



TOWARDS QUALITY,  
TRANSPARENCY AND  
PREDICTABILITY IN  
DOCTORAL TRAINING

The Graduate School  
Working Group's Suggestions  
for Doctoral Training  
Development



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## ABSTRACT

The Graduate School Working Group has drawn up suggestions to develop the graduate school system and to organise doctoral training with the aim of improving the transparency, predictability and quality of education. Doctoral training aims at getting graduate students to deepen their understanding of their field of research and to achieve the abilities within that field to independently and critically apply the methods of scientific or artistic research and to create new scientific knowledge. Doctoral training consists of independent scientific or artistic research and of relevant courses within the fields of science, art and education and transferable skills. Doctoral training is based on the guidance relationship between the doctoral candidate and the supervisor. The graduate school system creates the preconditions for guidance and an environment supportive of learning.

The Graduate School Working Group recommends that universities more clearly adopt overall responsibility for doctoral training and its development. The training should cover all fields of science and arts, and all doctoral candidates should be members of a graduate school. In organising doctoral training, the differences between fields of science, art and education, and the autonomy of universities shall be taken into consideration. The working group suggests that universities have one or several graduate schools consisting of doctoral programmes that are specific to the fields of science, art and education, and/or that are multidisciplinary. The doctoral programmes of a graduate school may be organised within a university, between universities, between a university and other actors (e.g. research institutes, business and industry) and/or as international network-based doctoral programmes. All doctoral programmes shall be tightly integrated into the university and shall form an important part of its research strategy and profile. The university is responsible for the process used by the graduate school to define the admission procedure and criteria, and the practices concerning supervision, monitoring, evaluation, feedback and correction requests.

The Graduate School Working Group recommends that the target time for the completion of a postgraduate degree in science or arts be set at four years of full-time education, and if doctoral studies are undertaken part-time, their duration shall be tailored to correspond to four years of full-time study. According to the working group, a doctoral dissertation is a comprehensive entity that shall be accepted by the university as a final thesis. The working group suggests that the proposals for the development of the graduate school system be taken into consideration in the supervisory relationship between the Ministry of Education, Science and Culture and universities as part of the development of the research career. The target number of doctoral degrees per field of education shall be waived. When allocating resources to universities, the required completion times and passing percentages of doctorates shall be taken into consideration.

The working group recommends that the Academy of Finland, in cooperation with the universities and the Ministry of Education, Science and Culture, consider its role and duties in developing the national graduate

school system by, for example, directing funding to internationalise high-quality doctoral programmes and to realise the other strategic aims of researcher training. The working group recommends that, when making funding decisions, the Academy of Finland take into consideration not only the functional quality of research and doctoral training, but also field-specific educational objectives that are based on the needs of society and/or science, arts and university policies in order to ensure an increase in doctoral training, especially in new and promising fields of research and networks.

Contents

ABSTRACT ..... 2

1 PREFACE ..... 2

2 RESEARCHER TRAINING IN INTERNATIONAL TERMS ..... 3

3 CURRENT RESEARCHER TRAINING IN FINLAND ..... 5

4 WORKING GROUP SUGGESTIONS FOR RESEARCHER TRAINING DEVELOPMENT ..... 8

    4.1 Developing the national graduate school system..... 9

    4.2 Organising doctoral training..... 10

    4.3 Promoting internationalisation in doctoral training ..... 12

    4.4 Monitoring and assessing doctoral training..... 13

    4.5 Clarifying researcher training regulations ..... 14

    4.6 Resourcing researcher training ..... 14

5 SUMMARY OF KEY SUGGESTIONS..... 15

6 REFERENCES ..... 18

APPENDIX 1: Good practices in researcher training as ratified by Universities Finland UNIFI ..... 20

APPENDIX 2: Examples of transferable skills ..... 22

## 1 PREFACE

Universities, the Academy of Finland and the Ministry of Education, Science and Culture all share the common aim of improving the transparency and predictability of the graduate school system. Doctoral programmes serve as a transition point in which studying and research come together. An early-stage researcher in the first tier of a four-tier research career system is simultaneously still in the final tier of the three-tier degree system. In order to increase the productivity and effectiveness of research and to shift the focus of the research career onto the phases of independence following the doctorate, doctoral training should be even more systematic than it is today. To promote these goals, the Ministry strengthened the role of the Academy of Finland in funding doctoral programmes, in developing and monitoring doctoral training and in funding the second and third tiers of the research career as of the beginning of 2008. In the spring of 2009, the Academy set up a graduate school working group to support the development and monitoring of doctoral training. The group consisted of outside experts along with representatives from the Academy, the Ministry, universities, doctoral programmes, and business and industry. The term of the working group ended on 31 December 2011.

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- *Science Adviser Eeva Sievi, Academy of Finland (until 31 July 2010)*
- *Science Adviser Risto Vilkkö, Academy of Finland (from 1 August 2010 to 30 August 2011)*
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The Graduate School Working Group was tasked with a) preparing the 2010 call for graduate school applications by taking into account the current education and science policy, the realisation of the full cost model and the change of funding into government grants; b) developing the monitoring and assessment of the graduate school system; c) assessing the effectiveness of the graduate school system; d) surveying the implementation methods used to analyse the need for doctors; and e) promoting good practices and internationalisation in the graduate schools.

The Graduate School Working Group familiarised itself with the doctoral programmes and graduate school systems in other countries and the present state of researcher training in Finland. Field trips to the United States and the Netherlands helped the working group to gain a more complete picture of doctoral training strategies and systems in the US and in Europe, their specific features and good practices in doctoral training. The key observation was that successful universities systematically support their doctoral candidates and supervisors through university-wide graduate schools, doctoral programmes or other corresponding arrangements.

The working group also organised seminars for interest groups and sent draft proposals for comment to universities, the Ministry of Education, Science and Culture and the Academy of Finland in January 2010. The working group would like to thank everyone who attended the seminars or gave written or oral feedback on the draft proposals.

*Helsinki, 15 December 2011.*

## 2 RESEARCHER TRAINING IN INTERNATIONAL TERMS

Graduate schools are comprised of one or more doctoral programmes specific to a field of science. The graduate schools funded since 1995 by the Academy of Finland and the Ministry of Education, Science and Culture are comparable, in international contexts, to doctoral training programmes or doctoral programmes as they are called in this report. Foreign universities mainly have internal doctoral programmes, but Finland and some other countries also have networks that operate between universities and/or other actors. This report interchangeably uses the terms researcher training and doctoral training, which both refer to the process of earning a doctorate. Those studying for a doctorate in science or arts are called doctoral candidates.

In most countries, admission into doctoral programmes requires a Master's degree, but in some countries, for example the US and the UK, a Bachelor's degree is sufficient. In addition to the general requirements of the graduate school, the applicant must also meet any selection criteria that are specific to the doctoral programme in question. Usually, doctoral candidates first select their supervisors, and then the doctoral programmes and graduate schools pick their students on the basis of their supervisors' suggestions. Several universities have also organised open applications for doctoral programmes on a regular basis. Graduate schools offer the possibility of completing both a Master's degree and a doctorate, or just a doctorate. A doctorate consists of research work, studies in a particular field of science and other supplementary studies and, if the postgraduate degree is in science, a dissertation, which can be a monograph or a compilation thesis based on a publication or publications. Some universities allow the dissertation to contain publications, while others demand that all material in the thesis be unpublished. In the fields of medicine,

the natural sciences and engineering, article theses are required in many countries. After assessment, the doctorate is awarded by the university, faculty or graduate school. The completion times vary between countries and fields of science (from three to more than ten years).

In different countries, doctoral candidates are either employed by the university or by some other employer, or they are explicitly students. Finland is not the only country where a significant portion of research is done by doctoral candidates. Doctoral candidates rarely pay their tuition fees themselves and typically finance their studies by working as research or teaching assistants, or by applying for research grants. Doctoral programmes usually get most of their funding directly from the university or graduate school. In some countries, like the Netherlands, a significant portion of the doctoral candidates' salary costs is covered by supplementary funding. Public funding is used to support graduate schools and doctoral programmes by awarding full-time fellowships, usually lasting 3 or 4 years. In many countries, business and industry also support researcher training by taking part in network-based doctoral programmes. The universities often have several part-time doctoral candidates who finance their doctoral training with outside funding by working simultaneously in business and industry or the public sector.

The graduate school systems of different countries, and even within an individual country, differ greatly from one another. Graduate school administration can be centralised (a single university graduate school) or decentralised (several graduate schools based on the faculty or department structure, interdisciplinary graduate schools). In addition, the skill requirements for those holding doctorates can be very different in content. Doctoral training may include very little studies in the field of science and transferable skills, or even none at all; while in some countries, only a year or two is spent on independent research (the thesis). In some countries, graduate schools form joint commissions that represent their interests when dealing with actors on the different levels related to education and science policy. In Europe, EURODOC (*European Council of Doctoral Candidates and Junior Researchers*) represents the interests of early-stage researchers and doctoral candidates.

According to the Salzburg II recommendations published by the European University Association (EUA) in 2010, the core component of doctoral training is the advancement of knowledge through research. They also highlight the demand for doctoral training to increasingly meet the needs of an employment market that is broader in scope than academia. This is also emphasised by the LERU (*League of European Research Universities*), the ESF (*European Science Foundation*) and the EU in their reports published in 2010 and 2011. According to the EUA's Salzburg II recommendations, doctoral candidates are considered to be in the early stages of their research career and should be treated as professional or junior researchers who produce new knowledge. Doctoral training should be constructed so that it is possible to complete a degree within three or four years of full-time work. The new recommendations concerning doctoral training in the US also highlight interdisciplinary training, the advancement of doctors' career management skills, internationalisation and the improvement of graduate student supervision (The Path Forward 2010; see also Cyranoski et al. Nature 2011 and McCook Nature 2011).

### 3 CURRENT RESEARCHER TRAINING IN FINLAND

In Finland, doctoral training is part of the three-tier university degree system, and only universities may award doctorates. Admission into postgraduate studies in science and arts is conducted according to the criteria set by the university, but there are great differences between universities and fields of education. Universities bear the responsibility for doctoral training in the same fields as for Bachelor's and Master's degrees. The university decides the number of doctoral candidates, even though the guidance process between the universities and the Ministry of Education, Science and Culture sets down targets for each field of education. Doctoral candidates in universities number around 20,500 (around 19,200 postgraduate students were enrolled as attending in 2010). The target time for the completion of postgraduate degrees in science or arts has not been set. There are, however, regulations governing the form of the dissertation in a postgraduate degree in science and the thesis for a postgraduate degree in arts.

The number of doctorates has tripled in 20 years, and today more than half of the doctorates are awarded to women. A notable proportion of doctors come from the fields of the natural sciences, engineering and medicine. The number of doctorates has remained level when compared with Master's degrees in the 2000s, with about one doctorate awarded per ten Master's degrees. In the fields of the natural sciences and engineering, the median age of doctors is lower than in other fields. The proportion of foreigners in doctoral training has remained relatively low (14.8%). The employment rate of those with a tertiary-level degree is good and clearly better than that of 15–64-year-olds on average (Statistics Finland 2011). The employment rate of doctorate holders is the highest, with only 2.4% of doctors unemployed. Doctors are primarily carrying out research and teaching at the universities, and only about 20% of doctoral programme graduates have recently been employed in business and industry. According to the universities' joint doctoral employment follow-up (Sainio 2010), however, young doctors, in particular, are increasingly being employed by the private sector. Over the last few years, doctors have been employed extremely well as experts; in 2007, only slightly over 2% of the employed doctors were assigned to tasks that were clearly not in keeping with their education (Statistics Finland 2010).

The aim of the doctoral programmes funded by the Academy of Finland (operational expense appropriation) and the Ministry of Education, Science and Culture (earmarked salary funds for hiring doctoral candidates and coordinators) has been the organisation of systematic, high-quality and guided doctoral training. At the beginning of 2011, the Academy and the Ministry supported 112 doctoral programmes, and about half of the new doctors had prepared at least part of their dissertation or thesis in one of those doctoral programmes. The majority of the doctoral programmes are carried out in the form of national networks (about 85%), the rest are local doctoral programmes within a single university. Doctoral programmes have been evaluated by national experts in the Academy's research councils. The Ministry has earmarked government funding to cover university salaries for 1,600 full-time doctoral candidate positions.

Other funding supports around 4,800 doctoral candidates in the doctoral programmes. A clear majority of the doctoral candidates in the doctoral programmes are employed by a university.

Each year, the Ministry of Education, Science and Culture funnels nearly 50 million euros into doctoral-programme positions and the Academy of Finland allocates around 5 million euros to the operational appropriation for the doctoral programmes. Universities also finance doctoral training using unearmarked government funding from the same budget item that contains the earmark. In addition, the Academy finances doctoral training through its research projects. Universities are responsible for providing supervisor and teacher resources and overseeing the research infrastructure. Doctoral programmes have been formed with the researcher in mind, and they are flexible and dynamic. Doctoral programmes have offered a collaborative opportunity to develop good practices, standardise studies, engage in national and international cooperation, and provide graduate students with a wide network of help and support. On the other hand, according to the applications for doctoral programme calls in 2008 and 2010, only about half the doctors have done at least part of their studies in a doctoral programme, and the differences between the various fields of science are considerable. Based on the applications, the integration of doctoral programmes into universities, faculties or departments is varied and the quality of those activities is uneven. Common problems in researcher training include sporadic supervision, long degree completion times, dropouts and the lack of internationality.

Once every government term, the Ministry of Education, Science and Culture draws up a development plan for education and research, which aims to exploit existing foresight information and to produce new information. In 2010, the Ministry carried out a foresight project on the number of future doctoral training positions (2010:13) in cooperation with Foredata Oy and a working group on future educational needs and the dimensioning of the educational supply (“Koulutustarpeiden ennakoinnin ja koulutustarjonnan mitoittamisen valmisteluryhmä”). The foresight project anticipated the quantitative need for doctorates per field of education, while also keeping the needs of business and industry in mind. The foresight model took into account the change in the age structure of researchers, changes in labour market trends, previous reports on researcher employment and education, and the aims of the Government’s education and science policy.

According to the results of the incidence model created in the foresight project, the annual rate of about 1,600 doctorates is in balance with doctors’ labour market development. The model focuses heavily on labour market attrition. Using the actual figures gained in 2007, the model indicates that, on the basis of the field-specific needs for doctorates, as driven by long-term demand (10–15 years), an increase in doctorates should be considered especially in the fields of law, chemistry, process engineering, chemical engineering, materials engineering and medicine. Based on labour market considerations, the number of doctorates may need to be reduced particularly in the fields of culture and arts research, business economics and trade, administration, computer science, electrical engineering, automation technology and health. The project emphasises the fact that foresight is not intended to predict exact and absolute numbers of doctorates

needed in each field of education but rather to highlight key trends that should be analysed through careful expert work. It should also be noted that, in addition to calculations reflecting the need for doctorates, as based on labour market demand, there is a need for field-specific degree targets based on the aims of social policy and science and education policies.

In 2010 and 2011, the Finnish Higher Education Evaluation Council (FINHEEC) conducted a follow-up study in partial cooperation with the Academy of Finland on the evaluation of doctoral education completed in 2006 (Dill et al. 2006). The central aim of the follow-up was to find out how universities have strived to develop their doctoral training and what changes have been undertaken in organising researcher training, especially on the university level in relation to the main recommendations of Dill et al. (2006). In addition, the follow-up attempted to look at how doctoral training has been developed on the national level; that is, what actions have been undertaken by the Academy and the Ministry of Education, Science and Culture to develop doctoral training and how they have incorporated the development recommendations given in the evaluations. One aim of the follow-up was also to examine doctoral training as a whole, which meant that the evaluation was not limited to the education of doctoral candidates within the doctoral programmes, but also those outside of them. The FINHEEC follow-up was an interim audit for the organisation of systematic researcher training in Finland between 1995 and 2011.

The report of Dill et al. (2006) paid special attention to the heterogeneity of Finnish doctoral training. Doctoral training is too far removed from other university operations, and its development has been largely dependent on the heads and coordinators of individual doctoral programmes. According to the FINHEEC follow-up (FINHEEC 15:2011), universities are now taking on a greater responsibility for the development of doctoral training in accordance with the preliminary proposals of Dill et al. (2006) and the Academy of Finland's Graduate School Working Group (1/2010). By the end of 2011, most universities had adopted the single graduate school model to support systematic doctoral training. Universities are creating common operational practices for doctoral training, but many processes related to the organisation and leadership of doctoral training remain unfinished or in the early stages. On the other hand, the heads of doctoral programmes and doctoral candidate supervisors fear that reforming the graduate school system may increase administration and bureaucracy at the expense of the research community.

The national graduate school system reform places the current doctoral programmes funded by the Academy of Finland and the Ministry of Education, Science and Culture in a new operating environment. The FINHEEC follow-up clearly demonstrated that, currently, there are far too many doctoral programmes. This has led to the heterogeneity of doctoral training, unclear practices, redundancy, scattering of funding and the candidates' uncertainty about funding. Only doctoral programmes of adequate size have managed to succeed. Many of them have functional quality assurance, clear guidelines, follow-up groups for doctoral candidates and an extensive course and seminar selection. Funding is generally considered short-term and scattered, and the difficulty of obtaining funding was also strongly expressed in the follow-up. Only very few doctoral candidates manage to secure continuous four-year funding.

The FINHEEC follow-up also clearly demonstrated that Finnish doctoral candidates still conduct their doctoral studies and prepare their dissertations in very varied conditions. Different fields and faculties have divergent dissertation criteria focusing on the scope of the dissertation or the number of publications rather than on the quality. Although most doctoral candidates still study part-time, doctoral training has primarily been organised and developed on the terms of full-time doctoral candidates. The evaluation highlighted key factors in terms of the quality of doctoral training: while they include the quality of supervision and the relationship between the supervisor and the doctoral candidate, the obligations and responsibilities between the supervisor and candidate often remain unclear. Supervision has not been adequately systematised, nor do any programmes utilise feedback systems that focus on supervision. The inadequacy of supervisory resources in relation to the number of doctoral candidates was also seen as problematic. In addition, the differences in research funding and the fields of science or arts in terms of organising education and supervision create inequality between doctoral candidates. The evaluation also raised concerns regarding the reality of completing the doctorate within the four-year time guideline.

Based on the FINHEEC follow-up, the promotion of generic career management skills has, over recent years, seen development primarily on the doctoral programme level. On the university level or, in large universities, on the faculty level, the responsibility and support related to employment relevance are still minimal. Even though more and more doctors are expected to be employed outside universities, career guidance for doctoral candidates remains minimal. Likewise, the systematic development of the skills required by different career paths is inadequate. The doctoral candidates' experiences of internationality often seem to be limited primarily to conference participation. National and international financing instruments are scarcely utilised in supporting the mobility of doctoral candidates. The comparability of foreign degrees and studies (incl. dissertation scope and degree completion time) to Finnish degrees is seen as problematic. Foreign doctoral candidates and supervisors are satisfied with the overall level of Finnish doctoral training, but internationality could be increased in universities with many relatively small changes in operational practices, such as the improvement of the integration of supervisors and doctoral candidates into the research community.

The Dill et al. (2006) report also drew attention to the varied and unsystematic nature of the doctoral candidate selection process and to the lack of knowledge about application periods and selection criteria. According to the FINHEEC follow-up, universities have made substantive changes to their selection processes through standardisation and attempted to increase the transparency of the application process for doctoral training through improved communication. Universities should also be credited for making or being in the process of making the assessment processes and criteria of theses transparent and uniform.

#### **4 WORKING GROUP SUGGESTIONS FOR RESEARCHER TRAINING DEVELOPMENT**

Upholding and improving Finland's international competitiveness can be achieved through the strengthening of its competence. Raising the population's competence level is a key element of

competitiveness and a cornerstone of wellbeing. In terms of the number of people doing research in the OECD countries, Finland does well, but the proportion of researchers with doctorates should be increased. The change between 2009 (14.1% of researchers were doctors) and 2010 (15.8%) is already noteworthy as the overall number of people in research and development grew as well. While the development of the education and research infrastructure has been viewed as being nationally important, it has not yet been allocated new resources in a significant amount. The structural development of a public research system is based on the idea of concentrating and reallocating resources in order to improve quality and effectiveness. The societal aim of developing researcher training is to secure a researcher pool of sufficient quality and quantity in order to respond to the needs of the entire research and innovation system, as well as the rest of society. Another aim is to get a larger share of doctors to work in research and other leading expert positions outside of universities. (Research and Innovation Council 2010)

The number of doctorates has tripled in 20 years (1991–2011) to around 1,600 per year. The national development of systematic researcher training began in 1995 (Development of Doctoral Training working group report, Ministry of Education 2006:3). As the structural development and autonomy of universities strengthened through the attainment of the legal person status in the 2000s, it has become ever more important to extend systematic researcher training to all fields and to pass the responsibility for such training to the universities. The equal treatment of applicants in student selection, in the supervision of postgraduate studies, in transferable skills training and in support services would clarify current practices and enable more target-oriented postgraduate studies than is currently possible. The report appendices contain good practices in researcher training (Appendix 1) and examples of transferable skills (Appendix 2).

#### 4.1 Developing the national graduate school system

Doctoral training has been guided and developed through decrees, guidelines, recommendations and policies from the different levels. The Graduate School Working Group considers it important that universities take a more active overall responsibility for doctoral training and its development in close connection with university research operations. The working group suggests that universities have one or several graduate schools consisting of doctoral programmes that are specific to the fields of science, arts and education. The doctoral programmes of the graduate school may be organised within a university, between universities, between a university and other actors (e.g. research institutes, business and industry) and/or as international network-based doctoral programmes. Multidisciplinary doctoral programmes and programmes between sciences and arts can, at best, strengthen research cooperation between university departments and faculties. Network-based doctoral programmes make it possible to achieve critical mass in terms of researchers and supervisors even in the minor fields of science and arts. The establishment of doctoral programmes through collaboration with business and industry, and research institutes would

promote, for example, the part-time completion of doctorates and the mobility of researchers between sectors. Part-time doctoral training should be organised so that participants have the possibility to genuinely belong to the research community.

Systematic doctoral training shall consist, in the personal study programme, of field-specific scientific and artistic research, of relevant courses within the fields of science, arts and education, and of general transferable skills. Studies dealing with questions about research ethics shall be an integral part of transferable skills training in all fields of science and arts. The university, doctoral programmes and research groups shall be responsible for the field-specific studies in science, arts and education, while the supervisor(s) and the research group shall be responsible for scientific and artistic research. The procedures shall apply to both full-time and part-time postgraduate students in science or arts, regardless of who finances the doctoral training or what the employment relationship is.

Universities shall support their doctoral candidates and the candidates' supervisors through university-wide graduate schools, doctoral programmes or other corresponding arrangements. Universities will decide on the graduate school system that supports their systematic doctoral training (e.g. centralised/decentralised) and on the establishment of doctoral programmes. The aim is to integrate doctoral programmes as an integral part of the universities' operation and research strategy. According to the view of the Graduate School Working Group, the graduate school system should be developed so that, regardless of the administrative structure on the university level, graduate schools and doctoral training are the responsibility of the person or body named by the university.

## 4.2 Organising doctoral training

Doctoral training aims at getting the graduate student to deepen their understanding of their field of research and to achieve the abilities, within that field, to independently and critically apply the methods of scientific or artistic research and create new scientific knowledge. Doctoral training is based on the guidance relationship between the doctoral candidate and the supervisor. The preconditions for this are created by a well-organised, transparent graduate school system of high quality. The primary goal is to secure a basic level of scientific and artistic postgraduate education in all doctoral programmes despite the varied special requirements of the various fields of science, arts and education, organisations and working life. Graduate schools shall offer systematic guidance and education for all participants in doctoral training. Universities will make sure that supervisors and doctoral candidates know their rights and obligations, the decision-making and responsibility structures of the graduate schools and the guidelines concerning doctoral training.

Universities shall work actively to improve the quality of doctoral training by developing, implementing and monitoring researcher training practices. A graduate school will have a head and a management group that is responsible for its operation; this also applies to doctoral programmes. The guidelines concerning postgraduate admission and doctoral programmes shall be clear and readily available to all students and staff. When necessary, these guidelines will be supplemented, for example, with guidelines that are specific to each graduate school, faculty, department or field. The universities shall monitor the operation of their doctoral programmes based on their goals and the key figures that reflect those goals. Doctoral candidates will be accepted in environments that provide the prerequisites for scientific and/or artistic research of a sufficiently high quality. Doctoral candidates will be guaranteed equal opportunity to participate in the development of doctoral training by, for example, the reform of feedback systems.

Universities shall be responsible for the selection of doctoral candidates and the criteria irrespective of who finances the researcher training or what the employment relationship is. In terms of postgraduate training, the universities shall only admit the number of students that their own mental and physical doctoral training resources can support. Doctoral candidates shall be selected according to open, predictable, transparent and uniform criteria. In addition to clear formal competency criteria, admission as a postgraduate student shall require solid basic knowledge, a research and study plan, and a supervisor relationship. The postgraduate student admission process shall also evaluate the applicant's suitability and ability to complete a doctorate. The student shall be familiarised with the rights and duties of a doctoral candidate, and ideally, they will be agreed upon in writing.

The supervisory responsibilities for research work shall be clarified and follow-up group practices adopted in all doctoral programmes. The follow-up group shall consist mostly of doctoral programme researchers but may also include a researcher from outside the doctoral programme. The universities shall appoint the doctoral candidate with a minimum of one supervisor with the required knowledge in the relevant field of science or art and adequate experience in supervising a doctorate. The responsibility for organising supervision always lies with the university, even in the case of network doctoral programmes run jointly with industry and commerce and research institutes. The supervisors shall be familiarised with the rights and duties of a supervisor, and ideally, they will be agreed upon in writing. It shall also be ensured that a single supervisor does not have too many candidates to supervise. High-quality scientific and artistic research and quality supervision help doctoral programmes to recruit talented postgraduate students.

The universities shall monitor and support the progress of doctoral candidates according to clearly-defined practices. The practices shall be communicated to doctoral candidates and the relevant staff. In order to develop the doctoral candidate's research knowledge and other skills, the supervisor(s) and candidate shall jointly draw up a personal study plan. The doctoral candidate and the research supervisor(s) shall agree, among other things, on the doctorate's content, schedule and the practical implementation of supervision. Research knowledge and other skills will be regularly assessed during the programme. The doctoral

candidates shall monitor their personal progress and the development of their researcher skills. The doctoral candidates' career planning will be supported more efficiently than is currently the practice.

The universities shall gather feedback on doctoral training and use it to assess and develop researcher training. The assessment of study results and theses will be open, clearly defined, balanced and consistent. The amount of work and the scope of the dissertation required for the degree will be dimensioned to make the completion of a doctorate possible within the target time. A doctoral dissertation is a scientific or artistic entity accepted by the university as a final thesis as part of the postgraduate degree, and it does not have to be defined in the legislation concerning universities. The evaluation of the thesis shall include an independent expert comment. The formal requirements of an artistic doctoral dissertation shall be accepted by arts universities. Universities shall have independent and official procedures and responsible bodies for the processing of correction requests and complaints.

#### 4.3 Promoting internationalisation in doctoral training

Research is international by nature. The internationalisation of doctoral training means systematic and active activities that aim at genuine cooperation and related added value to the doctoral candidate's learning and guidance. The internationality of doctoral training can be promoted, among other things, by research cooperation with such researchers working abroad that have the highest expertise in the same field of science, arts and education, whereby the doctoral candidate will be supervised by both a domestic and a foreign researcher. Then internationalisation would not only genuinely support the doctoral candidate's research work but also the completion of field-specific studies in science, arts and education. Educational cooperation may, in turn, lead to research cooperation and joint and double degrees.

Systematic international collaboration in doctoral training is best realised in research group work and by forming joint international doctoral programmes that organise joint education, engage in research cooperation and promote the mobility of educators, supervisors and doctoral candidates. University network-based doctoral programmes, both internal and national, also work in cooperation with the doctoral programmes of other European nations. Cooperation and participation in joint European doctoral programmes require that the quality and scope requirements of doctorates and dissertations be compatible with the doctoral programmes of other countries. The working group suggests that the Academy of Finland support internationalisation, for example, by encouraging mobility and international cooperation among those completing doctorates in research projects.

The internationalisation of graduate schools and doctoral programmes includes both Finnish doctoral candidates working abroad and foreign postgraduate students and researchers (supervisors) working in Finland. When recruiting foreign students into Finnish doctoral programmes, consistent selection criteria

shall be followed. Even though the development of the number of doctoral candidates and supervisors not of Finnish origin should be monitored, foreigner participation in doctoral programmes is not to be used as a quality criterion for such activities. Adequate knowledge of English should be required of Finnish and foreign supervisors and doctoral candidates participating in international education. Graduate schools and doctoral programmes should promote international mobility by offering candidates funding for work abroad.

#### 4.4 Monitoring and assessing doctoral training

The monitoring and assessment of doctoral training should be a part of the universities' quality management. The university shall organise a researcher training assessment in conjunction with regular university-specific surveys focusing on research and the FINHEEC evaluations (university-specific decision-making). The quality assessment of doctoral programmes will be performed according to jointly agreed criteria, taking into account differences between the fields of science and arts. The key figures used in assessing doctoral programmes may include, for example, scientific output, application pressure, completion percentage, degree completion time, the number of candidates per supervisor, the amount of external financing, the funnelling of university resources into the doctoral programme and the post-degree employment of doctors in different positions (academic researcher advancement, other research, education, expert and management positions). Doctoral programmes will report on their operations to the graduate school management according to previously agreed procedures.

The working group suggests that the quality assessment of doctoral programmes be a more solid part of the Academy of Finland's comprehensive evaluation process. This includes the evaluation of the various branches of science and the reviews of the state and quality of scientific research in Finland. The Academy's evaluations take into consideration the universities' commitment to doctoral programmes and their integration into the universities' research strengths. The evaluation should also consider the activities and the quality of processes involved in the doctoral programmes.

The universities shall report on researcher training (number of doctoral candidates, completion percentage, number of degrees) as part of their intraorganisational and national efforts to gather information. The employment follow-ups can continue to be implemented through university cooperation, and the same data will be available in Statistics Finland's person-based data collections. Separate national researcher training follow-up mechanisms are not necessary, but the working group suggests that the success of the initiation of the new researcher training system and the effects of the development of doctoral training be assessed internationally in 2017 after the university funding term of 2013–2016.

## 4.5 Clarifying researcher training regulations

Doctoral training is currently subject to the same admission regulations as the Bachelor's and Master's degrees. On the other hand, the target time or duration of completion for postgraduate studies has not been set. The Graduate School Working Group recommends that the target time for the completion of a postgraduate degree in science or arts be set at four years of full-time education, and if doctoral studies are undertaken part-time, the studies shall be tailored to correspond to four years of full-time study/research. The four-year target time can be extended based on a revised study progress plan, subject to consideration. The working group also suggests that the right to postgraduate study could be revoked. The four-year target time of completion is compatible with the doctorates in most comparable countries and thus promotes international mobility and facilitates equal participation in European doctoral programmes. A target time for completion helps both doctoral candidates and supervisors to picture, estimate and dimension the average amount of work required for a doctorate, increases the predictability of doctoral training and also lays the framework for making a study and research plan. The working group also suggests that the regulations governing the form of dissertation be removed from the Government Decree on University Degrees (794/2004).

## 4.6 Resourcing researcher training

The working group suggests that the 2013–2016 collaboration between universities and the Ministry of Education, Science and Culture consider the development of doctoral training as a strategic focal point in the researcher career. Doctoral training is a central part of the research-based education system, which makes it vital that universities use their autonomy to make researcher training more systematic. The working group suggests that the Government budget no longer include earmarked funds for doctoral candidate salaries and that during the funding term of 2013–2016 or 2017–2020 at the latest, the share of researcher training be simplified by taking into account the number of postgraduate students, the number of doctorates and, as made possible by information exchange, also the passing percentage and completion time. The removal of earmarking has also been suggested by a committee on the reform of the university funding model (Ministry of Education and Culture 2011:26). At the same time, the target number of doctorates per field of education is to be waived. During the transition, it is necessary to attend to the quality of doctoral training and to secure network-based doctoral training often implemented in small fields of education through the cooperation of various actors.

The Ministry of Education, Science and Culture shall decide on the national doctorate targets for each agreement period. Based on their research strategy and the quality of scientific and artistic research, universities will decide on the allocation of the amount of university-specific doctoral training, agreed upon with the Ministry, to be included in their doctoral programmes in different fields of education. They will

also secure the basic resources for education and supervision in doctoral programmes in all fields of science, arts and education. Universities shall evaluate the need for doctors per field of education and take that into account when granting rights of postgraduate study.

The working group recommends that the Academy of Finland, in cooperation with the universities and the Ministry of Education, Science and Culture, consider its role and duties in developing the national graduate school system, for example, by directing funding towards the internationalisation of high-quality doctoral programmes and the realisation of the other strategic aims of researcher training. The working group recommends that, when making funding decisions, the Academy take into consideration not only the functional quality of research and doctoral training, but also any aims specific to the fields of education, as based on the needs of society and/or the science, arts and university policy, so that doctoral training may be increased especially in new and promising fields of research and networks. The Academy can also use evaluations and foresight to recognise fields of science in which education does not seem to correspond to need.

In addition to universities and the Academy of Finland, doctoral programmes are funded, according to qualitative criteria, by other financiers, such as research institutes, foundations, the Finnish Funding Agency for Technology and Innovation (Tekes), and business and industry. Labour market needs can better be taken into account by placing some doctoral candidate positions into joint doctoral programmes run cooperatively with companies, research institutions and public administration. Cooperation between sectors helps make the postdoctorate researcher career more predictable and attractive, and improve the employment of doctors.

## 5 SUMMARY OF KEY SUGGESTIONS

- 1. Universities shall, more clearly, adopt the overall responsibility for doctoral training and its development at the system level. The responsibility specific to the fields of science and arts shall lie with the representatives of each field of education, science and arts.*
- 2. The graduate school system should cover all fields of science and arts, and all doctoral candidates should be members of a graduate school. Network-based doctoral programmes make it possible to achieve critical mass in terms of researchers and supervisors even in minor fields of science and arts.*
- 3. The organisation of doctoral training shall take into account differences specific to fields of education.*

4. *Universities shall have one or several graduate schools consisting of doctoral programmes that are specific to the fields of science, arts and education, and/or that are multidisciplinary.*
5. *The doctoral programmes of a graduate school may be organised within a university, between universities, between a university and other actors (e.g. research institutes, industry and commerce) and/or as international network-based doctoral programmes. International cooperation in doctoral training may lead to joint or double degrees. Network-based doctoral programmes between universities and with other actors will also be based on the process of gathering scientific or artistic researcher training together to form larger units.*
6. *Doctoral programmes shall be tightly integrated into the university and form an important part of its research strategy and profile, thereby ensuring high-quality scientific and artistic postgraduate education. Universities shall take the promotion of doctoral candidate employment and career planning into account in the planning of researcher training.*
7. *Doctoral training shall consist of independent scientific or artistic research and of relevant courses within the fields of science, arts and education and transferable skills. A doctoral dissertation shall be a scientific or artistic entity accepted by the university as a final thesis within the doctorate.*
8. *Graduate schools shall have defined the admission procedure and criteria, and the practices of supervision, monitoring, evaluation, feedback and correction requests.*
9. *In line with the lower and higher university degrees, the third cycle of the Bologna degree structure shall also be given a target time of completion. The target time for the completion of a postgraduate degree in science or arts shall be set at four years of full-time education, and if doctoral studies are undertaken part-time, their duration shall be tailored to correspond to four years of full-time study.*
10. *The agreement process between universities and the Ministry of Education, Science and Culture shall be improved to emphasise the autonomy of universities and secure the quality activities of the doctoral programmes. The share of scientific and artistic postgraduate education in the university funding model will be simplified by removing earmarking. The target number of doctorates per field of education is to be waived. When developing the structures of researcher training, universities should take care to uphold the quality of doctoral training both in terms of competition and, particularly in small fields of science and arts, of the strengthening of educational cooperation.*

- 11. Based on their research strategy and the quality of scientific and artistic research, universities will decide on the allocation of the amount of doctoral training, agreed upon with the Ministry of Education, Science and Culture, to be included in their doctoral programmes in different fields of education. They will also secure the basic resources for education and supervision in doctoral programmes in all fields of science, arts and education. The development of cooperation and distribution of work between universities ensures that doctoral training will suitably cover all fields of science and arts, including small fields.*
  
- 12. The working group recommends that the Academy of Finland, in cooperation with the universities and the Ministry of Education, Science and Culture, consider its role and duties in developing the national graduate school system, for example, by directing funding towards the internationalisation of high-quality doctoral programmes and the realisation of the other strategic aims of researcher training.*

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## APPENDIX 1: Good practices in researcher training as ratified by Universities Finland UNIFI

### **Universities**

Universities work actively to improve the quality of researcher training by developing, implementing and revising researcher training practices.

Universities support their doctoral candidates and their supervisors through graduate schools, doctoral programmes or other corresponding arrangements.

The guidelines concerning postgraduate admission and doctoral programmes are clear and readily available for all students and staff. When necessary, the guidelines are supplemented with those that are specific to faculty, graduate school, department or field.

The universities monitor the operation of their doctoral programmes based on their goals and the key figures that reflect those goals.

Doctoral candidates are accepted into environments that provide the prerequisites for scientific and artistic research of a sufficiently high quality.

Doctoral candidates are guaranteed an equal opportunity to participate in the development of doctoral training.

### **Student admission and orientation**

Doctoral candidates are selected according to open, predictable, transparent and uniform criteria.

The student is familiarised with the rights and duties of a doctoral candidate, and ideally, they are agreed upon in writing.

### **Supervision and assessment of doctoral candidates**

Universities appoint a supervisor or supervisors for the doctoral candidate.

The supervisor is familiarised with the rights and duties of a supervisor, and ideally, they are agreed upon in writing. It is also ensured that a single supervisor does not have too many candidates to supervise.

The universities monitor and support the progress of doctoral candidates according to clearly-defined practices (incl. assessment phases). The practices are communicated to doctoral candidates and the relevant staff.

### **Developing research know-how and other skills**

To support the development of the doctoral candidate's research know-how, the candidate and supervisor(s) draw up a personal study plan.

Research knowledge and other skills are regularly assessed throughout the programme. The doctoral candidate monitors their personal progress and the development of their researcher skills.

### **Feedback**

Universities gather feedback on doctoral training and use it to develop researcher training.

### **Assessing study results**

The assessment of study results and theses is open, clearly defined, balanced and consistent. Thesis evaluation includes an independent expert comment.

### **Correction requests and complaints**

Universities have independent and official procedures for the processing of correction requests and complaints.

## APPENDIX 2: Examples of transferable skills

Scientific and artistic research methods

Research environment

Questions of research ethics, incl. peer review, publishing pressure, confidentiality, liabilities, authorship

Research administration and management

Time use, research prioritisation, realistic approach, subprojects and milestones

Data management, special skills in data processing

Practical skills

Management skills

Communication and presentation skills

Scientific writing

Oral presentation, poster presentation

Scientific communication

Teaching skills

Personal traits

Recognising personal strengths and weaknesses

Research networks and teamwork

Working in a multicultural research group, unit and the global science community

Recognising the strengths of other team members

Postgraduate student's rights and duties

Applying for a research grant

Using research results

Protecting innovations and intellectual property, using unprotected innovations, entrepreneurship, popularisation of science

Research career planning

Realistic goals, development needs

Opportunities outside universities

Drawing up a CV and applications, preparing for interviews

Writing the dissertation