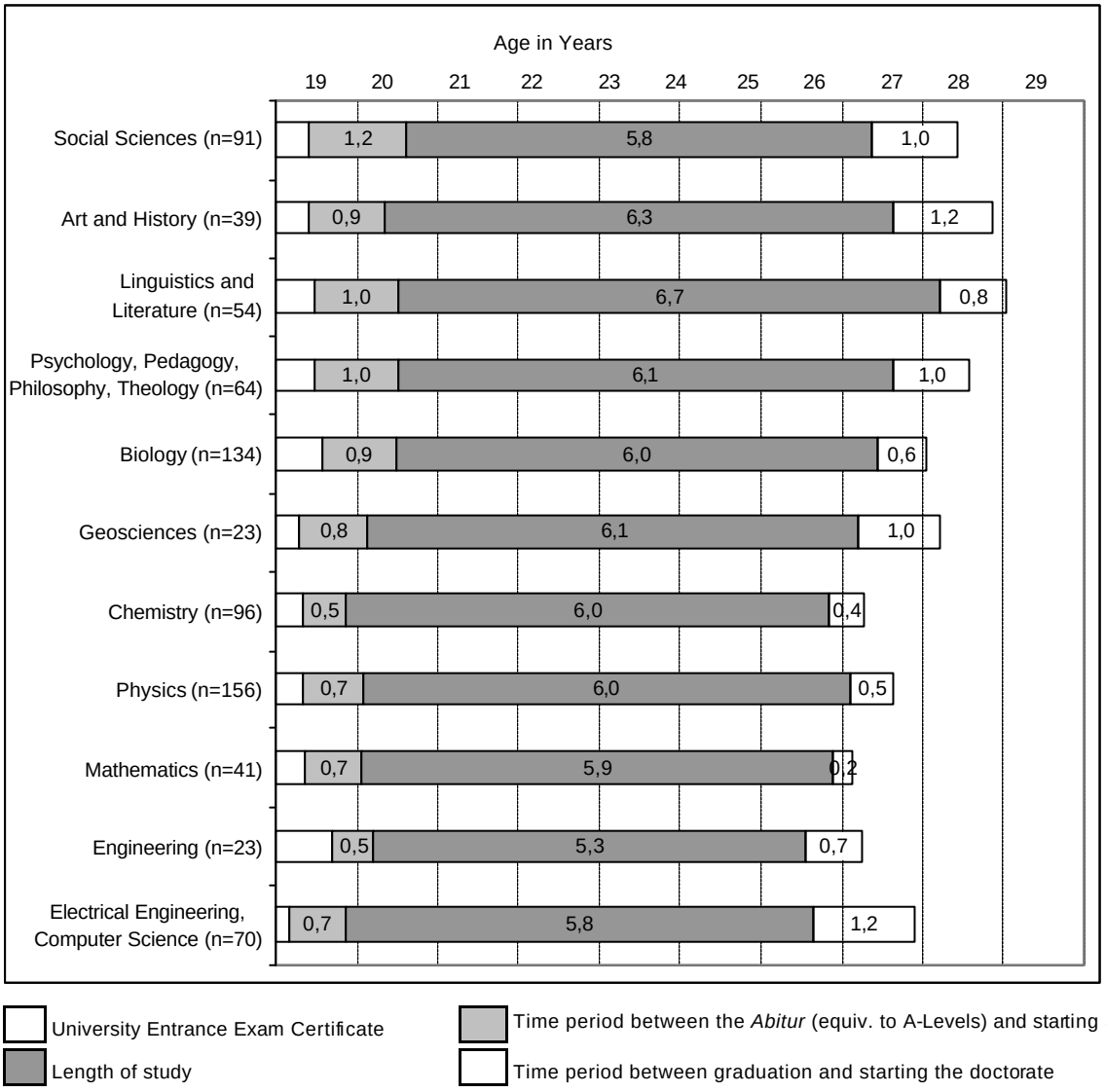
Students who became integrated in the research process as so-called research assistants during their studies seemed to be affected positively by this experience and were more apt to use their dissertation as a means for beginning their own research project. Students who worked as research assistants during their studies tend to make the decision to begin with their doctorate after graduation six months earlier than those with no experience as research assistants.

The time period between graduation and the start of the doctoral thesis depends heavily on the subject. Doctoral students in the area of mathematics begin their thesis after a mere two months, whereas graduates in the field of humanities and social sciences tend to wait about a year before starting their dissertation.

Women generally need a few more months than their male counterparts to make the decision to pursue their doctorate. This is especially true for those in the field of engineering (an additional six months), and in electrical engineering and computer science (an additional year).

Students who have children need up to one year longer than those students who have no children.

Diagram 6: Educational path of the doctoral students according to research area (average length of time and age in years)



3. Supervision of the doctoral students

In order to provide the doctoral students with excellent supervision, the standard of research done by the senior researchers themselves must be exceptional. More than four out of five doctoral students are of the opinion that the expertise found in their Research Training Group can be rated very highly. 77% feel that their particular Research Training Group conducts very good research. Two-thirds of the doctoral students say that there is a trusting relationship between themselves and the senior researchers, which is another important requirement for successful supervision.

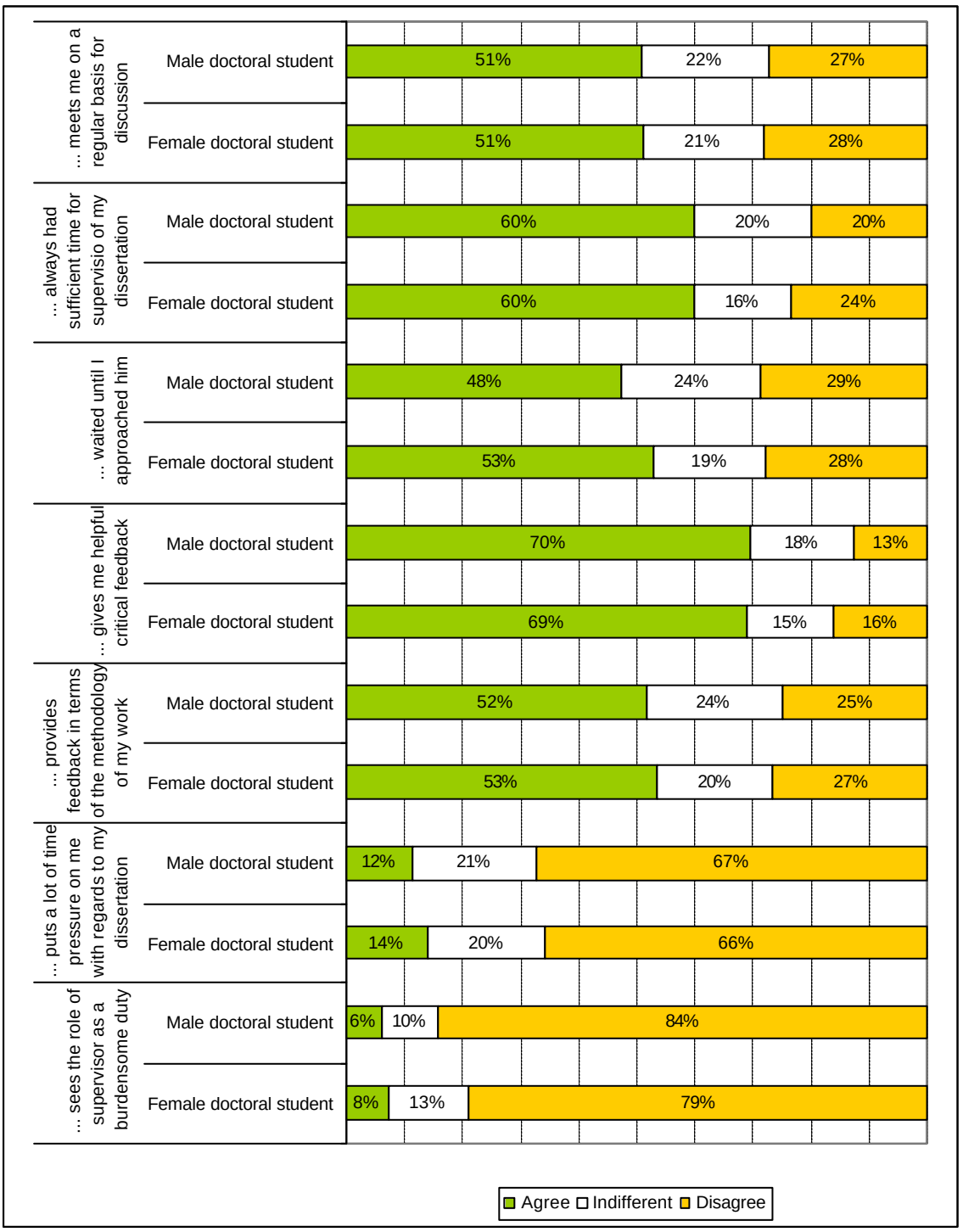
The doctoral students have high expectations with regard to the supervision that they should receive from the senior researchers. Four out of ten students would appreciate even more supervision, such as receiving feedback about their individual performance. These high expectations correspond with the positive evaluation of the actual supervision. 60% of the doctoral students say that their supervisors always have enough time for their dissertation, and 69% of the students say they receive helpful criticism about the status of their dissertation. These comments indicate that the students are generally satisfied with the supervision that they receive, however, in some cases, do expect more involvement from the senior researchers.

The need for more supervision was most often expressed by students in the fields of humanities and social sciences (with the exception of the doctoral students in the field of linguistics and literature) and those in the geosciences. The students in these subjects evaluated the amount of time that their own supervisor and the supervising senior researchers gave them much lower than their colleagues.

There are generally between ten to fifteen senior researchers participating in each Research Training Group. This means that in contrast to the traditional way of supervising doctoral students, having a group of supervisors can prove to be far more advantageous for the students in terms of the support that can be offered. Not only do the students have access to their individual supervisor, but with the help of the group of advisors, the students can build up a much broader advisory and communication network.

There is very little difference in the evaluation of the supervision between the male and female students. However, many female students responded negatively to the question asking if the supervisors actively sought contact with them. Many said that the supervisors waited for the students to approach them. Ultimately, the female students were more often of the opinion that the time the supervisors had available for their dissertations was not always sufficient.

Diagram 7: Evaluation of the supervision of individual supervisors according to gender (answers given in per cent of those asked)



Question 60: To what degree do the following statements apply to your supervisor? Please mark accordingly from 1 = does not apply at all to 5 = applies exactly.
'Agree' corresponds to the answer categories 4 and 5 and 'disagree' corresponds to the answer categories 1 and 2.

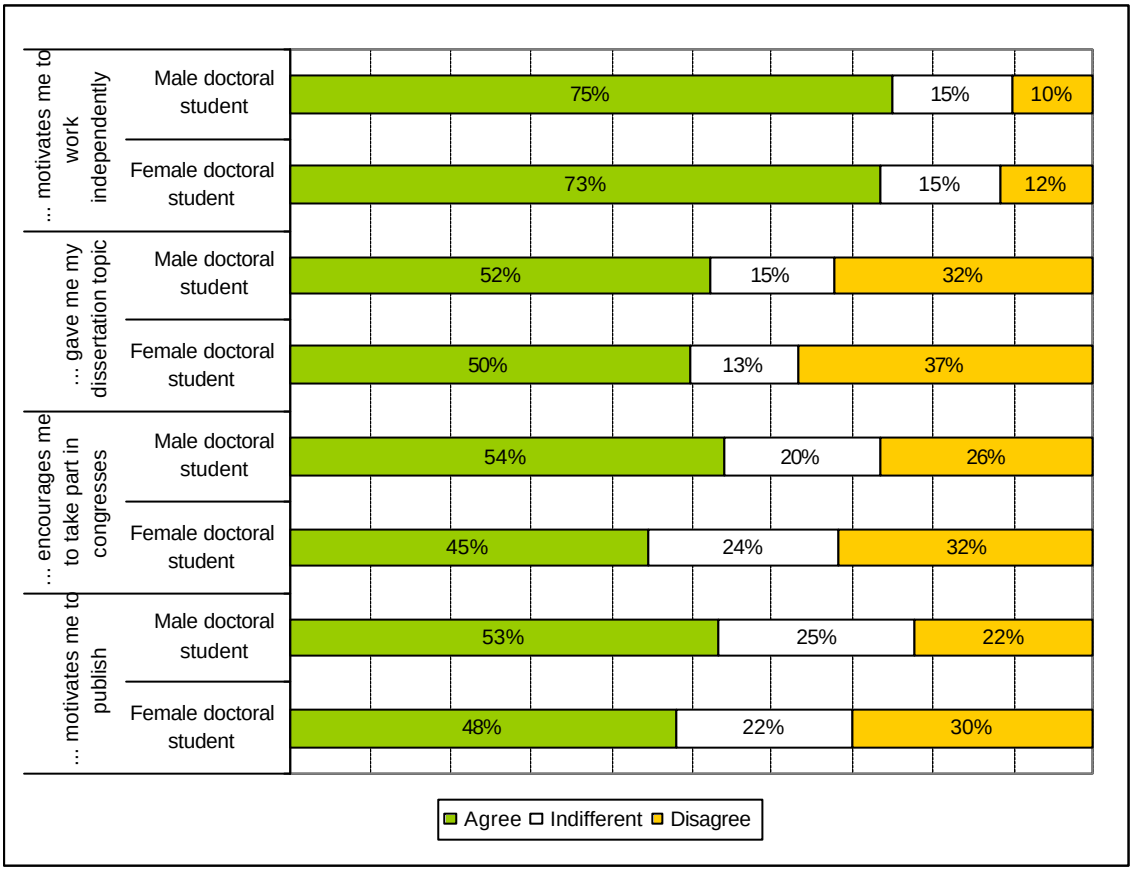
4. Encouraging independent research

Senior researchers support early independence of the doctoral students by encouraging them to present and publish their research results. On average, every second doctoral student indicated that his/her supervisor encouraged him/her to participate in congresses and to publish his/her work. The most motivated students appear to be those in the fields of physics, mathematics as well as electrical engineering and computer science. Not only do their direct supervisors in these RTGs encourage them to take part in the activities mentioned above, the other senior researchers of the Research Training Groups encourage the students to seek discussion with other researchers at conferences and congresses or in the form of publications as well.

The female doctoral students, in contrast to their male counterparts, feel that they are not encouraged as much to participate in congresses or to publish their work. These differences in evaluation of the supervision between the male and female students already became apparent in the evaluation of the time that the supervisors dedicated to their particular student's dissertation. This indicates that the support of these young researchers in the Research Training Group Programme needs to be approached with more carefully directed aims and objectives.

One-third of the doctoral students indicated that they chose the topic for their dissertation themselves. This is particularly true of those doctoral students in the humanities and social sciences, whereas in the fields of chemistry and biology, seven of ten topics for the dissertation were selected by the supervisors.

Diagram 8: Evaluation of the supervision in terms of encouraging independence according to gender (answers given in per cent of those asked)



Question 60: To what degree do the following statements apply to your supervisor? Please mark accordingly from 1 = does not apply at all to 5 = applies exactly.
'Agree' corresponds to the answer categories 4 and 5 and 'disagree' corresponds to the answer categories 1 and 2.

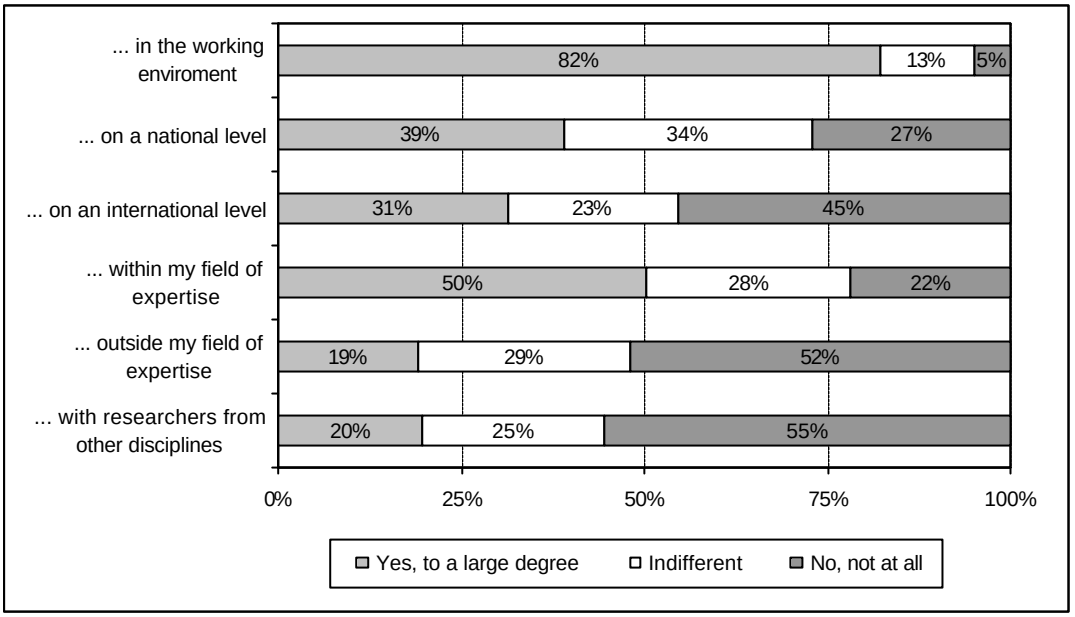
5. Integration in research networks

The Research Training Groups offer a very good framework for establishing and fostering contacts with scientists and academics in other areas of expertise and disciplines. On average, every fifth student states that they have developed such contacts. This facility of offering multidisciplinary and interdisciplinary research opportunities seems to be used more by the research fellows than by those who are employed as research assistant at their universities or those receiving external funds. The latter are integrated more within their area of expertise and on a national level.

The doctoral students in the Research Training Groups place a high value on international contacts. More than half of the students would welcome their Research Training Group increasing its international network even further.

Significant differences can also be seen between the different disciplines: International contacts form an important part in the field of mathematics. This tends to be emphasized less with the students in engineering; however; their contacts are therefore stronger in their working environment and in their area of expertise and beyond. The students in the fields of linguistics and literature also have very strong networks, especially in comparison with the students in other areas of the humanities and social sciences.

Diagram 9: Establishing contacts during the doctoral programme – all doctoral students (answers given in per cent of those asked)



Question 48: To what degree have you been able to establish contact with other researchers so far? Please mark accordingly 1 = not at all to 5 = to a large degree. 'Yes, to a large degree' corresponds to the answer categories 4 and 5. 'No, not at all' corresponds to the answer categories 1 and 2.

6. Career guidance

If the freedom of choice for future employment were left up to the doctoral students, the majority (68%) would choose to stay in the area of research after having completed their doctorate. Every third student would choose to stay on at the university as their first preference, and nearly every fifth student would prefer a job in research in the private sector, while every eighth student would rather pursue a research career in the public sector. 12% of the students would choose a career outside of research and 17% of the students are still undecided.

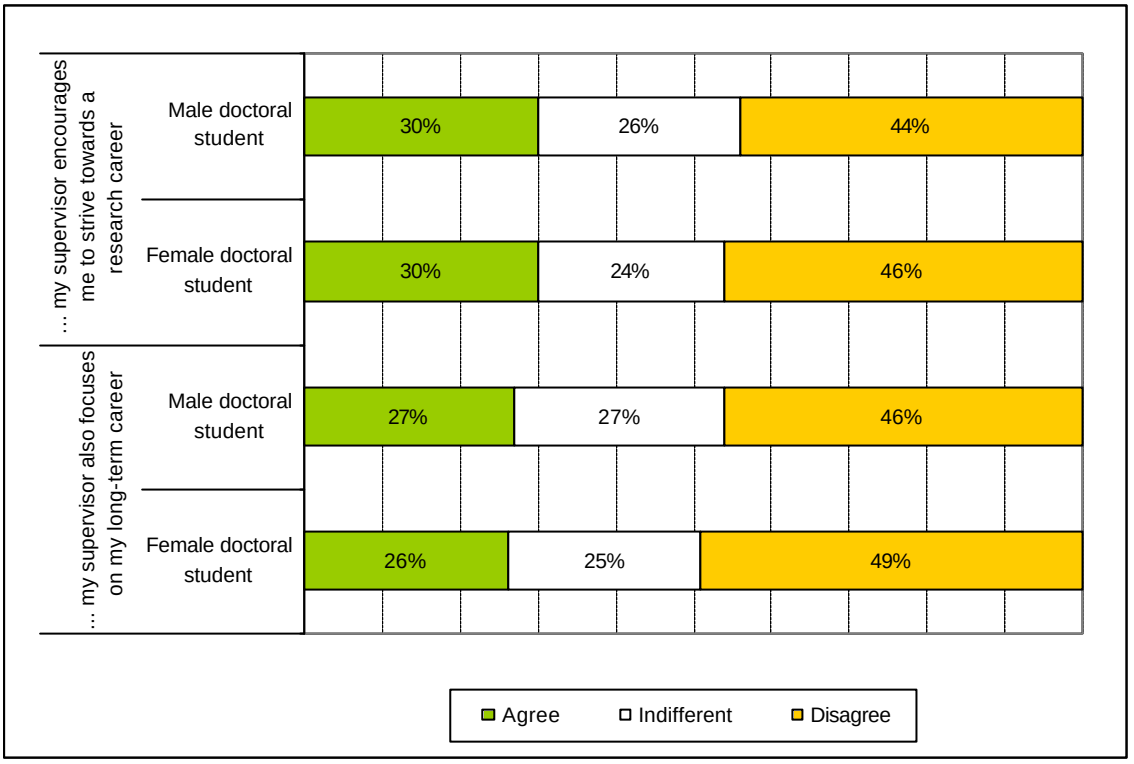
Despite the fact that the majority of students want to pursue a career within the field of research, only one-third of them indicated that their supervisors encouraged or motivated them to strive towards this goal. Nearly half of the students feel as if they receive little or no support from their supervisors to stay in the field of science and research.

The long-term career plans of the doctoral students do not seem to be a focus of most of the senior researchers. On average, only every fourth student felt that his/her supervisor paid attention to giving him/her career guidance, and half of the students even indicated that they received no support in this direction from their supervisors. Once again, more female than male students were of the opinion that they received little or no help at all in their career planning.

According to the students, Research Training Groups provide important skills for their future careers by offering interdisciplinary approaches and a broad basis of knowledge. The students rate the use of the specialised knowledge and research methodology low on the scale of usefulness for a career outside of science and research. They do, however, value the extent to which the Research Training Groups contribute to developing these skills and knowledge. They also see the advantages of being able to learn the different techniques in giving presentations in the RTGs. However, many feel that there are deficits when it comes to developing more key qualifications for a professional career (e.g. motivation and leadership skills and the practical application of research results) and receiving training in foreign languages.

Nearly half of the students would welcome their Research Training Group placing greater emphasis on their career development.

Diagram 10: Support with career planning according to gender (given in per cent of those asked)



Question 60: To what degree do the following statements apply to your supervisor? Please mark accordingly from 1 = does not apply at all to 5 = applies exactly.
'Agree' corresponds to the answer categories 4 and 5 and 'disagree' corresponds to the answer categories 1 and 2.

7. Organisation amongst the doctoral students

The doctoral colloquia in the Research Training Groups are organized mainly by the doctoral students themselves and are mostly structured on an interdisciplinary basis. Usually all of the students and several senior researchers participate in these colloquia. Nine out of ten students say that these types of colloquia take place regularly. 41% of the students maintain that seeing the progress and success of the work done by other doctoral students provides them with more incentive and motivation than "a thousand admonitions from the senior researchers." The work of other doctoral students provides many of the others with the challenge to be successful in their own work. It therefore makes sense to continue allowing the students to organize things for themselves to support not only the self-critical evaluation of their own work, but also the competition between them which leads to a higher performance level of each individual.

One of the goals of supporting the doctoral students in the Research Training Groups is to reduce the time that it takes to complete a doctorate. The DFG strongly recommends that this period should not exceed three years. On average, the expectations of the students and their supervisors conform to this goal.

Doctoral students who receive fellowships usually are prepared to do their doctorate in a shorter time period than the students who are employed as research assistant at their universities or those receiving financial support from a third party. This is particularly noticeable in the fields of engineering, electrical engineering, computer science and mathematics. The difference in the time expectation for completion of the doctorate in the abovementioned subjects is about one year.

When asked if the basic conditions for doing a doctorate or if any other special event had led to a delay in completing the dissertation, three out of five doctoral students answered with no. The following reasons were listed by those who did experience a delay in completing their doctorate: the study programme, the work load from the institution that granted the funding, be it the basic equipment grant or third-party funding, and the work load from sources outside of the field of science and research.

Financial difficulties are mentioned especially by the students in the field of engineering. Changing the topic of the dissertation is another central reason for the delay in completion among the students in the areas of psychology, pedagogy, philosophy and theology. The students in the social sciences, history, art and in the field of engineering have more doubts about their own abilities than other doctoral students.

Table 1: Delay in completing the doctorate according to subject (answers given in per cent of those asked)

	Psychology, Pedagogy, Philosophy, Theology	Social Sciences	Art and History	Linguistics and Literature	Biology	Geosciences	Chemistry	Physics	Mathematics	Engineering	Electrical Engineering, Computer Science	All doctoral students
Work load outside the area of science and research	4%	4%	8%	8%	6%	0%	9%	7%	9%	10%	**25%**	8%
Work load due to research assistantship, grant from a third party	6%	8%	8%	6%	6%	4%	**13%**	**11%**	7%	7%	**13%**	8%
Work load due to the study programme of the RTG	6%	**18%**	**14%**	11%	9%	11%	10%	7%	11%	10%	6%	9%
Work load due to the guest programme of the RTG	6%	3%	4%	2%	1%	7%	3%	4%	2%	7%	1%	3%
Financial problems	2%	5%	8%	2%	6%	0%	2%	3%	0%	**10%**	6%	3%
Pregnancy	0%	2%	4%	5%	2%	4%	1%	1%	2%	0%	1%	2%
Lack of childcare facilities	2%	2%	4%	5%	2%	4%	1%	3%	0%	0%	4%	2%
Change of dissertation topic	**12%**	3%	0%	5%	7%	7%	6%	5%	5%	0%	7%	5%
Change of supervisor	4%	6%	4%	5%	4%	0%	2%	2%	5%	3%	1%	3%
Doubt of my own ability	6%	**10%**	**10%**	8%	6%	4%	2%	7%	5%	**10%**	4%	6%

Question: 50 and 51: Has your dissertation been delayed through special events or basic conditions? If yes, what kind of special events or basic conditions? (More than one answer is possible)

8. Lectures and publications

Three-quarters of all the students have already been to congresses, 68% of which took place abroad. The amount of travelling in the engineering sciences tends to be less than in the other fields. Two-thirds of these doctoral students use the congresses as an opportunity for keeping up with the current scientific and academic debate within their field of specialisation.

The students who attend these congresses or conferences usually play an active role in them. 73% of the students have given lectures themselves or have presented posters. The majority (87%) have been active in up to five congresses and a smaller percentage of doctoral students (13%) have given presentations on their research at more than five congresses.

The percentage of female students who travel and give presentations is only 2% lower than that of their male counterparts. Although the female students feel that they do not receive much encouragement from their supervisors to take part in such congresses or to publish their work, their active involvement at such events is comparable with the male students.

71% of the students have had at least the first results of their research published. The most preferred form of publication for over half of the doctoral students is the paper that is presented at conferences of the Research Training Groups or at other events and congresses. 53% of the students have had the opportunity to present the results of their research to a wider audience using this forum. Two out of five students have published in professional journals. 16% of the doctoral students have written contributions for scientific anthologies. 18% of the students indicate that they have published their working papers and a small number (2%) have even written a monograph.

Of those students who have not yet published, over half had started their dissertation only within the previous 12 months.

Table 2: Congress trips and lectures within Germany and abroad according to research area (answers given in per cent of those asked)

	Participated in congresses in Germany and abroad	…of these students took part in more than five congresses	Gave lectures	…of these students gave lectures at more than five congresses
Psychology, Pedagogy, Philosophy, Theology	76%	**24%**	64%	21%
Social Sciences	78%	20%	59%	6%
Art and History	89%	12%	76%	0%
Linguistics and Literature	89%	**25%**	72%	18%
Biology	**69%**	13%	74%	9%
Geosciences	81%	18%	70%	12%
Chemistry	**69%**	16%	**81%**	12%
Physics	79%	**23%**	**85%**	17%
Mathematics	83%	**27%**	**44%**	**26%**
Engineering	62%	17%	72%	0%
Electrical Engineering and Computer Science	84%	**24%**	**86%**	18%

These figures are based on the answers to questions 68, 69 and 71, 72.

Table 3: Doctoral students' publications according to research area (answers given in per cent of those asked)

	Psychology, Pedagogy, Philosophy, Theology	Social Sciences	History and Art	Linguistics and Literature	Biology	Geosciences	Chemistry	Physics	Mathematics	Engineering	Electrical Engineering and Computer Science
Number of doctoral students who have published	79%	70%	88%	76%	72%	78%	79%	84%	63%	81%	88%

These figures are based on the answers to question 64.

9. The financial resources and infrastructure of the Research Training Groups

The majority of the doctoral students (60%) are satisfied with the working conditions and the infrastructure of the RTGs. Every fourth student is completely satisfied; 16% of the students expressed dissatisfaction with the present conditions.

What received criticism in the evaluation was the supply of literature and professional journals. Even though 82% of the students can access the library at all times, and 66% of them feel that the library stocks the appropriate literature, only two of five students say that they have sufficient funds to buy important books and scientific journals. One can deduce from this that the majority of the students would like to have more funds made available for literature so that they are in the position to decide for themselves what books to buy.

There is also criticism about the amount of funding available for consumables, trips and for inviting guests. The amount of criticism differed according to the area of research. The differences in the level of satisfaction with the working conditions indicate that the Research Training Groups affected by these criticisms should assess the need for increasing the amount of money made available and/or they should make the distribution of these funds more transparent and more structured towards the students' needs.

There also appears to be deficits in the infrastructure provided for the doctoral students. On average, only every fourth student has access to his/her own workplace or office. In the areas of history and art as well as linguistics and literature, only 12% have this privilege. Similar deficits can be found in some disciplines where there is a lack of computers, individual internet access and personal email addresses. If one considers that doctoral students need to participate in the research discussion within their discipline/faculty, that they profit from the formal and informal exchange with other members of the research centres and in so doing become an integrated part of the research culture, then one sees that the importance of having their own workplace, personal email address and internet access plays a vital role in the planning of the infrastructure.

Table 4: Evaluation of the working conditions and infrastructure according to subject (answers given in per cent of those asked)

	Psychology, Pedagogy, Philosophy, Theology	Social Sciences	Art and History	Linguistics and Literature	Biology	Geosciences	Chemistry	Physics	Mathematics	Engineering	Electrical Engineering and Computer Science	All doctoral students
I have sufficient financial resources for travelling	73%	71%	71%	81%	**59%**	**48%**	**54%**	79%	83%	71%	**59%**	67%
I have sufficient consumables available for use	75%	69%	**41%**	**45%**	76%	**63%**	80%	82%	70%	77%	72%	72%
I have enough guest funding available to follow through on my suggestions and invite other researchers	39%	44%	55%	72%	35%	**22%**	**27%**	38%	59%	32%	49%	40%
I receive enough funding to buy important books and professional journals	50%	55%	45%	40%	**28%**	41%	**32%**	40%	59%	55%	59%	42%
I always have access to the library	75%	**69%**	**63%**	76%	86%	93%	85%	93%	72%	84%	84%	82%
The library is furnished with sufficient literature	62%	68%	**55%**	66%	**57%**	**56%**	65%	72%	74%	74%	65%	66%
There are enough scientific journals made available	**58%**	60%	**47%**	**49%**	**54%**	**56%**	61%	69%	67%	61%	64%	61%
I have my own workplace/office	26%	28%	**12%**	**12%**	30%	**15%**	30%	27%	35%	32%	33%	28%
I share my workplace/office with other students	61%	62%	45%	57%	69%	85%	74%	79%	63%	65%	72%	68%
I have my own PC	64%	75%	**29%**	**48%**	**36%**	85%	**42%**	81%	70%	97%	96%	61%
I have my own internet access	73%	81%	**43%**	**57%**	**58%**	93%	67%	88%	83%	100%	98%	74%
I have my own email address	94%	93%	**71%**	**69%**	98%	100%	98%	100%	98%	100%	99%	95%
I have the possibility of receiving help from research students	27%	24%	16%	13%	22%	15%	29%	24%	15%	45%	58%	26%
I receive support from the whole administration (secretariat, etc.)	58%	**46%**	**45%**	**42%**	53%	63%	55%	68%	59%	87%	80%	58%

Question 23 and 24: Please cross the appropriate answer in as far as the statements apply to your working conditions and infrastructure. More than one answer is possible.

10. The financial situation of the doctoral students

Only a small number of doctoral students finance their entire doctorate from one source (e.g. fellowships, working for their institute, financial support from partner/parents and working outside of the research area). The majority of them use several different sources of funding or use different possibilities simultaneously.

Some students have indicated that they do not have a secure and fixed funding programme for the entire time period needed for doing their doctorate. Only half (53%) say that they have secure funding for their entire doctoral programme. 12% of all the students know that their present finances are not enough and that they are dependant on other funding sources, but on the whole are on a sound financial footing. 25% can make no comment in this regard as they do not know yet and 7% find themselves in a precarious situation as they already know that they do not have the finances for the entire time needed for their dissertation.

Despite the varying difficulties of securing enough funds for the doctoral programme, the number of students who have had to delay finishing their doctorate due to finances is relatively low. In fact, the difficulties presented by funding are not regarded as a big problem by the students. The financial situation does not appear to be more burdensome for those who have been awarded a fellowship than for those who have other means of financing their doctorate. Only a small number of students consider stopping their doctorate due to financial reasons.

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