

OPERATIONAL PLAN 2020-2022



UMEÅ UNIVERSITY
FACULTY OF SCIENCE & TECHNOLOGY

Operational plan 2020-2022
Faculty of Science and Technology, Umeå University
FS 1.3.1-1867-19

Nationally leading and internationally respected

The Faculty of Science and Technology comprises eleven departments that conduct research, education and collaboration in a wide range of fields. The faculty is host to several centres/work units and participates in additional centres and major projects. The faculty has approximately 3,000 full-time students and more than 900 staff, of whom about 200 are doctoral students.

THROUGH ITS BREADTH the faculty has several strengths and overall well-functioning procedures and routines. In order to continue developing in a positive direction, we have identified several challenges that the faculty will address over the next three-year period. Many of the challenges are overarching and concern the entire faculty. At the same time, the faculty's breadth of activities in a range of subjects and disciplines means that many challenges require tailored activities.

Our staff and the students who take our programmes constitute our most important resources and recruitment of highly qualified staff and students is crucial for the faculty to stack up in the national and international competition. We will offer conditions that make our research, education and collaborations first class. Our research will gain national and international attention and our students and doctoral students will be attractive on the labour market after completion of their training. In this context, effective communication is necessary to disseminate knowledge about the faculty's research and education, attract skilled staff and students and foster long-term interest in our activities with a broad public.

Vision for Umeå University (UMU), the State's values, the United Nations (UN) Agenda 2030 goals for sustainable development and our quality systems form the foundation of our work.

Departments

- Applied Physics and Electronics
- Chemistry
- Computing Science
- Ecology and Environmental Sciences
- Physics
- Plant Physiology
- Mathematics and Mathematical Statistics
- Molecular Biology
- Science and Mathematics Education
- Umeå Institute of Design
- Umeå School of Architecture

Centres/Work units

- Centre for Biomedical Engineering and Physics - CMTF
- Centre for Sustainable Cement and Quicklime Production - CHECK
- European CBRNE centre
- High Performance Computing Centre North - HPC2N
- Industrial Doctoral School for Research and Innovation
- Umeå Marine Sciences Centre - UMF
- Umeå Mathematics Education Research Centre - UFM
- Umeå Plant Science Centre - UPSC



1. THE GOOD AND EFFICIENT UNIVERSITY

We have highly qualified staff and students and our activities are permeated by equal opportunities and sustainable development

A UNIVERSITY IS built and developed by its staff and students. Our staff are the faculty's number one resource and their health and well-being are key factors for success. In order to have a well-functioning organization and highly competent staff, it is important that our staff have adequate resources and opportunities for professional development. Analysis of the latest staff survey (2018) shows a similar result within the faculty as well as the university, which in turn does not differ from the average for all Swedish universities [1.1]. Concerns reflected in the survey reflect the university and society in general and they primarily involve a feeling of not having enough time to keep up with work tasks and that the time for recovery is inadequate. Therefore, the faculty has had, and will continue to have, a focus on further development of the working environment. One part of this work is the newly created work environment group at the faculty, which will work broadly and in line with the university's policy for the work environment and equal opportunities [1.2] to further improve both the physical as well as the mental and social environments from an equal opportunities perspective. The working environment group has begun its activities by taking stock of the work environment management in the departments to identify risk factors as well as good examples in the work environment to prevent and improve the working climate. In order to coordinate the work environment management and increase the exchange of experience between the departments, joint network meetings for the faculty's work environment representatives and representatives for equal opportunities will be initiated. The faculty has implemented a more clear introduction to new heads of department in the fields of education, research, finance, human resources and communication. There is also a need for initiatives for the purpose of introducing new staff to their respective work roles and for continued professional development.

TO INCREASE RECRUITMENT of motivated students, the faculty must continue to work for an attractive learning and working environment. During the survey of the work environment management at the departments, it was found that the work on students' work environment and broader recruitment, based on an equal opportunities perspective, has often been lacking. According to a student union report [1.3], mental ill health is a growing problem among students. The work environment group has made the students' work environment a high priority and will work on developing tools that will facilitate how the departments work with the students' psychological and social work environments.

SINCE 2009 the number of full-time students and the number of applicants per place in our faculty education programmes has been relatively stable. An important basis for the development of the faculty's training is an increased number of applicants per place. Some of our programmes, for example, in architecture and industrial design, are very popular, while it is more difficult to attract students to other programmes.

TO INCREASE recruitment of staff whose skills can contribute to meeting society's future challenges, the faculty should announce jobs that attract a number of qualified applicants with high competence. The proportion of women among new professors is still lower than the university's goals (at least 35%) [1.4]. To ensure that we recruit highly qualified staff with the right skills, the faculty will work towards achieving a broader recruitment with more applicants from under-represented groups. A well-functioning university also has an effective infrastructure support, a long-term competence development plan and a stimulating work environment.



THE UNITED NATIONS (UN) Agenda 2030 Sustainable Development Goals [1.5] is an important element of the academy's work environment efforts. The UN's objectives include areas such as health and well-being, good education for all, gender equality and equal opportunities as well as sustainable societies. The Swedish government also wants the country to be a leader in the implementation of Agenda 2030, both at home and internationally. The implementation will be based on knowledge and insight, aspects where faculty teachers and fully trained students can play a leading role. This requires that all activities of the faculty be "permeated by the integrated thinking and approach to sustainable development constituted by the Agenda" [1.6].

AN INVESTIGATION INTO sustainability aspects of the faculty's programmes was presented in 2016 and since then the faculty has been working to implement the proposals that were presented. The faculty has a responsibility and the goal to contribute to an increased knowledge and awareness of sustainable development in the field of education and we are therefore focusing on sustainability being firmly integrated in the entire operation. Physical meetings are often important elements of our work, especially for our research environments, and with Umeå being located in the northern part of Sweden, this often requires travel. At the same time, we have a demand for us to take responsibility for our climate footprint, especially in the form of reduced travel. Therefore, the faculty strives for more meetings to take place through forms that do not require travel and, if physical meetings are necessary, for more flights to be replaced by train journeys.

TOGETHER WE WILL realise our ambitions and by building on our strengths we will continue to improve our activities.

GOAL 1: The faculty has a systematic work environment management for both students and staff

STRATEGIES:

- The faculty will work in accordance with government values
- All faculty staff should have a work situation that promotes both physical, mental and social health
- The faculty will work to ensure that all staff have good opportunities for competence development and the possibility of pursuing a career
- The faculty will work to ensure that administrative systems that exist and are implemented should have good functionality and facilitate our activities

INDICATORS:

- Number of under-represented groups who are applicants for the faculty's education and advertised positions
- Index area Working Climate in Staff Satisfaction Index 2022
- Index area Leadership in Staff Satisfaction Index 2022

GOAL 2: The faculty has many highly qualified applicants for its programmes and positions

STRATEGIES:

- The faculty will work to increase interest in and attractiveness for their education and research
- The faculty will work to facilitate the recruitment of highly qualified students and staff regardless of background
- The faculty will work to ensure that the housing issue does not hamper recruitment

INDICATORS:

- Number of first-choice applicants for the faculty's academic programmes
- Number of applicants for the faculty's advertised positions.
- Number of teaching posts which, after announcement and interviews by the appointment board, results in at least three ranked applicants, of which at least two are external applicants and at least one is of the underrepresented sex
- Number of applicants from under-represented groups/gender
- Number of women among new professors

GOAL 3: Sustainable development and climate thinking are reflected in all of the faculty's activities

STRATEGIES:

- The faculty will work to reduce its climate footprint
- The faculty will work to clarify and increase the elements of sustainable development in its programmes

INDICATORS:

- Number of flights booked
- Number of courses with content directed towards sustainable development

References:

- 1.1 Umeå University (2018). Staff survey 2018.
- 1.2 Umeå University (2019). Working environment policy and equal opportunities. Policy. FS 1.1-1526-19
- 1.3 Student Unions at Umeå University (2019). Student Union letter 2019.
- 1.4 Umeå University (2018). Operational plan 2019. Faculty of Science and Technology FS 1.1-1661-18
- 1.5 The UN's global goals. United Nations (2015). General Assembly Resolution A/RES/70/1. Transforming Our World, The 2030 Agenda for Sustainable Development.
- 1.6 Swedish government (2017). Sweden and Agenda 2030 – report to the UN High-level political forum 2017 on sustainable development. The Ministry of Finance Report.



2. FIRST AND SECOND CYCLE EDUCATION

The faculty educates critically thinking students who are equipped with high-quality knowledge and skills to solve future societal challenges

HUMANITY TODAY IS facing challenges - not least social, economic and environmental - powered by globalisation and rapid technological development. These societal challenges need to be considered and addressed from a sustainable perspective. The students who begin their university education today will be active citizens in our community for many decades to come. To help today's as well future generations of students, we need, in addition to communicating the obvious content knowledge, to implement broader educational objectives. In its report "The Future of Education and Skills 2030 Project", the Organisation for Economic Co-operation and Development (OECD) emphasises that students need a combination of knowledge, competences, attitudes and values, while students also need to develop the ability to improve our society and to shape our future [2.1]. Examples of these fundamental skills are critical thinking, problem-solving, communication, collaboration, creativity, innovation and digital competence. It is therefore of the utmost importance that we combine in our courses solid content knowledge with fundamental skills. Lifelong learning, where one continues to return to the university for further education and training, will become an increasingly central aspect. A prerequisite for conducting high-quality education is pedagogically skilled teachers with first-class content knowledge, who continuously can and are allowed the opportunity to further the development of our programmes in order to adapt to a changing world, thereby increasing our competitiveness.

IN UMEÅ UNIVERSITY'S quality system for education [2.2], the importance of teachers' competence and the following six key perspectives are emphasised:

1. Research links
2. Internationalisation
3. Equality
4. Collaboration and links to working life
5. Sustainable development
6. Student influence and student-centred learning

THE SIX PERSPECTIVES, together with solid content knowledge, are crucial to the quality of our courses. The quality of the programmes is reviewed in connection with the national evaluations of the Swedish Higher Education Authority (UKÄ'S). Although not all courses can implement all perspectives, the faculty needs to develop a progression within the programmes that draws attention to the whole. In order for the perspectives to permeate through the faculty's programmes, the faculty will support our teachers' professional development and opportunities to develop courses and programmes.

THE FIRST PERSPECTIVE, research links, requires close collaboration between education and research. In a globalised world, internationalisation contributes to our students being equipped for the future. The equality perspective assumes that our education is inclusive, that all students regardless of background, feel welcome. Diversity creates innovation and success, and a level playing field is the cornerstone of the entire university. Collaboration between universities and the surrounding community strengthens our own knowledge development and creates added value and authenticity in our programmes and results in added value for the surrounding community. The fifth perspective, sustainable development, has its starting point in the UN's

17 global sustainability goals [2.3], and is of a multidisciplinary character. Our students' education must be relevant because the students will be active in the labour market for a long time to come.

To achieve this, sustainable development is a fundamental perspective. To solve societal challenges it is important that the students are active in their learning through a high level of ambition and strong commitment. Learning environments are important infrastructures for education, where both students and teachers meet to learn together. In order to maintain a high educational quality, the allocation of the faculty's educational grants to the departments also needs to be regularly reviewed.

The demand from the labour market for the students we educate is high [2.4]. In a government mandate (2018-2023), the faculty is tasked with increasing the number of available spots in the architectural and engineering programmes.

THE APPLICATION PRESSURE on some of the faculty's programmes is not satisfactory at present. The faculty therefore wants to continue to work to promote more applicants with the interest, ambition and sufficient qualifications to take part in our programmes. We therefore need to work with marketing measures both nationally and internationally. A valuable resource in this context consists of Curiosum, Umeå University's new science centre. New groups can be reached through broader recruitment to attract people who, despite good conditions, have previously not applied for higher education. Here we regard the foundation-year programme as one of several important recruitment sources for the faculty's education programmes.

AT SWEDISH HIGHER EDUCATION institutions, the drop-out rate from academic programmes is in many cases high [2.5]. According to a recently conducted drop-out analysis for our information technology programmes, early drop-out is mainly due to difficulties in coping with early courses and mental ill-health. Drop-outs at a later stage are mainly due to the fact that students are offered employment even without a degree. The faculty regards this as problematic to lose students who have the opportunity and willingness to complete their programmes. In order for us to hold onto these students, we also want to work on different levels for increased student completion rates. The Vision for Umeå University states: "By combining our own and the region's strengths, challenges and needs, we continue to develop northern Sweden as a knowledge region". The faculty conducts education in a knowledge-driven organization that, through its combination of breadth and depth, has good opportunities to continue developing in a positive direction.

Referenses

- 2.1 OECD (2018). The Future of Education and Skills. Education 2030. The Future We Want. Report. Paris: OECD.
- 2.2 Umeå University (2019). Quality systems for education. Rule: FS 1.1-1324-18
- 2.3 The UN's global goals. United Nations (2015). General Assembly Resolution A/RES/70/1. Transforming Our World, The 2030 Agenda for Sustainable Development.
- 2.4 SACO (2018). Prospects. Here is where there are available jobs for academics in 2023. Report. Christan Lövgren (editor).
- 2.5 Swedish Higher Education Authority, UKÄ (2017). Tidiga avhopp från högskolan. Analyser av genomströmning på de tio största yrkesexamensprogrammen [Early drop-outs from the university. Analysis of student completion rates in the ten largest professional degree programmes]. Report 2017:17.

GOAL 4: The faculty's education programmes will be attractive and maintain high quality

STRATEGIES:

- The faculty will implement the university's quality system for education
- The faculty will work to ensure that teachers are given both good opportunities for professional development tied to the quality system's six perspectives as well as content-related, generic and pedagogical competences
- The faculty will promote the development of courses, programmes and teaching forms
- The faculty will update the information for students based on an equal terms perspective for broadened recruitment



INDICATORS:

- Number of teachers merited as qualified and excellent
- Number of teachers who have participated in teacher exchanges, spent time at a company or another universities
- Number of incoming and outgoing students (contract students and so-called free-movers)
- Number and percentage of teachers who are women
- Percentage of students per programme that is of under-represented gender or belong to underrepresented groups
- Percentage of courses with a collaborative element
- Percentage of courses that contain elements of sustainable development
- Percentage of courses that contain documented course evaluations
- Number of teachers participating in professional development courses
- Number of courses developed by the faculty in order to strengthen the skills of their teachers
- Number of courses that have teacher who holds a PhD
- Number of courses that have teachers who have professional competence

GOAL 5: The faculty's programmes have a high student completion rate and high quality

STRATEGIES:

- The faculty will work to attract many highly qualified first-choice applicants
- The faculty will promote broader recruitment
- The faculty will develop and conduct recruitment efforts and marketing of our programmes
- The faculty will implement the university's quality system for education



INDICATORS:

- Number of first-choice applicants for the faculty programmes
- Number of foundation-year programme students who continue their studies in our programmes
- Credit increment from first-choice applicants to faculty programmes
- Completion rate of courses, especially for new higher education entrants
- Percentage of students who drop out of their programme in the first year
- Percentage of students who earn degrees from programmes at the faculty
- Number of visits to websites and social media where we promote our programmes
- Percentage of new higher education entrants who have taken part of our targeted marketing efforts
- Number of students who experience mental ill-health according to the quality system student surveys



3. RESEARCH

The faculty's researchers have the best conditions for innovative, pioneering and world-leading research that leads to breakthroughs

IN THE VISION for Umeå University 2020-2022, it is stated that: "Umeå University meets the increased demands of competitiveness brought on by globalisation. We have a strong position in Sweden and the world. Pioneering research makes us world leading in several disciplines and generates results that will benefit society through innovations and applications" [3.1] which is in line with the government's research policy proposition 2017-2020 [3.2]. This is best achieved if the research carried out, regardless of whether it is basic or applied research, is innovative, pioneering, high-quality and world-leading.

HIGH QUALITY CAN be defined as the impact of the research carried out by an organization or individual. A measure of impact is in which journals/channels the research is published. Our staff should publish in reputable journals/channels such as those rated level two in the Norwegian Register for Scientific Journals, Series and Publishers (Norwegian list) [3.3]. Another measurement is the citation rate, which should be high, something that not only indicates that the research we are doing is of importance to others, but can also open up for national and international collaborations. In a report by the Swedish Foundation for Internationalisation of Higher Education and Research, STINT, 2014 [3.4], the scope of internationalisation is emphasised as a good quality marker. In addition, the Swedish Research Council (Vetenskapsrådet, VR) Research overview 2019 [3.5] mentions that a high proportion of international collaborations can increase the degree of citation. Although Sweden's share of highly cited publications over the period of 2015 - 2017 has increased from 10.6% percent to 11.2%, which is above the global average of 10%, and a relatively large proportion of our projects are carried out on the international stage, there are reasons to increase both the rate of citation and internationalization [3.6].

THE ACADEMY SHOULD collaborate with the surrounding society when it comes to both education and research and high quality research paves the way for faculty researchers to be regarded as attractive collaboration partners. An estimate of the societal benefit of the faculty's research can be how many of the faculty's scientific findings that address the UN's global sustainability goals, how many have arisen in collaboration with non-academic actors, and how many result in patents, licensing and start-up of new companies.

THE REPORT FROM the Swedish Research Council "The role of external financing in Swedish higher education research" [3.7] emphasises that external financing, especially from the Swedish Research Council and the European Research Council, ERC, is of crucial importance for the research carried out and is an important quality assurance function. It is therefore important that faculty researchers have a significant proportion of their research externally financed. The share of external funds at our faculty in 2018 was 47% (45% in 2017). This is lower than for most other comparable higher education institutions in the country; in 2017, external financing in Sweden overall was 56% [3.7]. Because there is no rational reason for this, the faculty's external financing rate should be increased. This is particularly important in terms of funding from financiers, where we currently receive a relatively small share of distributed funds, such as from ERC and Vinnova. To succeed, the faculty must provide targeted support in the application process to the departments where external funding is low.

FACULTY RESEARCHERS ARE currently active in many areas [3.8]. One of these is sustainability. The UN's global sustainability goals are the most ambitious goals for sustainable deve-



lopment goals that the world's countries have ever adopted. It is of the utmost importance that these be taken into account by the multitude of actors in our society, both nationally and internationally. As a result, both the government and the research councils have announced targeted investments in sustainability. The faculty's researchers should therefore strive to address the UN's sustainability goals.

ANOTHER AREA IS artificial intelligence (AI), which is a strategically selected area that is prioritized nationally and internationally. At the faculty, there is an unprecedented build-up of AI areas. This venture is conducted through internal priorities, the government initiative AI Competence for Sweden and Wallenberg AI, the Autonomous Systems and Software Program (WASP), which is Sweden's largest single research programme ever, and WASP - Humanities and Society (WASP-HS), which is a multidisciplinary programme in which humanities and social sciences are combined with technical research. Together with the Faculty of Science and Technology and the Faculty of Humanities, Umeå University is also investing in the artistic field through the formation of a centre for architecture, design and art (UmART). This initiative means that Umeå School of Architecture and the Umeå Institute of Design will have increased opportunities to strengthen their research environments.

THE BREATH OF the university and the faculty is a strength that gives us unique opportunities to develop internationally established and recognized research centres.

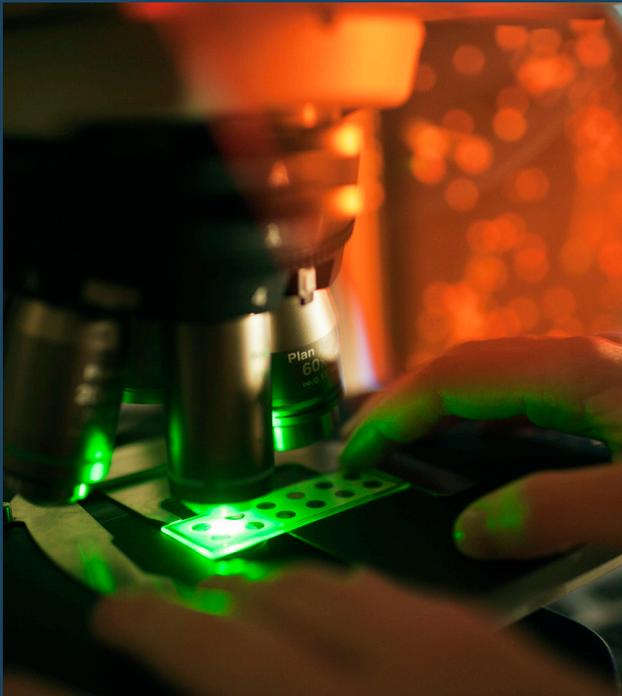
CENTRAL TO THE development of research is also that researchers have access to high-quality research infrastructures. In many cases, it is not possible to develop a separate set of research infrastructures on a local or regional level. To address this, a number of major infrastructures have been established or planned, such as SciLifeLab, MAX IV and the European Spallation Source (ESS). In some areas, access to these is crucial to the possibility of conducting high-quality research and the government has an explicit objective of increasing the use of MAX IV and ESS [3.9]. It is therefore of great importance that the faculty facilitates the use of relevant research infrastructures for our researchers.

THE FACULTY IS currently characterized by the fact that some of its departments are significantly more active in research than others. However, all of our educational programmes must have a research basis and the faculty strives for all departments to conduct research of high quality and to a sufficient extent. One way of achieving this is to develop a resource allocation system that is adequate for all departments. In addition, the faculty must work to ensure that its staff conduct research in areas that are expected to have a positive development in the future. In order to achieve this, we need a research strategy that spans across all research areas within the

GOAL 6: The faculty conducts research of the highest quality that generates a great deal of attention

STRATEGIES:

- The faculty will develop systems to give their researchers good opportunities to conduct top notch research that addresses research issues of high scientific and societal relevance
- The faculty will encourage an increase in the number of publications in highly reputable journals



INDICATORS:

- Number of scientific articles published in journals/channels with peer review
- Number of articles published in level 2 journals on the Norwegian list
- Percentage of articles taking into account the UN's 17 global sustainability goals
- The faculty will have developed a resource allocation system for research conducted at Umeå School of Architecture, the Umeå Institute of Design and the Department of Science and Mathematics Education
- The citation rate of the articles published by the faculty researcher
- Percentage of interdisciplinary and national and international collaborations (the percentage of projects with co-authors from another departments, other national or international higher education institutions or non-academic actors such as research institutes or companies)
- Number of publications authored by the faculty researchers mentioned in patents
- Number of external grants and their size received by faculty researchers
- Number of departments that have implemented adequate procedures to support their researchers in the writing of applications
- Number of applications to the European Research Council, ERC
- Number of grants funded by ERC
- Media impact for faculty press releases

faculty. It is crucial for each academic department that its staff are proficient, skilled and competent. The faculty's researchers must have good ability to generate top-notch research results and also have a good capacity to attract external grants, initiate and manage research projects, motivate and inspire people in their environment and convey the research that is conducted to the surrounding community. To achieve this, the faculty must apply a well-functioning recruitment process and offer staff conducting research good opportunities for professional development in a number of areas. Currently, the faculty has fewer women than men employed in all categories of employment apart from administrators. Although there is less bias in our entry-level positions, such as doctoral student, postdoctoral researcher and assistant professor, there is still a significant imbalance between lecturers and professors (25 and 26% women, respectively) despite measures [3.10]. The faculty will therefore continue to work to ensure that the biased distribution disappears in the long run.

THE FACULTY CURRENTLY has a strong position in a number of research areas. Through strategic work on all levels, we will continue to develop our strengths and reinforce and establish new research specialisations.

GOAL 7: The faculty's researchers have access to top notch infrastructure

STRATEGIES:

- The faculty will work to ensure that its researchers have adequate access to and use the best infrastructures

INDICATORS:

- Number of researchers using regional, national or international research infrastructure facilities

GOAL 8: The faculty has a strategic competence development plan that increases the faculty's competitiveness

STRATEGIES:

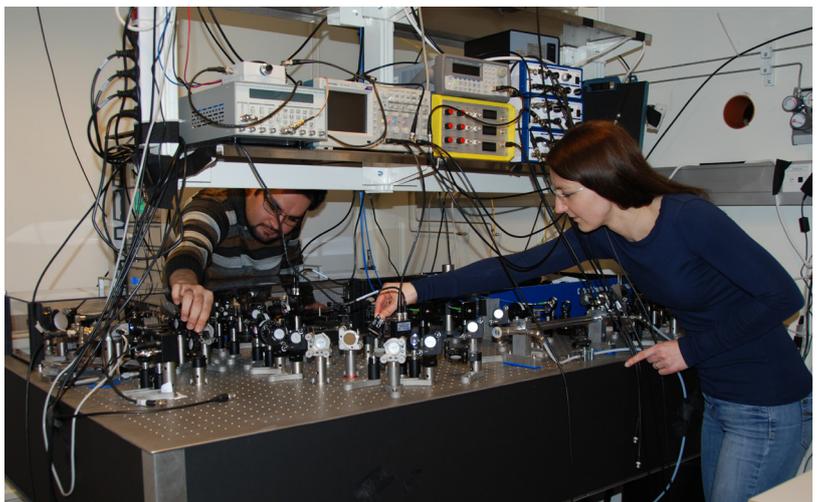
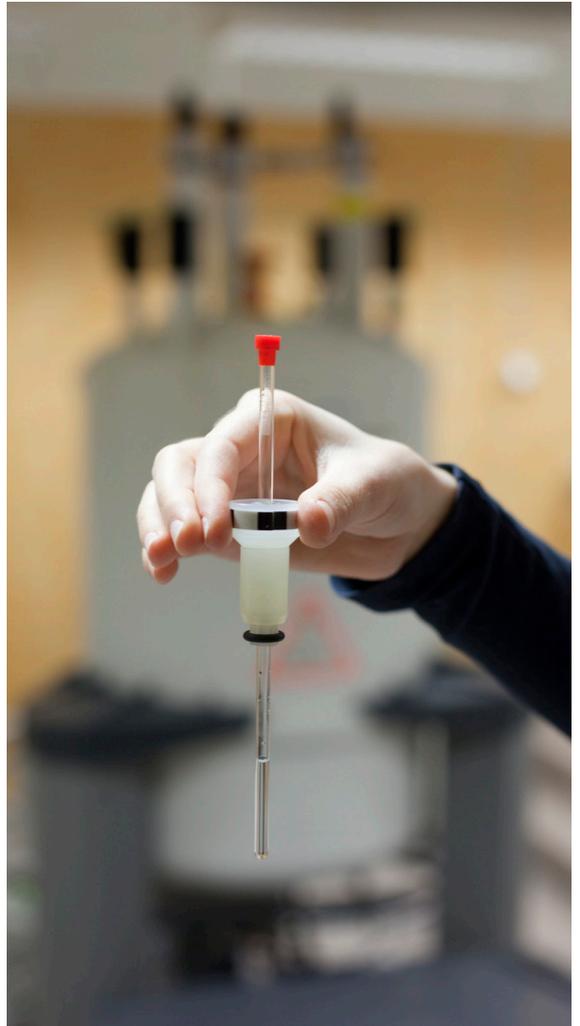
- The faculty will develop and implement a research strategy to identify attractive future research areas
- The faculty will ensure that it has a well-functioning recruitment process to insure competence management and development

INDICATORS:

- A research strategy will have been developed.
- The faculty will have developed a strategy for the field of artificial intelligence, AI
- The faculty will have developed a strategy regarding a strategic competence development plan that takes into account both scientific excellence and gender equality.
- Percentage of new professors who are women

Referenses:

- 3.1. Umeå University (2019). Vision for Umeå University. FS 1.1-96-19
- 3.2. Swedish government (2016). Knowledge in collaboration - for society's challenges and strengthened competitiveness. Research government bill 2016/17:50.
- 3.3 Register of scientific publication channels. Visit <https://dbh.nsd.uib.no/publiseringsskanaler/Forside.action>
- 3.4. STINT (2014). International analysis of higher education and research - global trends and new opportunities. Report 14:02.
- 3.5 Swedish Research Council (2019). Research overview 2019, Natural and engineering sciences, Trends, impact and challenges. Report VR 1905.
- 3.6 Swedish Research Council (2019). Research Barometer 2019. Swedish research in international comparison. Report. Reg. No. 3.5-2019-102.
- 3.7 Swedish Research Council (2019). The role of external financing in Swedish higher education research, a case study of some research-oriented departments. Report VR 1910.
- 3.8. Umeå University (2018). A cluster analysis of the Research at the Faculty of Science and Technology 2009-2016. Report. FS 1.6.2-2099-18
- 3.9 Swedish government (2018). A national strategy for the ESS and the surrounding knowledge environment. Ministry of Education Skr. 2017/18:262.
- 3.10 Umeå University (2018). Annual report 2018, the Faculty of Science and Technology. FS 1.3.3-440-19





4. DOCTORAL STUDIES

The faculty educates the most sought-after doctoral students, who through knowledge, creativity and critical thinking drive science and social development forward

OUR DOCTORAL STUDENTS will play a key role in meeting today's major global challenges, such as sustainable development and opposing phenomena such as increasing factual resistance. It is therefore more important than ever that education on a doctoral level not only conveys subject knowledge at the highest level but also combines this with broad generic skills. A Swedish academic doctor should be a mature and highly skilled researcher and citizen who can identify problems and collaborate with others in order to, in a creative yet critically thinking way, drive science and societal development forward.

THE FACULTY CURRENTLY has a well-functioning doctoral education that almost all departments participate in by educating doctoral students in their subjects. Many of the doctoral students participate in collaborative projects where both academia and companies are represented, for example within the Industrial Doctoral School for Research and Innovation, where the faculty has several doctoral students. However, learning environments vary with respect to size and composition. In its evaluations, the Swedish Higher Education Authority (UKÄ) emphasises the importance of all doctoral students being part of a stimulating and multi-faceted environment. This includes highly merited supervisors, but also assumes broad participation and thus interaction across cultural and social boundaries, and confrontation with today's major sustainability problems. At the Faculty of Science and Technology, most of the environments are international and ethnically mixed. However, many disciplines are characterized by a gender imbalance among both supervisors and doctoral students. Taking measures to improve gender balance in education is therefore a key objective.

EDUCATING CREATIVE and thinking academic doctors also requires that doctoral students are provided with optimal conditions in order to feel good and maintain a study and life balance. Because education at a doctoral level contains many stressful elements, in particular towards the end of the studies or when progress is slow, this is an aspect that must be constantly worked on.

IN 2018 UKÄ PUBLISHED a report on the entry of academic doctors into the labour market [4.1]. The report shows that the majority of doctoral students in science and technology after graduation establish themselves outside of academia. However, the faculty currently has virtually no instruments or procedures to follow up on where doctoral students end up and whether they receive relevant employment in the business sector, public sector, or research and education. An active alumni network and functional contact areas with the stakeholders in the faculty's doctoral studies could remedy this. Platforms that give doctoral students and supervisors the opportunity to come in contact with alumni also facilitates the networking of doctoral students and gives them greater insight into life after the dissertation, while enriching the educational environment. At present, the challenge is to build up suitable contact areas. As a next step, these contact areas should be used in a systematic way to develop and improve doctoral studies.

UMEÅ UNIVERSITY HAS a new quality system since 2019 [4.2], which for the first time includes education on a doctoral level. Because the part of the system that concerns doctoral education is completely new, work is required to implement the system in the best possible way. The faculty's aim is to use this system to ensure that all departments have a doctoral education that is among the very best in Sweden. In particular, all subjects should receive the rating High



Quality in the UKÄ'S regular evaluations. An important part of the work towards creating good environments and high-quality education is to have good competence development plan at all levels. A high-quality doctoral education requires dedicated supervisors who, in addition to being leading researchers, are well trained in supervision and take an active role in the doctoral students' education. However, we also need qualified directors of studies, examiners, programme directors, and most of all talented doctoral students. Competence development at a supervisor level is done through teacher recruitment, where supervisor competence is a factor in the assessment of candidates, although normally not the factor that carries the most weight. Therefore, it is important to organise opportunities where supervisors can further their education, in order to ensure that the research environments achieve an appropriate size and receive good support from the faculty as well as that the most promising doctoral students are recruited.

AN OBSTACLE THAT impedes education on a doctoral level and its continued development consists of insufficient support in the form of effective systems for learning, supervision and administration. For example, neither the web-based individual study plan nor any other system offers suitable functionality to support the collaboration between supervisors and doctoral students, nor the possibility to produce statistics that would simplify the implementation of the quality system. It should be possible to develop or purchase systems for such purposes, but this requires careful preparatory work to identify the conditions, needs and possible solutions. The faculty currently has, with few exceptions, a well-functioning education on a doctoral level and the academic doctors who are educated at the faculty are attractive on the labour market. Through continuous development work, we will continue to strengthen the conditions for doctoral studies of the highest quality.

GOAL 9: All doctoral students are part of stimulating and multi-faceted environments with qualified supervisors who promote the doctoral students' maturation process, creativity and future careers

STRATEGIES:

- The faculty shall ensure that each doctoral student is part of a well-functioning environment of suitable size
- The faculty will improve the gender balance in postgraduate education, both among supervisors and doctoral students
- The faculty will work to ensure that doctoral students thrive and are provided in general with conditions for a good study and life balance

INDICATORS:

- The percentage of doctoral students included in a well-functioning environment of suitable size
- The programme's graduation rate
- Gender equality among both supervisors and doctoral students
- The percentage of PhD students experiencing mental ill-health

GOAL 10: All doctoral students educated at the faculty are attractive on the labour market

STRATEGIES:

- The faculty will improve the education's contact areas with stakeholders and alumni

INDICATORS

- A systematic alumni activity has been started on a faculty or department level
- The percentage of alumni who believe they have been employed where they can make good use of the knowledge and skills that they acquired through their education
- Faculty doctoral graduates are coveted by employers in relevant sectors
- Doctoral graduates who choose an academic career are employed at reputable higher education institutions within and outside the country

GOAL 11: All departments at the faculty have high-quality postgraduate education

STRATEGIES:

- The faculty will implement the university's quality system for education on a doctoral level
- The faculty will work to improve tools and systems for learning, supervision and administration in education on a doctoral level

INDICATORS:

- Number of activities in the quality system that have been implemented
- The percentage of the faculty's postgraduate programmes that have been rated as high-quality by UKÄ
- Graduation rate in education on a doctoral level

Referenses

- 4.1 Swedish Higher Education Authority, UKÄ (2018). Doktorsexaminerades etablering på arbetsmarknaden Examinerade åren 1998-2012 [The establishment of PhD graduates on the labour market. Graduates between the years 1998-2012]. Report 2018:1.
- 4.2 Umeå University (2019). Quality systems for education. Rule: FS 1.1-1324-18





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