

Section 6

University education

1. Introduction

This section gives a general outline of the Danish research-based education programmes (bachelor, master and PhD), educational activities and structure of the university educations and their particular characteristics.

The university educations in numbers:

<ul style="list-style-type: none"> - In 2000, about 18% of a birth cohort enrolled at university. - The universities had a total of about 105,000 students. - Most degrees were earned in the social sciences (34%) and the humanities (26%). - At PhD level 27% of the degrees earned were in health science, 23% in natural science, 20% in technology, and the humanities and the social sciences 22%. - As a whole about 65% of the students complete their studies. - About 30% of the university students enrol at a foreign university for a term. - The number of students in the master programme for adults (with a prior degree) has increased from app. 370 to 960 FTE- students since 1999. - 80% of university students receive the state educational grant.
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2. Educational profiles and educations

Today, the Danish tertiary educational system has several strings and is highly differentiated, please see figure 6.1.

Figure 6.1 Overview of the tertiary educations

Level	No. of institutions	No. of educations
Short tertiary education <i>2 full-time equivalents incl. traineeship</i>	53 vocational schools (out of 117) licensed to provide short tertiary educations <i>Business colleges, technical colleges and business academies</i>	15 business academy educations <i>For example: computer scientist, multimedia designer and market economist</i>
Medium tertiary education <i>3-4 full-time equivalents incl. traineeship</i>	113 "mono disciplinary" institutions (provide only one education and without research status)	15 research related educations <ul style="list-style-type: none"> • existing medium tertiary educations • new professional bachelor educations • existing academic bachelor educations located at two business colleges
Long tertiary education <i>2 full-time equivalents</i>	12 universities	A wide selection of research based bachelor and master programmes

- *The short tertiary educations*, which arose as specialised degrees supplementing the professional youth educations, are mainly targeted at the private sector. Characteristic of the short tertiary educations is that they are development-based and comprise long periods of traineeship.
- *The medium tertiary educations* primarily target professions found in the public sector where they arose. They are research-related and comprise a trainee period of about six months.
- *The long tertiary (university) educations* are research based and target specific job functions in both the public and the private sector.

For many years it's been a general policy to ensure a geographic balance of the tertiary educations offered, in order to link the Danish policies of research and education to the policies of innovation, commerce and employment.

During the next few years, new short and medium tertiary educations of a high quality are to be established. The educations will have a high degree of practical relevance and be targeted at the private sector and at professional jobs. Recent legislation provides for stronger more comprehensive legal units offering short and medium tertiary educations. A number of short tertiary educations are gathered in business academies. Likewise, a number of medium tertiary educations are gathered in centres for tertiary education. The aim is to develop strong educational environments for the basic and continuing educations as knowledge centres in relation to regional business communities and public activities.

Bachelor and master educations

In accordance with the bachelor, master and PhD structure, as described in section 2, bachelor, master and PhD educations are offered in all main areas, e.g. law, engineering, economics, pharmacy, psychology, medicine, agriculture, horticulture, veterinary sciences and theology.

In the humanities and natural sciences, the master educations mostly comprise two subjects, a major and a minor. The educations are structured in different ways. Below are two examples of master educations within the humanities and natural sciences, comprising two subjects.

Example of educational structures for the humanities

MA in Danish MA in Danish and German

Year 5	Thesis ½ year	Thesis ½ year
	Danish ½ year	Danish ½ year
Year 4	Danish ½ year	<i>German ½ year</i>
	Danish ½ year	Danish ½ year
Year 3	Supplement ½ year E.g. interdisciplinary supplementary humanities subject	<i>Minor in German ½ year</i>
	Supplement ½ year	<i>Minor in German ½ year</i>
Year 2	Danish ½ year	Danish ½ year
	Danish ½ year	Danish ½ year
Year 1	Danish ½ year	Danish ½ year
	Danish ½ year	Danish ½ year

Example of educational structures for natural science

M.Sc. in physics M.Sc. in chemistry and physics

Year 5	Thesis 1 year	Thesis 1 year	
Year 4	Physics ½ year	Physics ½ year	
	Optional subjects ½ year	Optional physics subjects ½ year	
Year 3	Physics ½ year	Chemistry ¼ year Minor	Physic ¼ year Major
	Supplementary main subjects ½ year	Chemistry ¼ year Minor	Physic ¼ year Major
Year 2	Physics ½ year	Chemistry ¼ year Minor	Physic ¼ year Major
	Physics ½ year	Chemistry ¼ year Minor	Physic ¼ year Major
Year 1	Physics ½ year	Chemistry ¼ year Minor	Physic ¼ year Major
	Physics ½ year	Chemistry ¼ year Minor	Physic ¼ year Major

Both educational programmes comprise a large bachelor project in the 2nd or 3rd year of the programme. As a main rule, the bachelor project rounds off the bachelor education, although not in all cases. Having earned a master's (candidatus) in two subjects, the student may obtain a diploma in education, which provides the competence to teach at upper secondary schools.

Problem based project work in bachelor degrees

The educational programmes offered by Roskilde University and the University of Aalborg differ from the bachelor-master structure as outlined above by being problem based project work. The educations start with independent basic studies programmes, which organise and conduct a wide multi-disciplinary and cross-disciplinary curriculum, and constitute a complete and separate introduction to several specialised degree programmes. The purpose of the first year programme is to provide a broad introduction to further and more specialized study programmes.

Roskilde University has three basic studies programmes, within the humanities, social sciences and natural science. The students enrol in a basic studies programme for two years and specialize in one or two subjects in their third year to earn a bachelor degree.

Aalborg University has two basic studies programmes within social sciences and technology-natural sciences. The basic studies programmes last one year continuing with a two-year specialised degree programme ending with a bachelor degree in one or two subjects.

The ideas about multi-disciplinary approaches and problem-focused project work were originally initiated and developed at Roskilde University and the University of Aalborg. The concept has now to a certain degree spread to other universities in Denmark.

An evaluation of the basic studies programmes made in 2001 by The Danish Evaluation Institute emphasised that the basic studies programmes each had to find the right balance between being a programme in their own right and an introduction to a composite educational programme.

The evaluation recommended the basic studies programmes to further develop their methodology to:

- shift between varieties of academic content and cross-disciplinary approaches
- exhibit a more systematic approach to the interaction between teaching and project work
- improve their forms of testing and assessment and to provide employers with relevant and adequate information about how the individual student benefited from the programme

To varying degrees the basic studies programmes have already redefined their targets and visions relative to academic level and cross-disciplinary approaches. The evaluation also showed that the completion percentage was high for the basic studies programmes.

Complete master educations

Most universities have established complete two-year master programmes to which students having completed bachelor programmes at other universities or even in other subjects may be admitted.

The Danish University of Education and the IT University of Copenhagen only offer specialised degree programmes, including 2-year master programmes. The Danish University of Education primarily admits day-care teachers, schoolteachers and other professional bachelors and academic bachelors within the areas of pedagogics, the humanities, social sciences and health science to specialised master programmes. The specialised master programmes combine general and cross-disciplinary elements and specialities within the area concerned and comprise a written thesis of 30 ECTS points.

Master educations for adults

Since 1994, the universities have offered continuing education programmes for instance master educations, to adults with a tertiary education. By 1 December 2002, a total of 63 master educations had been approved by the Ministry of Science, Technology and Innovation within all main areas.

The master educations for adults constitute the highest level of the adult further education system, please see section 2. In general, the master educations are to develop the work-related and personal competencies of adults on a scientific basis and provide them with the skills required to undertake highly qualified functions in businesses, institutions etc. The master educations, which are 1-year programmes at the level of a master (candidatus) degree, take the work and life experience of adults into account. In order to be admitted to a master education, the student must possess relevant work experience and have completed a relevant bachelor or a medium tertiary education.

Examples of master programmes for adults

Master of Mediation and Conflict Resolution is offered by the University of Copenhagen. The master programme is aimed at professional adult students who as part of their job – formally or informally – are involved in conflicts. The programme is intended to enable them to solve conflicts as a mediator between public institutions, private businesses and voluntary non-profit organisations.

Denmark is at the moment attempting to use conflict resolution within a number of areas, by mediation at places of work, at schools, ethnic conflicts, housing areas, etc. Attempts at using conflict resolution are also made where approaches of a more legal character have traditionally been applied, for instance as an alternative to trying commercial disputes in a court of law or at state county level, and in minor criminal cases where the victim and the defendant are offered to meet with a mediator.

Master of Public Health (MPH) is offered by the University of Copenhagen and the University of Aarhus.

The master programme focuses on many aspects of public health as a special degree supplementing the tertiary social science and health science educations. The purpose of the education is to enable the students to improve the general health of the public and of individual groups of the population based on scientific evidence. The education qualifies the students to assume positions such as health planner and leader in the central administration or at local or regional government level, head of health programmes, prevention advisor or teacher at tertiary educations. The education also aims at being able to provide international health service in humanitarian organisations.

Master of Knowledge Management (MKM) is offered by Copenhagen Business School and Learning Lab Denmark.

The MKM focuses on knowledge, innovation and strategy and links traditional ways of thinking with the new challenges that organisations face in today's knowledge society.

The knowledge society requires new organizational structures, a rethinking of existing strategies and new daily routines in order for knowledge creation and knowledge dissemination to occur. Consequently, the management role has changed and new competencies are required: How to manage complex projects, how to make decisions in an atmosphere of high uncertainty, how to motivate knowledge workers, how to facilitate the spreading of knowledge from one team to another, how to encourage an innovative culture etc.

One of the important problems in knowledge-based companies is how to share experience-based knowledge. Many solutions offered within knowledge management are different kinds of software, but these tools do not address the strategic and cultural issues related to knowledge management - needles to say that electronic tools for structuring information cannot solve such complex organisational issues.

Master in Management of Technology (MMT) is offered by Aalborg University and since 1997 by the Technical University of Denmark.

The intention of the MMT is to teach the students – based on the technological platform of the company – to carry through measures of innovation and change so that new business opportunities arise. The subjects studied are, among others, the influence of information technology on the innovation, production and business processes in a firm; the influence of technology on market conditions and finances/economics; understanding new management functions which promote innovation in the organisation; and strategic planning, in which technology and its utilisation are important elements.

Competition has become global: you are constantly being compared with the best in the world. This means completely new demands on the engineers of the future. Not only do they have to be good at engineering, they also have to be able to work together with others across traditional job boundaries and, to an increasing extent, they have to be able to understand and define the production and business processes of their firm - what today is called "the innovation process". Above all, they must be internationally orientated. Thus the engineers of the future need more information on subjects such as finance, management, market conditions, etc., and on the interaction between these factors and technology.

Master of ICT and Learning (MIL) is offered by IT-Vest, Aalborg University and Aarhus University in co-operation with The Danish University of Education, Copenhagen Business School and Roskilde University.

The master programme focuses on aspects of ICT and learning and is aimed at adult students who as a part of their jobs attend, organize and integrate ICT in educational and learning processes at schools and educational institutions.

The intention of the master programme is to provide the students with theoretical, analytical and methodical competences in relation to ICT and learning. The education qualifies the students to understand and use theories and working methods within ICT, to design and integrate ICT-based learning processes, to participate in experimental and user oriented development of ICT-based learning processes,

to analyse, test, evaluate and assess ICT-based learning processes, and to analyse and understand the consequences of ICT-based learning systems.

Master of Public Administration (MPA): is offered by Copenhagen Business School.

The education is a tertiary education with an international bias focusing on the management and consultancy functions of the public sector in particular.

The MPA is to give students that have work experience a theoretic education with an international bias in economy and administration. The education qualifies the students to undertake jobs related to management and consultancy in public and voluntary organisations, and to undertake functions in the private sector that require interaction with public authorities.

The first steps towards the MPA programme were taken in 1990. The first MPA class started in January 1994; there were about 140 applicants, thus exceeding expectations. Since the start of the programme the number of applicants has been stable and high. In 2002, 45 students were admitted to the MPA programme.

PhD educations

The 3+2+3 system

In accordance with the Danish 3+2+3 structure and the decree on the PhD education, see section 2, the universities also offer PhD educations within their main areas. Following the 1993 decree on the PhD education, a PhD programme comprises PhD training activities equivalent to ½ annual student outcome (30 ECTS) and work on the student's own research project and the production of a thesis tutored by a senior researcher. In addition, the PhD student participates in teaching and/or research activities at the student's own university.

The 4+4 model

In 1991 the Faculty of Science at University of Aarhus introduced a research training programme of 4 years in which the student enrolled before completing a master's degree. However it is possible to leave the programme prematurely and still be granted a master's degree. The 4+4 model has been introduced successfully at other universities e.g. the Faculty of Science and Engineering at University of Southern Denmark, some faculties at the Royal Veterinary and Agricultural University and at the University of Copenhagen. The 4+4 model provides opportunity for the student to spend more time on research projects and the thesis and may reduce the duration of the PhD studies¹.

The individual PhD educations and programmes are run either at faculty or at department level. Since 1996, about 75 doctoral schools have been established supported by the Research Training Council (the former *Forskerakademiet*), the research councils and the Danish National Research Foundation.² Doctoral schools have been established in all main areas. In many cases, however, the more specialized PhD programmes compared to the ordinary PhD programmes have been set up at the level of faculty or department. It should be emphasised that Danish Ph.D students are employed by the universities on normal contracts and not, as is often the case in other countries, on scholarships.

The evaluation report published by the Danish Council for Research Policy (*"A good start – the Danish researcher training"* – in Danish: *"Godt begyndt - forskeruddannelsen i Danmark"*) gives a series of relevant recommendations on how to improve the Danish researcher training:

- Researchers should be trained in research environments conducting research of international standards, the training should be detailed as well as provide a scope.

¹ *De ph.d.-uddannede 1997 og 1998 (Ph.D graduates 1997 and 1998)*, The Danish Research Academy.

² Danish Council for Research Policy, evaluation report: *Godt begyndt - forskeruddannelsen i Danmark. Evalueringsrapport januar 2000 (in Danish)*.

- Universities and faculties must ensure that individual study programmes or study plans are prepared for every single PhD student.
- All PhD students must change environments, mainly through stays abroad.
- The quality of the researcher training must be ensured by a formal set of guidelines for coaches and coaching. All PhD students should have more than one coach.
- Points should be awarded to all PhD courses according to the ECTS scale, and the universities should make a joint effort to develop and organise these courses.
- All PhD theses accepted for public defence should be published internationally.
- The universities should use foreign reviewers to the widest possible extent.

Examples of Doctoral schools

The Doctoral School on Knowledge and Management, Copenhagen Business School (CBS).

The Doctoral School on Knowledge and Management focuses on management problems faced in knowledge and network societies in the tension between knowledge, value, innovation and policy at a high international level. It was established by the CBS Faculty of Economics and Business Administration in 1999 and is funded by the Danish Research Training Council³ for the period of 2003-2008. The Doctoral School is governed by Dept. of Management, Politics and Philosophy (LPF).

The Doctoral School is member of the EUDOKMA consortium, which is an international network of leading European business schools sharing a common interest in providing a distinguished European and internationally competitive educational environment for PhD studies in knowledge and management.

iNANO Graduate School, University of Aarhus.

The iNANOschool is a graduate school in nanoscience and nanotechnology at the University of Aarhus. The school is related to the Interdisciplinary Nanoscience Center (iNANO). Currently the volume of the iNANOschool is about 50 PhD students. The iNANOschool was founded by the Danish Research Training Council, the Faculty of Science and the Faculty of Health Sciences at University of Aarhus, and a number of external partners. Currently, major support is received from the County of Aarhus, Haldor Topsøe A/S, H. Lundbeck A/S, Danfoss A/S, Exiqon A/S, Aeolus Pharmaceuticals (USA), and Sagres Discovery (USA).

Drug Research Academy, Danish University of Pharmaceutical Sciences

Drug Research Academy, DRA, is an academic/industrial graduate school covering all core disciplines related to the drug development process - from discovery to clinical use. The school was founded in 2002 at the Danish University of Pharmaceutical Sciences (DFU), Copenhagen, Denmark, with funding covering a 6-year programme. Nine Danish pharmaceutical companies, including two biotech companies are associated as programme partners.

3. The university educations in numbers

A majority of the students admitted to the universities continues to come from the upper secondary schools⁴: about 50 % of the students from the upper secondary schools' mathematical line continue at university whereas the crossover frequency is 40% for the students from the upper secondary schools' language line. Students from other types of upper secondary schools also continue at university although the crossover frequency is lower: app. 17 % of the students with a Higher Preparatory Exam (HF), 20 % with a Higher Commercial Examination (HHX), and app. 30 % with a Higher Technical Examination (HTX) continue at university.

³ In Danish: Forskeruddannelsesrådet, FUR)

⁴ In Danish: Gymnasium

A relatively low number of students admitted to the universities have already completed a short or medium tertiary education. About 5 % of the students completing short tertiary educations proceed to long tertiary educations and the rate is slightly more than 10 % of the students completing medium tertiary educations.

In the early 1980s only 8 % of a year enrolled at university, and less than 6 % earned a degree. Now, these percentages have risen to 18 % and 13 % respectively. Of course this increase has a major impact on the growth in the absolute number of students.

In 1980, 117,000 students were enrolled in short, medium and long tertiary educations. The 2000 figure had reached about 202,000; 22,000 of whom were enrolled in short tertiary educations, app.75,000 in medium tertiary educations, and app.105,000 in long tertiary educations with app. 100,000 at the level of bachelor or master (47,000 bachelor students and 53,000 master students) and about 5,000 at PhD level. It should be noted that the reason for the relatively high number of students enrolled in master educations is that at this level there is a high number of students who have exceeded the prescribed number of years for their particular education. In addition, a considerable number of educations continue to be undivided master educations. In summary, the composite growth of the tertiary educations has been almost 73% over the period, which is equal to an annual growth of 3.8%.

The large increase in the number of students at university educations in Denmark is not evenly distributed between the educational institutions: half of the students are enrolled at the multifaculty universities in Copenhagen and Aarhus, see table 6.1.

Since their foundation approximately 30 years ago, the three young universities with a relatively broad scope of disciplines found in Odense (the University of Southern Denmark), Roskilde and Aalborg have, however, experienced satisfactorily increasing numbers of students. Their total number of students is nearly equal that of the University of Copenhagen.

The two business schools in Copenhagen and Aarhus cover social sciences and the humanities. Together they have a total of almost 14,000 students.

Table 6.1. Number of students at Danish Universities 1992 -2001

	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
University of Copenhagen	25.425	25.946	26.303	26.401	27.104	27.917	28.572	29.326	29.462	28.472
University of Aarhus	14.809	15.150	16.177	16.739	17.376	18.024	18.636	19.237	19.483	19.436
Copenhagen Business School	16.110	16.259	15.578	15.212	14.594	14.246	13.726	13.524	13.107	13.445
University of Southern Denmark	11.161	11.340	11.223	11.014	11.070	11.360	12.007	12.607	12.810	12.657
Aalborg University	8.337	8.490	8.571	8.759	8.997	9.479	9.686	9.493	9.571	9.261
Roskilde University	4.186	4.487	4.853	5.156	5.478	5.962	6.227	6.530	6.626	6.609
Technical University of Denmark	7.908	7.458	6.870	6.326	6.074	6.037	5.823	5.989	6.088	6.224
Aarhus School of Business	6.031	6.048	5.765	5.501	4.855	4.176	4.500	4.591	5.509	6.081
Royal Veterinary and Agricultural University	3.146	3.163	3.236	3.164	3.308	3.423	3.550	3.410	3.297	3.115
Danish University of Pharmaceutical Sciences	971	975	1.038	1.059	1.092	1.148	1.191	1.221	1.226	1.193
Total	98.084	99.316	99.614	99.331	99.948	101.772	103.918	105.928	107.179	106.493

1. no data available for Danish University of Education (established 2000) and the IT university (established 2003)
2. Figures for the two business schools and University of Southern Denmark include part-time students at diploma educations.

Source: Statistics Denmark

3.1. Developments 1980 -2001

The increasing number of students

In the early 1980s only about 30% of a year enrolled in tertiary educations and only about 8% enrolled in long tertiary educations. By 2000 these figures were 52% and 18%, respectively. In absolute figures, an increasing number of people complete a long education despite the declining number of young people per cohort in recent years, see fig 6.2.

Figure 6.2 The total number of students at the long tertiary educations 1980- 2000

As a whole the universities have increased the number of admitted students. The introduction of the 3+2+3 structure made it possible to divide the students into three levels, viz. bachelor, master (candidatus) and PhD, which became particularly clear in the 1990s when the number of bachelors really started to rise. Prior to 1993, only the bachelors of business administration (HA) and languages for special purposes were recorded. Some university educations have still not been adapted to the bachelor-master structure, for instance the civil engineer education, and some have been adapted recently.

The number of degrees awarded by the institutions has seen a similar increase, see figure 6.4. In particular Copenhagen Business School, the University of Aalborg, Aarhus School of Business and Roskilde University have experienced considerable growth in the number of degrees awarded since 1980. Conversely, the number of degrees awarded by the “old” institutions is found to remain stable in over time.

3.2. Main areas

The number of students in each main area varies considerably. About 58% of the students begin studies of the social sciences and the humanities, and in 2000 these two main areas together accounted for more than half of the degrees awarded: The number of master's degrees in social sciences (about 3,000 degrees) accounted for about 30 % and the humanities (2,200 degrees) accounted for about 25 % of the total number of master's degrees awarded, see figure 6.4.

Source: Statistics Denmark, the Ministry of Education and the Ministry of Science, Technology and Innovation.

The health sciences and technical sciences have experienced fluctuations and drops in student affiliation, but are now on the rise again. The natural science area saw a modest increase from the mid-1990s, but has now stabilised. The number of social science and the humanistic degrees has been rising constantly since the 1980'es and account for almost 60% of the degrees awarded.

Over the past few years, the number of admissions has remained very stable. As a result of this, the areas of technology and natural science will have a stable share of the total number of university degrees awarded of about 23% over the next few years.

Figure 6.5 shows the distribution of the total number of master's degrees awarded at the 12 Danish universities divided onto main areas. The distribution of the bachelor degrees onto main areas is not included because some of the universities only offer teaching at the level of master or complete master programmes.

The humanities constitute up to 50 % at the multi-faculty universities and the social sciences make up more than 20% and reach 40 % at Roskilde University. At the University of Aalborg, the technical and natural science educations make up more than 50%.

At the business schools in Copenhagen and Aarhus featuring educations within business economy and languages for special purposes, the social sciences' share is close to 80%.

The University of Copenhagen is the oldest university with a very broad range of disciplines. The university awards more than 2,000 degrees a year, hereof 450 degrees in humanities and 500 degrees in mathematics, chemistry, computer science, geography and biology. The largest main area is the social sciences that award 8-900 degrees a year, about half in law.

The University of Aarhus is a multi-faculty institution awarding more than 1500 degrees a year. The university offers almost as wide a range of disciplines as the University of Copenhagen. The social sciences account for the largest number of students: law is the most popular discipline followed by political science, whereas economics has a more modest student intake.

The faculties of medicine at the universities in Copenhagen and Aarhus and the University of Southern Denmark were very large in the 1970s, but shrank in the 1980s due to the admission control introduced in 1976 reducing the student intake. Now, the total student intake at the three faculties of medicine has risen to almost 1,100 again, which is equivalent to the number of the early 1980s.

At the University of Southern Denmark, the humanities is a very large area with more than 40% of the total students admitted and degrees awarded, whereas the social sciences play a relatively minor role.

The University of Aalborg awards more than 300 degrees in civil engineering (30 %), but only 30 degrees in natural sciences a year. Within the social sciences, the degrees awarded in business economics constitute the largest portion.

At Roskilde University, the degrees in social sciences constitute more than half of the degrees awarded. The remaining degrees are awarded mainly in the humanities whereas only a modest number of master's

degrees are awarded in natural sciences. For the basic studies programmes there is a more even distribution of the number of admissions between the three large areas.

Copenhagen Business School awards a total of approximately 800 degrees, of which the M.Sc. in Economics and Business Administration etc. make up 700 (90 %). Of the bachelor degrees awarded, about 25% of the degrees are awarded within languages for special purposes. The Aarhus School of Business awards approximately 400 degrees, with almost the same relationship between economics and languages.

The Royal Veterinary and Agricultural University and the Technical University of Denmark award about 700 degrees a year each. Whereas the Technical University of Denmark concentrates on civil engineers at the level of master, the Royal Veterinary and Agricultural University embraces a wider range of disciplines with veterinary and agricultural science master's degrees as their most important areas. The two universities offer BSc and MSc educations in Food Science and Technology, coordinated by the Centre for Advanced Food Studies.

The Danish University of Pharmaceutical Sciences, awards about 160 pharmaceutical degrees a year.

3.3. Transition from the level of master to PhD

Most of the PhD-students in Denmark are admitted to PhDprogrammes in the fields of health sciences, technology, and veterinary and agricultural sciences. The mentioned areas account for a total of 77% of the PhD student intake, which is remarkable considering that less than 40% of the master's degrees are awarded in these areas. The situation is reversed for the humanities and social sciences, which account for app. 22% of the PhD-student intake compared to 60% of the master's degrees awarded. This discrepancy is caused by a rather low crossover frequency of 5 %. PhD

PhD students

It can be seen from figure 6.6 that there has been a significant increase in the number of PhD degrees awarded over the entire period. Since the student intake has not increased significantly in recent years, the number of awarded degrees has stabilised.

Source: Data om dansk forskeruddannelse 2001⁵

In 2000 about half of the PhD degrees were awarded within health sciences (27%) and natural sciences (23%), whereas the humanities and social sciences accounted for app. 22 % of the awarded PhD degrees.

Source: Data om dansk forskeruddannelse 2001⁶

Figure 6.8 illustrates the share of awarded PhD degrees according to institution. The University of Copenhagen is the institution with the largest share awarding about 1/3 of the total number of PhD degrees, followed by the University of Aarhus with about 1/5. The Copenhagen Region accounts for a total of 60% of all PhD degrees awarded in 2000. This is a clear reflection of the intra-university distribution of the appropriations for PhD scholarships and the number of externally funded scholarships. In average 35% of the degrees awarded in 2000 were funded by the appropriations allocated to the individual university whereas the remaining 65% were funded by external sources such as foundations, research councils and private funding.

⁵ Data about Danish training of researchers for 2001

⁶ Data about Danish training of researchers for 2001

Source: Data om dansk forskeruddannelse 2001⁷ and the PhD register administered by the Ministry of Science, Technology and Innovation

3.4. Study conduct with special emphasis on the percentages and periods for the completion

Generally, 80% of the students who enrol at university, complete a tertiary education, but not necessarily the education of their first choice. It is not possible to identify specific factors causing dropout and transfer to other studies but the following non-exhaustive list indicates factors affecting the completion rates of the universities and their variations:

- The introductory courses of the educations.
- The structure and flexibility of the educations including whether or not the bachelor education is rounded off with a bachelor project.
- The teaching qualifications of the researchers.
- The study environment and study forms.
- The competence profile and relevance of the education in relation to the desired jobs.
- The interaction between tutoring at the upper secondary school and the university.
- Tutoring during the studies, in particular in connection with the bachelor project and thesis.
- Types of exams and tests.
- The width of the research environment and its relation to the content of the education.
- Work alongside the studies.
- Early enrolment in the education after upper secondary school.
- Guidance in upper secondary school.

In connection with the content and academic profiles of the educations, it is clear that in particular the educations targeted a particular profession, such as the medical, legal and food technician, pharmacist and veterinary doctor educations tend to exhibit high completion rates.

Statistic overview

Out of the 80 % of students that complete a tertiary education, more than 60% complete the first education of their choice or a closely related education and 20% transfer to another university education or a medium *tertiary* education etc.

The completion rates fall into three groups. The professional education of medicine, has a completion rate of 75%, social sciences, 60%, humanities and natural sciences are slightly below 50% at the level of bachelor. If the completion rate is accumulated to the final master level, the completion is down below 45% and for a number of small humanities subjects the figure is down below 20%.

In other words, the number of awarded master degrees has been able to keep up with the increased student intake. About 65% of the students at the long tertiary educations earn a degree compared to less than 50% in the mid-1980s. In return, the completion rate at the medium tertiary educations has fallen from slightly above 70% to about 66%. As can be seen, the figures of for instance the medium and long tertiary educations are approaching each other. As it happens, an increasing number of the drop-outs from for instance medium tertiary educations such as nurse or teacher etc. later transfer to the university educations.

The years following the introduction of the general admission control in 1977 saw a considerable increase in the completion rates of a number of educations. The increasingly liberal admission requirements of the past decade have not deteriorated the completion figures, more likely quite the contrary.

⁷ Data about Danish training of researchers for 2001

Selected completion rates

Table 6.2 shows the completion rates of university educations at the level of bachelor. These figures include students transferring to other studies within the same educational category, whereas students transferring to studies in other educational categories and at other levels are not included.⁸

Table 6.2 Completion rates for selected university educations at the level of bachelor for 2001.

Education	Completion rates
Bachelor of business administration (HA)	63.7
Law	68.2
Social sciences	64.1
LSP	55.9
Humanities, lang.	39.2
Humanities, others	56.9
Art	45.2
Psychology	59.0
Natural science	44.7
Agriculture	64.5
Doctor	74.9

Source: Statistics Denmark, the Ministry of Education and the Ministry of Science, Technology and Innovation.

After the introduction of the so-called 3+2+3 structure it has become a highly complex process to calculate completion rates. In general, the completion rates for master is below the figures for bachelors. The difference is, however, relatively modest since the transfer frequency from the bachelor level is high, and the dropout figures relatively low.

Waiting periods and study periods

Typical of the student conduct at Danish universities has been very long study periods and increasing waiting periods. Students in the technical and natural sciences typically enrol after a sabbatical year at the age of 21, whereas students in the social sciences and the humanities typically wait 2 or 3 years.

Unlike the waiting period, the average study period has gone down. Where the students in the humanities and natural sciences used to spend an average of 8 or 9 years obtaining their degree, this period has now been reduced to about 7 years. Two of the major reasons for this have been the tightening of the State Educational Grant and Loan Scheme in Denmark in 1989 with the introduction of the flexible state educational grant⁹; and the introduction of the 3+2+3 structure in 1993. For many courses of study the prescribed study period has dropped from 6 or 5½ years to 5 years.

The outcome of these two opposite tendencies has been that the age of the students when they earn their master degree more or less remains the same. During the past 15 to 20 years Danish students have earned their master's degree at the age of about 29, but the older the students are when they enrol at the university, the fewer complete their education.

Table 6.3. Average length of study periods (years) for areas of study 1990-2001

Area/year	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001

⁸ The method is the so-called cross sectional method which is used in the statistics modules for instance produced by the Ministry of Education. A description of the method can be found in: the Ministry of Education, *Gennemførelse, studeskift og frafald – fra ungdomsuddannelse til ph.d.* ("Completion, change of studies and dropout – from the youth educations to PhD" – in Danish), 2000.

⁹ The so-called "ten-trip token" (in Danish: "klippekort") with the state educational grant being divided into a number of monthly grants to be consumed as requested by the student.

Soc.sc./ pub.adm.	6.9	6.8	6.5	6.5	6.6	6.6	6.5	6.9	6.8	6.8	6.4	6.3
Law	5.4	5.4	5.8	5.8	5.8	5.8	5.8	5.8	5.8	5.8	5.4	5.4
Theology	8.3	7.9	8.5	8.0	8.1	8.0	7.7	7.9	7.9	7.5	8.0	7.8
Hum.	8.0	7.5	6.9	6.9	7.0	6.9	7.1	7.3	7.3	7.3	7.0	6.7
B.Sc. (Eng.)	5.5	5.4	5.5	5.2	5.0	5.0	5.3	5.3	4.7	4.9	5.0	4.9
Nat.sc.	7.7	7.4	7.6	7.6	7.7	7.7	7.8	7.9	8.1	7.9	7.3	6.9
Agri./vet. ¹⁰	6.4	6.5	6.1	6.2	6.3	6.6	6.7	6.4	6.9	6.7	6.9	6.8
Pharma.	6.3	5.9	5.9	5.6	5.8	5.7	5.8	5.8	5.9	5.9	5.8	5.8
Medicine	7.9	7.8	7.9	8.0	8.1	7.9	7.9	7.9	7.9	7.7	7.8	7.4

Note: For some fields e.g. engineering the average length of study period might be artificial low due to intake of students with a bachelor degree or transfer of merits from other educations.

3.5. International student mobility

General

As part of their education, an increasing number of Danish students enrolled in tertiary educations include a study visit abroad. The number almost doubled from the academic year of 1991/1992 to 2000/2001 and the same tendency applies to the number of Danish students choosing to earn a full degree abroad.

Students either participate in organised study visits, for instance exchange programmes or bilateral exchange arrangements lasting typically one or two semesters, or organise their own study visits abroad. The student mobility into and out of Denmark within the EU programme Socrates/Erasmus¹¹ shows that the mobility out of Denmark has doubled and the mobility into Denmark has increased by a factor four during the last 10 years.

Table 6.4 Exchange students to/from Denmark, from 1995/1996 to 2000/2001.

Year	Total	No. of students leaving	No. of students entering
1995/96	5668	3384	2284
1996/97	6167	3588	2579
1997/98	6748	3818	2930
1998/99*	7487	3957	3530
1999/2000*	8255	4312	3943
2000/2001*	8175	4326	3849

Source: Cirius

*These figures also include the mobility of the educations under the Ministry of Culture.

Source: The Ministry of Education and the Ministry of Culture, Ministry for Science, Technology and Innovation

Table 6.4 shows the number of students leaving and entering for not less than three months under organised exchange programmes including the Erasmus programme. The table does not comprise exchange students at the school of nursing and the short tertiary educations.

¹⁰ The agriculture and veterinary educations is composed of widely different educations where the study approach differs considerably. The fluctuating study times should be regarded with some reservation.

¹¹ Source: Cirius and the State Educational Grant and Loan Scheme Agency (SU-styrelsen)

For the number of students leaving Denmark for a given average period, however, there is a widely different figure because many students typically stay about six months at a foreign educational institution when going abroad, see table 6.5. For the average period of October 2001, about 7000 students stayed abroad, which is about 4% of the total number of Danish students. By far most of the students chose another EU country for their study visit. It should be noted that the table includes students from the short, medium and long tertiary educations.

Table 6.5 The number of Danish students abroad distributed onto recipient countries, cross-sectional period October 2001.

	The Nordic countries	The EU	Other countries	Total
Social Sciences	29	682		725
Humanities	12	629		647
Technical sciences	3	138		140
Natural sciences	0	43		43
Agricultural/veterinary sciences	1	11		12
Health sciences	21	73		83
Pedagogics	8	179		184
Unspecified	850	2933	894	4,375
Total	924	4.688	894	7,189

Table 6.6. Danish students enrolled for complete educations abroad with the state educational grant, 1992-2000.

Year	No. of students	In the Nordic countries	In the UK	Elsewhere in the EU, incl. Austria	In the US	In other countries
1992	2.031	569	647	394	285	136
1993	2.524	616	852	509	358	189
1994	2.765	661	949	566	386	203
1995	2.981	704	1.033	648	390	206
1996	3.581	755	1.283	791	490	262
1997	4.164	783	1.522	910	574	375
1998	4.465	836	1.698	931	601	399
1999	4.455	825	1.778	890	538	424
2000	4.370	772	1.843	838	496	421

Source: The State Educational Grant and Loan Scheme Agency (SU-styrelsen): *SU støtte og SU-gæld 2002 (The State Educational Grants and Loans 2002 – in Danish)*.

Half of the Danish students that earn a complete degree abroad on the state educational grant enrol in a programme in either the United Kingdom or one of the Nordic countries, see table 6.6. The student can obtain a state education grant for a maximum of 4 years provided they enrol in a publicly recognised educational programme.

International mobility of PhD students

In 2000, 449 foreign PhD students were enrolled at Danish universities out of a total number of 5,035, which is equivalent to 9%. At the same time 247 Danish PhD students earned a complete PhD degree abroad, which is equivalent to 5% of the total number of PhD students in Denmark. The real number is probably somewhat higher.

The ministerial order on the Ph.D programme states that “the Ph.D-programme shall include participation in research activities, including stays at other, mainly foreign, research institutions, or in similar ways”.

3.6. Continuing education at university level

During the past five years new possibilities for continuing education, based on the work experience of the participants, have been created at the Danish universities. In recent years various master educations have been established in practically all university disciplines, and the activities continue to grow steadily year-by-year.

Table 6.7 Activity at master programmes for adults, 1999-2002*.

Main area	1999	2000	2001	2002
The humanities and pedagogics	22	103	171	379
Social sciences	133	214	229	231
Health science	71	92	88	92
Technology – natural science	143	96	174	255
Total	369	505	661	958

Note: The activities are computed as the number of full-time equivalent students. A full-time equivalent student is a participant that has paid for the equivalent of one full year of studies. Normally, these students enrol part-time for their studies.

* These figures are exclusive of the Danish University of Education for the sake of comparison from one year to the next.

Table 6.8 Other activities under the open education programme besides the master programmes, 1999-2000*.

Main area	1999	2000	2001	2002
The humanities	2,272	2,079	1,900	1,883
Natural science	197	204	199	188
Pedagogics	223	194	192	30
Social sciences	3,323	3,097	3,168	3,287
<i>of which Graduate Diplomas in Business Administration</i>	2,937	2,721	2,755	2,695
Health science	23	7	9	4
Technology	118	183	172	152
Others	30	17	12	9
Total	6,185	5,781	5,652	5,552

Note: The activities are computed as the number of full-time equivalent students.

* These figures are exclusive of the Danish University of Education for the sake of comparison from one year to the next.

These activity figures show an increase in the number of full-time equivalent students at the master educations and a drop in educations under the open educations.

4. The State Educational Grant and Loan Scheme

Danish students enrolled in a tertiary education or an acknowledged youth education are eligible for the state educational grant (SU), administered by the State Educational Grant and Loan Scheme Agency ("SU-styrelsen"). About 298,000 people received these grants in 2001, of which 181,600 were enrolled in a tertiary education programme.

The state educational grant is a three-pronged funding scheme: the grant, the loan and the student's own funding, which is to provide a flexible basis serving to motivate the highest number of people to take an education. The idea is that students are to pay part of their own living expenses during their education, either by taking up loans that are repayable or by working.

In 2001, the payments totalled app. DKK 10.5bn. Of this amount DKK 6.226bn were grants allocated for further education, DKK 1.752bn were paid out as loans, and the rest was paid to students enrolled in youth educations.

In 2001, each student received grants averaging of DKK 28,400. Students at the tertiary educations are awarded their grants according to the so-called trip token principle, where each "trip" is equivalent to one month's grant. The actual size of the grant depends on the student's additional income. Students can receive grants for a period equalling the prescribed study period of the education concerned plus an additional 12 months, up to a total maximum of 70 "trips", corresponding to about six years. Slightly more than 80% of the students received the state educational grant in 2001. The remaining 20% either had other sources of funding or had used up their grants.

In addition students have access to additional funding in the form of loans. Table 6.9 shows the number of students that took up loans to supplement their grants in 2001. The number of students taking loans is tripled as the students grow through their 20s and slightly more than 50% took up loans in 2001 see table 6.9.

Table 6.9 Percentage of students receiving grants that took up loans in 2001

Age	Percentage
20-year-olds	19.6 %
22-year-olds	26.4 %
23-year-olds	35.1 %
24-year-olds	44.9 %
25-year-olds	51.6 %
26-year-olds	57.6 %
27-year-olds	61.0 %
28-year-olds	64.1 %
29-year-olds	65.6 %
30 years or more	61.9 %

The changeover to the 70-”trip token” model has meant that some students are unable to complete their education before they have consumed all their ”trips”. In 2001 this figure was about 7,000.

The percentage of students that completed their education after consuming all trips allocated to them is higher for the students at university than for students at the short and medium tertiary educations. This is particularly true for the humanities (61.5%), natural science (57.7%) and law (48.7).

To prevent work from taking up too much of a student’s time, there is a limit to how much a student may earn in addition to the state educational grant. In 2001, this limit was DKK 4,878 a month for months when the student received the state educational grant and DKK 12,183 a month for other periods. As a result of this, a large share of the students choose not to receive the grant during the long vacations to be able to earn extra money.

The three-pronged scheme is set up to ensure the student a financial basis that on one hand is sufficient enough to ensure that studies are given a high priority yet providing a flexible basis serving to motivate the highest number of people to take an education.

5. Some aspects of university pedagogics

5.1. Assistant professor pedagogics

To secure and develop the pedagogic quality of the university educations, new assistant professors take an assistant professor’s diploma in education. The programme comprises pedagogic supervision of the assistant professor’s teaching and relevant tutoring. The 3-year period as assistant professor is completed with a written assessment of the assistant professor’s teaching qualifications given by an associate professor or a professor.

The programme aims at enabling the assistant professor to evaluate and develop his/her own teaching in the perspectives of academic didactics and methodology. Also later in their career the pedagogic qualifications of university teachers are assessed and must be documented.

At e.g. the University of Southern Denmark, the responsibility for pedagogics rests with a centre dedicated to university pedagogics (*the Center for Universitetspædagogik*).

5.2. Using computers as a pedagogic tool

In Denmark, students are among the groups with the most extensive use of computers. The target of the tertiary educations is that “computers are a naturally integrated part of the teaching as a tool the students can learn to operate and work with for their assignments and apply to create networks and strengthen the study environment, but also as a natural tool for the teachers as part of their teaching, knowledge sharing and creation of networks across educational institutions”. Computer usage at Danish universities is primarily manifested in two main areas of application: 1) administration and self-service solutions and 2)

e-learning concepts. The borderline between these two areas of application may vary because the administrative self-service systems also often comprise applications that enhance the communication directly related to teaching, such as communication between teacher and student and between students.

E-learning platforms and self-service concepts

There are many examples of e-learning platforms at Danish universities, which compile data on educations, gather together a series of administrative services and opportunities for virtual conferences.

In addition, e-learning is an essential tool in the continuing educational programmes offered by the universities. In 2001, 9 out of 11 universities offered e-based distance learning as an option¹². Most of the courses by far are offered as continuing education, and in a few cases a complete educational programme is offered as e-learning, e.g. the virtual Graduate Diploma In Business Administration 1st part at the Copenhagen Business School. As the first university in Denmark, the business school offers students enrolling in this education digital submission of exam papers using digital signatures, and it is the government's plan to make it possible for the entire Danish population to use digital signatures in the near future.

Portal for virtual university teaching in Denmark

There is not at the moment, however, an overall view of the extent of technology-based teaching offered by Danish universities. To satisfy the need for this overview, the Rectors' Conference is to launch a project funded by the Ministry of Science, Technology and Innovation to set up a portal compiling and creating an overview of the distance learning programmes offered by the universities. Offering a single entry to the virtual educational programmes, the portal is to serve as a platform for dissemination of experience, knowledge and competencies in relation to distance learning. In addition, the portal is to disseminate news and give access to other virtual services.

Pedagogic units to promote new approaches to teaching and learning

Most of the universities strengthen the use of computers in their teaching and learning by establishing special pedagogic units. The overall task of such units is to enhance the pedagogic quality of the teaching, for instance the assistant professor's pedagogics, see above. Some of the core tasks of these units are to encourage scientific staff to apply computers in their teaching in general and to develop new concepts of teaching and learning, including e-learning. Such units are for instance:

- CBS Learning Lab, Copenhagen Business School
- Technical Knowledge Centre of Denmark, Technical University of Denmark
- Centre for the Interdisciplinary Study of Learning, University of Aalborg
- Pædagogisk Center (centre of pedagogics), social science, University of Copenhagen
- Department of Educational Research, Roskilde University
- A centre for university pedagogics at the University of Southern Denmark
- Learning Lab Denmark, Danish University of Education
- The Science faculty of the University of Copenhagen

6. Internationalisation of educations

In recent years there has been increased focus on the concept of internationalisation of tertiary educations. The English-Language-Taught Degree Programmes (ELTDP) in European tertiary education is one of several ways of strengthening the international dimension.

According to a study conducted by the Academic Cooperation Association (ACA) the number of ELTDPs now offered is far from sufficient unless Europe wants to lose an obvious opportunity to

¹² Learning Lab Denmark: *Notat vedr. undersøgelse af udbudet af fleksibel netbaseret fjernundervisning* ("Memo on a survey of flexible internet-based distance learning offered" – in Danish), 2001. 10 of the universities asked responded to the questionnaire.

exploit a crucial market opportunity. The report assesses that the institutions should have a clearly defined strategy for their ELTDPs comprising: development of quality courses with realistic curricula, targeted recruitment and marketing. According to the study, an ELTDP is very demanding in terms of labour and extra resources. A programme of this nature should equally attract domestic students on the path to an international career and foreign students. The report concludes that countries such as Finland, Switzerland and The Netherlands boast the highest percentages of ELTDP students relative to the total number of students in the country.