FINNISH EDUCATION EVALUATION CENTRE

EVALUATION OF HIGHER EDUCATION IN SCIENCE

Summary of key findings and recommendations

SUMMARIES 5:2025

Contents

Summaries 5:2025
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1 Introduction

This publication discusses the key findings and recommendations of the evaluation of science education conducted by the Finnish Education Evaluation Centre (FINEEC) in 2023–2025 on the basis of the evaluation report (Lundell et al., 2025).

The evaluation of science education produced an overall idea of the strengths and development areas of science degree programmes in relation to education development, competence produced by the degrees and their labour market relevance, and continuous learning. The evaluation also created a comprehensive national understanding of science degree programmes and the possibilities associated with them as implementers and enablers of the measures outlined in the Finnish National STEM strategy (Ministry of Education and Culture, 2021) and the European STEM strategy[1] (European Commission, 2025).

The evaluation focused on science degree programmes leading to Bachelor of Science, Master of Science and doctoral degrees. The evaluation covered chemical and physical sciences, biosciences, environmental sciences, geosciences and geography as well as mathematics and statistics.

Versatile quantitative and qualitative datasets were collected for the evaluation. The data were collected from students, university representatives and employers outside the universities. In addition, the evaluation also drew on responses to teacher and student surveys carried out in an evaluation titled The evaluation of the state and renewal of higher education pedagogy (Toom et al., 2023).

The evaluation of higher education in science supports the national development of education in this field. The results of the evaluation can be used by not only those engaged in developing science education in universities but also policy-makers and stakeholders external to higher education in science.

1 The STEM fields are science, technology, engineering and mathematics. The English acronym STEM stands for science, technology, engineering and mathematics – and information and communications technology (ICT) fields.

2 Evaluation questions

Picture: Scott Graham on Unsplash

The key evaluation questions were:

- How are the resources and development of science degree programmes ensured?
- How is the attractiveness of education, student engagement in studies, and smooth progress in studies ensured in science degree programmes?
- What kind of competence does higher education in science generate and how?
- What is the relevance of higher education in science to the labour market? How do the degree programmes respond to changes in environment?
- How do the provision and practices of continuous learning ensure the development of competences in the sciences in the future?

3 Evaluation data

Picture: Campaign Creators on Unsplash

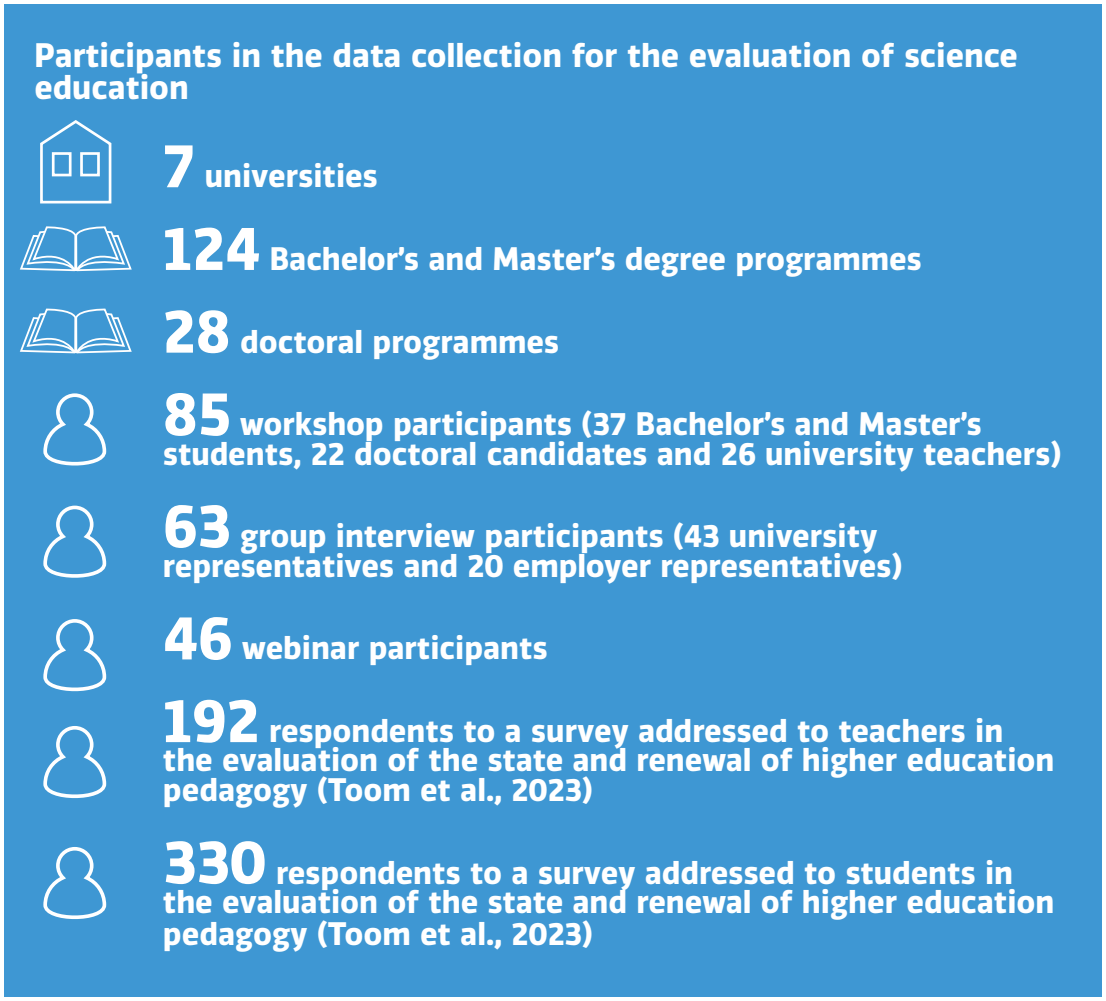

FIGURE 1. Participants in the data collection for the evaluation

4 Higher education in science in Finland

Picture: AI-genereted – Gamma (Ideogram)

Higher education in science is provided at seven universities in Finland. Bachelor's, Master's and doctoral degrees in science (chemical and physical sciences, biology and biosciences, environmental sciences, geosciences, mathematics and statistical sciences) in the fields covered by this evaluation can be completed at a number of faculties, depending on the university (see Table 1).

TABLE 1. Universities and faculties that provide science education

University	Faculties that provide science education covered by the evaluation
University of Helsinki	Faculty of Biological and Environmental Sciences Faculty of Pharmacy Faculty of Medicine Faculty of Agriculture and Forestry Faculty of Science
University of Eastern Finland	Faculty of Science, Forestry and Technology Faculty of Health Sciences Faculty of Social Sciences and Business Studies
University of Jyväskylä	Faculty of Mathematics and Science
University of Oulu	Faculty of Biochemistry and Molecular Medicine Faculty of Science Faculty of Technology
University of Tampere	Faculty of Information Technology and Communication Sciences Faculty of Medicine and Health Technology
University of Turku	Faculty of Medicine Faculty of Science Faculty of Technology
Åbo Akademi University	Faculty of Science and Engineering

There has been no major change in the number of students studying for Bachelor's and Master's level science degrees and the number of completed degrees in 2019–2023, with the exception of an increase in the number of degrees completed in 2020 (see Figure 2). The number of doctoral candidates in the field of science has increased steadily from 2019 to 2023 (see Figure 3).

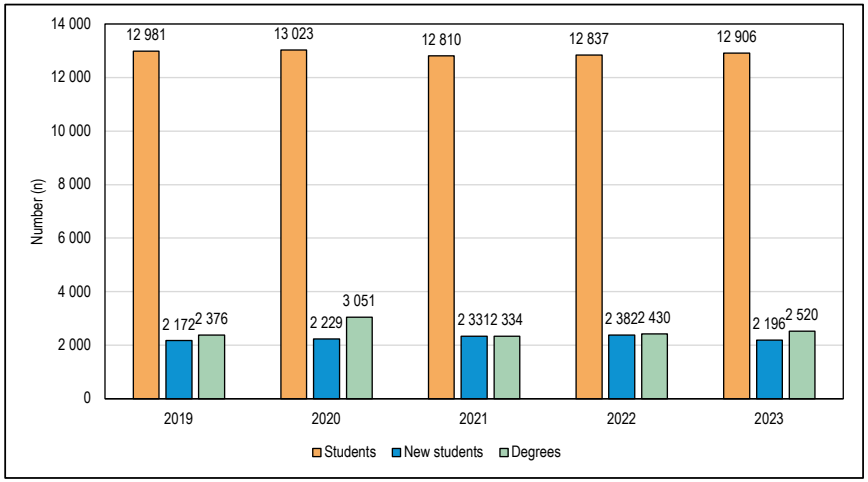

FIGURE 2. Numbers of Bachelor's and Master's degree students, new students and completed degrees in the field of science in 2019–2023 (Vipunen, 2025)

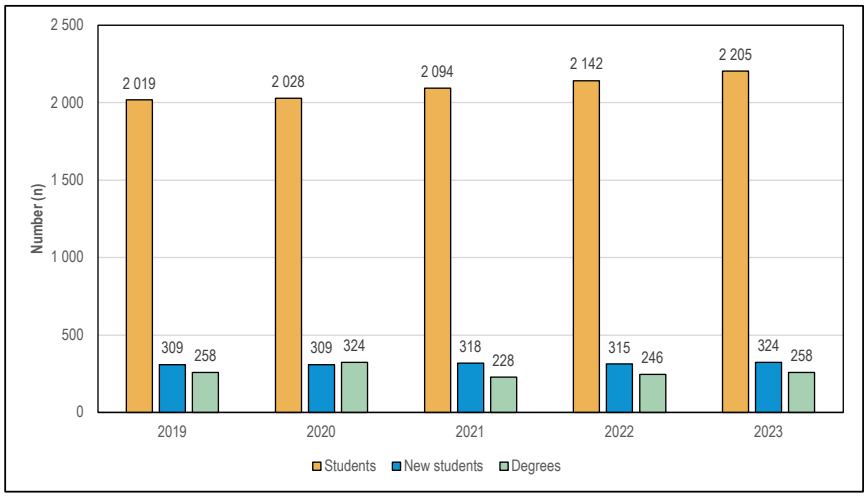

FIGURE 3. Numbers of doctoral candidates and doctoral degrees completed in the field of science in 2019–2023 (Vipunen, 2025)

In 2023, the University of Helsinki had the highest number of science students (4,800) and the University of Turku the second highest (2187 students), while Åbo Akademi University had the lowest number (459).

The University of Helsinki had the largest number of doctoral candidates in the field of science (1,044) in 2023. A total of 108 doctoral degrees were completed at the University of Helsinki. The lowest numbers of doctoral candidates and completed doctoral degrees were recorded at the University of Tampere, with 105 doctoral candidates and nine completed degrees.

As few as 8 % of all students who started their studies in science degree programmes in academic years 2013–2014 and 2014–2015 completed a Master's degree in their original degree type within the target time of five years (see Table 2). In relative terms, the lowest completion rate five years after starting the studies was seen in the field of chemistry (3 %) and the highest in general science degree programmes (20 %) (Vipunen, 2025). As few as 36 % in total of those who started their studies in science degree programmes had completed their degrees within seven years.

TABLE 2. Relative share of graduates with a Master's degree in the original degree type of those who started their studies in academic years 2013–2014 and 2014–2015 (Vipunen, 2025)

Field of study	Relative share of graduates (%) of those who started		
	5 years	6 years	7 years
Total for all fields of science	**8**	**21**	**36**
Science, general degree programmes	20	38	45
Environmental fields	11	31	45
Mathematics and statistics	11	21	34
Biology and biosciences	9	38	45
Geosciences and geography	5	27	43
Physics	5	16	30
Chemistry	3	11	31

A number of science degree programmes leading to a Master's degree or doctorate are delivered in English. More than one half of the Master's degree programmes that responded to the self-evaluation survey had English as their main language of study.

From 2019 to 2023, the number of Bachelor's and Master's degree students with a foreign background increased by 74 %. In 2023, 36 % of all doctoral candidates in the field of science had a foreign background (see Figure 4).

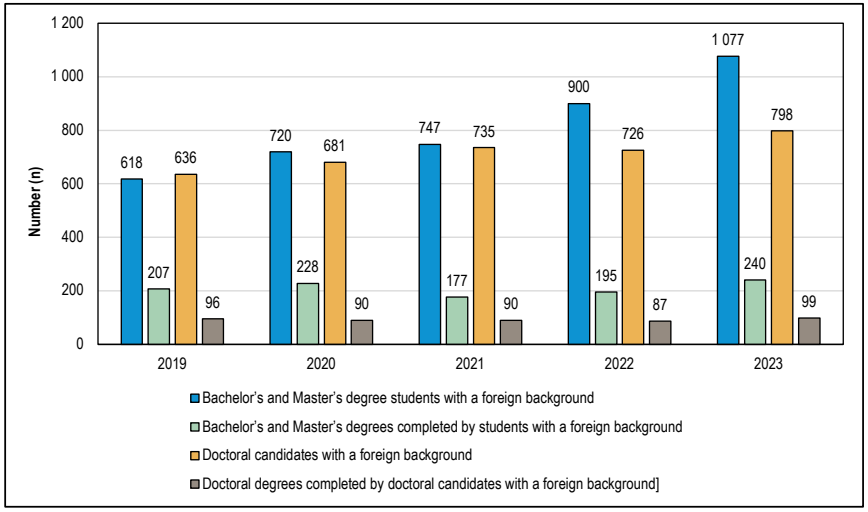

FIGURE 4. Numbers of students with a foreign background and degrees completed in the field of science in 2019–2023 (Vipunen, 2025)

In 2023, approx. 2 % of Bachelor's and Master's degree students in the field of science took part in an international exchange of more or less than three months in duration. Exchanges longer than three months dropped to their pre-COVID-19 level of 2019 in 2023 (see Figure 5). While exchanges of less than three months in duration increased by almost 80 % between 2019 and 2023, their number remained low.

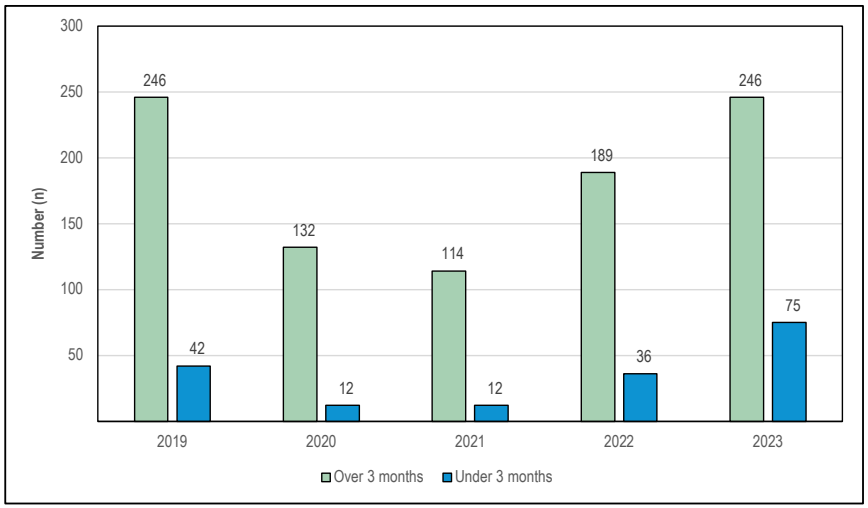

FIGURE 5. Numbers of Bachelor's and Master's degree students in the field of science who went on international exchanges in 2019–2023 (Vipunen, 2025)

5 Key findings

5.1 Resources and development of science degree programmes

Picture: Word

When new degree programmes in science are launched, the focus tends to be on labour market needs and future skills requirements. However, scientific content and an interdisciplinary approach are stressed more than labour market needs in the planning of degree programmes.

In Bachelor's and Master's degree programmes, updates of learning outcomes and contents are guided by the personnel's expertise, student feedback and research in the field. The renewal of doctoral programmes is guided by developments in science and research, in particular, whereas less attention is paid to graduate and employer feedback as well as foresight information. The degree programmes do not systematically collect or use feedback from external stakeholders, which is why the labour market perspective is not particularly visible in degree programme development. According to the degree programmes, the infrastructure, teaching facilities and teaching tools are mainly adequate. As the greatest challenges in this respect are seen resources allocated to teaching and development work. The degree programmes respond to the resource-related challenges through flexibility in the teaching staff's working hours and workload, adaptation of teaching, and cooperation with other degree programmes and higher education institutions. In almost all universities that participated in the evaluation, research staff and doctoral candidates also teach.

Cooperation opportunities with other degree programmes or universities are not yet systematically tapped in degree programme development and delivery of teaching. According to teachers' experience, teaching and its development are also not appreciated as much as research in universities, which may undermine the teaching staff's work motivation and possibilities for long-term development of teaching.

> **Cooperation; why not at the level of individual degree programmes at first, allowing teachers to know what is covered in courses taught by other teachers. Once we understand each other at this level, cooperation between degree programmes and even higher education institutions can be considered.**
>
> Teacher survey, open-ended answer

RECOMMENDATIONS

Science degree programmes should engage in more systematic cooperation with labour market representatives in the planning, delivery, evaluation and development of degree programmes.

Science degree programmes should engage in closer and more systematic national cooperation between programmes in the same field, making it possible to allocate teaching resources to small group teaching or laboratory and field teaching, for instance.

Degree programmes should ensure that teaching staff's working hours enable content-related and pedagogical development of teaching. A precondition for this is more strategic planning of human resources and cooperation between teaching staff members.

Degree programmes should secure support services for teaching and education as well as maintain and develop teaching facilities and the research infrastructure used for teaching. The adequacy of support services and physical resources should be continuously evaluated, and the flexibility of resources should be ensured in different situations of change.

When renewing the learning outcomes and contents of doctoral programmes, feedback from graduates and employers as well as foresight information regarding skills needs should be used more systematically.

In order to increase the appreciation of teaching, it should be ensured that teaching-focused career paths are recognised and valued equally with research in career progression.

5.2 Attractiveness of science education, student engagement and ensuring smooth progress of studies

Picture: Brooke Cagle on Unsplash

Just love the subject.

Student workshop, Bachelor's level student

Science degree programmes take a number of measures in an effort to improve their attractiveness, including cooperation with upper secondary schools, social media visibility and participation in various marketing and introductory events. Visits to educational institutions and participation in the activities of LUMA Centres are key forms of cooperation in which especially subject teacher programmes participate actively.

Students' interest in pursuing science studies is primarily influenced by their personal interest, teachers' encouragement, and desire to work with meaningful societal challenges.

Students' smooth progress and engagement in their studies are fraught with many challenges, such as lack of study skills, poor basic skills in mathematics and science, and problems with students' well-being and life management. The degree programmes strive to respond to these challenges by providing personal guidance, developing study paths and supporting study skills. Despite this, some students still find the counselling and support insufficient.

While students welcomed distance learning, they hoped for more contact teaching especially at the beginning of their studies, as distance learning may drive feelings of loneliness. Interest in the field and engagement in studies are affected negatively by uncertainty about the kind of competence the education produces and the career options the graduates will have.

We have so little contact teaching in small groups that as a result of all this, you can easily be left really alone, no matter how motivated and interested you are in your field.

Student survey, open-ended answer

RECOMMENDATIONS

The attractiveness of science education should be increased through flexible study paths and by stepping up and diversifying cooperation with general upper secondary schools and vocational institutions.

Science education should enhance student engagement and foster and promote a sense of community among students at different stages of their studies by using teaching and guidance methods that promote group cohesion.

Students' engagement and study motivation should be strengthened by developing student-teacher interaction and information provision on guidance and study support measures. Degree programmes should develop more systematic ways of collecting and drawing on students' experiences of the support and guidance they receive.

Degree programmes should support students' engagement and networking with the scientific community and introduce them to diverse career paths and employment opportunities.

Science teachers' guidance skills should be improved and supported to promote student-centred teaching. Degree programmes should work on monitoring students' progress throughout their studies.

5.3 Competences produced by the higher education in science

Picture: AI-generated – Gamma (Ideogram)

> **Some of the key things are that people are seeking meaningful careers and that you must be able to articulate how science is the career that can solve these big and small problems of the world.**
>
> Interviews, university representative

The profiling of science degree programmes is rather fragmented. Degree programmes' responses indicate that there is little content-based or national profiling, and profiling is not clearly verbalised.

While multisectoral and interdisciplinary cooperation is considered important in science education, the practical implementation of cooperation remains limited. Teachers and students in science education called for more cooperation between both different disciplines and with employers.

Strong subject knowledge and broad-based competences are characteristic of the competences produced by the degree programmes, whereas shortcomings in work-life skills and labour market relevance of the degree programmes emerged as weaknesses. The way sustainability competence is integrated into the contents and objectives of different degree programmes varies a great deal. Sustainability competence is one of the learning outcomes in some degree programmes, whereas there are also programmes in which sustainability competence plays no role at all yet.

Degree programmes' responses indicate that the development of students' science competence is supported and ensured in many ways. Instead of traditional lectures, efforts have been made to diversify teaching through various pedagogical solutions. While teachers use various digital possibilities in teaching, they do not have enough time to develop their digital pedagogy competence. AI also remains little used in teaching. Students find that their feedback makes no impact on the development of teaching.

All teachers should take a minimum volume of pedagogical studies to ensure their skills in constructive alignment of teaching. Pedagogical competence should also be updated at certain intervals.

Teacher survey, open-ended answer

Most courses follow the same track and formula that has been used for the last 20 years. The digital know-how of teachers of some courses is non-existent. You can see that some lecturers have an incredibly large amount of knowledge about something, but they are unable to pass it on to students comprehensibly. I would also like to see improvements in cooperation between teachers and students in course completions. The students' opinions are not usually asked at all.

Student survey, open-ended answer

Internationality is more prominent in Master's and doctoral programmes than in degree programmes leading to a Bachelor's degree. In Bachelor's and Master's degree programmes, encouraging students to study foreign languages is the key manifestation of internationality, whereas in doctoral programmes it is about having international doctoral candidates.

RECOMMENDATIONS

Master's degree and doctoral programmes in science should define and verbalise their profiles more clearly, ensuring that different degree programmes can stand out better with their attractive and specialised profiles. As Bachelor's programmes offer basic skills, they could profit from more efficient national cooperation.

Degree programmes should develop multisectoral and interdisciplinary cooperation in the planning and delivery of teaching. Teachers' and students' engagement in this co-operation should be improved.

Teachers and doctoral candidates in the field of science should have more opportunities to participate in subject pedagogy studies and strengthen their pedagogical education. Subject teacher education in science should be used more extensively as staff training for both class and subject teachers and the teaching staff at universities.

Teachers in the field of science should apply different learner-centred and evidence-based teaching and guidance methods more diversely at all stages of studies.

Degree programmes should improve teachers' digital skills and opportunities to develop their digital pedagogy skills as well as the use of artificial intelligence in teaching, in addition to digital learning platforms and exams.

Sustainability competence should play a larger part in all science degree programmes. The link between sustainability competence and solving multidisciplinary global challenges should be made visible in more concrete terms.

The work-life skills of science degree graduates should be improved further. Key skills from the labour market perspective include interaction and problem-solving skills, language skills needed in the workplace, and project management skills. Students should be supported in articulating their competence and work-life skills gained during their studies.

Degree programmes should ensure that international students and doctoral candidates can also actively participate in education development.

5.4 Science degree programmes' labour market relevance and ability to respond to changes in the operating environment

Picture: AI-generated – Gamma (Ideogram)

While science degree programmes rely on cooperation with the world of work and alumni networks for foresight information on future skills needs, such information is not collected systematically. However, especially Bachelor's and Master's degree programmes in science have reacted to changes in this field by incorporating in the degrees studies that focus on work-life skills, including artificial intelligence and sustainability competence, and by reinforcing connections with the world of work. Doctoral programmes are less likely to react to changes in the world of work outside the university than Bachelor's and Master's programmes.

Whereas degree programmes work together with employers in different networks as well as in the context of theses, dissertations and research, employer representatives do not play a large role in curriculum work and degree programme development. Cooperation with employer representatives is rarely seen in teaching, and little is done to extensively develop teachers' working life competence outside the university, for example in form of professional development placements. While degree programmes organise various meetings with employer representatives and alumni, cooperation with the world of work is not developed systematically.

> **Companies should be involved in teaching. For example, courses should have visiting lecturers and sample assignments related to the course topic that come directly from companies. This enables companies to make themselves known. Joint thesis and research projects can be created based on teaching cooperation.**
>
> Teacher survey, open-ended answer

Degree programmes support doctoral candidates' labour market transition by means of studies that develop work-life skills and through research cooperation as well as by offering opportunities for networking. However, doctoral candidates' career guidance still has room for improvement.

Degree programmes offer little support for international students' transition to the labour market. The support methods include introductions to job opportunities and networks, encouraging students to study Finnish or Swedish and have traineeships, and joint studies with Finnish students.

> **We have made Finnish language courses compulsory for international students. We have a trainee programme and cooperation with companies, and we focus on placements.**
>
> Interview, university representative

RECOMMENDATIONS

Science degree programmes should regularly evaluate the labour market relevance of the education based on different types of monitoring and feedback data.

The field of science education should collect and use more actively and systematically foresight information on changes in the labour market and future skills needs in the planning of degree education.

Degree programmes should develop long-term, systematic collaboration with employers outside the university, starting from Bachelor's programmes.

Science degree programmes should make better use of international networks to offer students extensive educational opportunities and different career paths.

Teaching staff's working life competence should be actively developed in cooperation with employers outside the university. Teaching staff should obtain up-to-date information and personal experience of the world of work outside the university to support teaching development.

To support doctoral candidates' transition to the labour market outside the university, doctoral programmes should develop systematic models and practices together with employers. Degree programmes should contain more studies that support work-life skills and career choices.

The education of international students and doctoral candidates should be more strongly connected to diverse professional networks during their studies to support their opportunities for staying in Finland and integration into Finnish society after graduation. The studies should include more instruction in Finnish or Swedish, enabling students to improve their language proficiency in the workplace.

5.5 Provision and development of continuous learning

Picture: AI-generated – Gamma (Ideogram)

We at universities have not really understood yet what providing continuous learning means for us, but the cohorts are getting smaller and even if we get more foreign students, this will not solve all problems either. I think we should really focus a bit more on continuous learning.

Interview, futures expert

The provision of continuous learning in science education is primarily based on existing courses, rather than planning the offer for labour market needs. There is little cooperation with other higher education institutions and employers on planning and implementing the offer of education.

In science education, the strength of continuous learning lies in interesting and interdisciplinary contents of the programmes, whereas the meagre resources available for planning and delivering teaching and developing the provision of continuous learning are a challenge. Currently, key target groups for continuous learning courses are career changers, general upper secondary school students, and mathematics and science teachers.

RECOMMENDATIONS

Degree programmes should work together on the planning and delivery of continuous learning courses as well as on communicating about the educational opportunities to the world of work and other target groups for continuous learning.

The contents of continuous learning courses and micro-credentials should be planned and developed together with the world of work in order to meet labour market skills needs better.

Degree programmes' teaching resources should be managed and developed strategically, addressing the planning and provision of continuous learning courses.

6 Key strengths and recommendations

Picture: Junior Ferreira on Unsplash

The evaluation of higher education in science formed an overall idea of education in this field on the basis of different types of datasets. The evaluation produced information on the strengths and development needs of the field in relation to its skills needs and future operating environments.

This section summarises the key strengths and development recommendations discussed in the evaluation report abstract.

KEY STRENGTHS OF SCIENCE EDUCATION

The launch of new science degree programmes is influenced by labour market needs and future competence requirements. The planning of degree programmes is based on scientific content and an interdisciplinary approach.

Interest in the field, encouraging teachers and the opportunity to work on issues that are significant for the future affect students' interest in pursuing science education.

The strengths of the competence produced by the degree programmes include subject knowledge and a broad scope. Masters and doctors graduating from science degree programmes are satisfied with the academic skills produced by the degree.

Degree programmes have reacted to changes in the field of science by adding work-life skills to the studies. In efforts to improve work-life skills, AI skills and sustainability competence as well as stepping up and strengthening cooperation with the world of work are emphasised.

KEY DEVELOPMENT RECOMMENDATIONS FOR SCIENCE EDUCATION

Degree programmes should engage in closer and more systematic national cooperation in order to promote the attractiveness of the field and to develop the programmes.

Degree programmes should strengthen students' engagement in their studies and support and promote their sense of community through teaching and guidance methods that promote group formation.

In order to increase the appreciation of teaching, it should be ensured that teaching-focused career paths are recognised and valued equally with research in career progression. Teachers' pedagogical competence and guidance skills should be improved and supported to promote student-centred teaching.

Science degree graduates' work-life skills and career awareness should be improved further. Students should be supported in articulating their competence and work-life skills gained during their studies. The education of international students and doctoral researchers should be strengthened by connecting to various working life networks that support their possibilities of staying in Finland after graduation.

Degree programmes should develop their cooperation with employers outside the university systematically and over the long term. The field of science education should collect and use more actively foresight information on changes in the world of work and future skills needs in the planning of degree education and continuous learning programmes.

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Good practices for improving in studies and students' competence

Developing curricula and study paths

- Drawing up model timetables
- Listing and scheduling compulsory courses
- Providing a recommended order of course completion
- Teachers' joint discussions on using previously learned knowledge in subsequent courses
- Identifying and developing courses that have proved challenging for students
- Critical examination of the contents and timing of courses and eliminating overlaps
- Clear course descriptions and learning outcomes, also including skills-related goals
- Clarifying and describing study paths leading to a degree
- Starting laboratory and field studies right at the beginning of the programmes
- Integrating language and communication studies into courses

More effective study guidance and monitoring

- Compulsory orientation course and career planning course
- Tutor teacher activities and teacher tutoring
- Personal study plan counselling with group and individual guidance
- Active monitoring of progress in studies and personal contacts if necessary
- Course and semester-specific feedback events
- Students' peer guidance as well as financial and practical support for other peer group activities (teachers' visits to peer groups)

Support for study skills

- Addressing changes in students' basic knowledge and skills
- Refresher and remedial courses and workshop-based tutoring in mathematics
- Courses that support study and work-life skills

Students' group formation and supporting their sense of community

- Supporting students' group formation and sense of community through pedagogical solutions
- Increasing contact teaching and student-teacher interaction
- Laboratory work in pairs at the beginning of studies under guidance
- Interdisciplinary research projects

Flexibility of studies

- Flexible course completion methods
- Developing recognition and accreditation of prior learning and studification
- Offering more optional studies
- Cooperation studies with other higher education institutions
- Course schedules that enable international exchanges

Improving labour market relevance

- Active cooperation with employers during courses
- Versatile teaching and learning methods that support the development of students' work-life skills
- Workplace studies
- Compulsory or optional internships and internships in research groups
- Possibility of doing lab work in research laboratories and companies
- Combining practical work and theoretical studies from the beginning of programmes
- Recommending studies in Finnish and academic study skills to international students
- Developing language proficiency and ability to operate in a multicultural environment through joint courses of degree programmes taught through Finnish and English

Developing the thesis process and guidelines

- Annual calendar and follow-up at mid-term seminars for theses
- Compulsory thesis seminars
- Courses that support thesis work, including project planning, scientific writing and communication, ethical questions, introduction to literature and laboratory methods
- Theses produced in corporate cooperation or research projects
- Annual Master's thesis camp

Improving the efficiency of thesis supervision and the training of supervisors

- Supporting and training thesis supervisors and rewarding participation in training
- Two supervisors per thesis
- Regular thesis supervision meetings and agreement on common goals
- Group guidance for theses, peer support groups for writing and writing workshops

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