Self-evaluation report for programme evaluation of: Master's Programme in Biomedicine

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The Assessment Panel's report for the programme evaluation of: Master's Programme in Biomedicine

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Self-evaluation and Assessment Panel's report for the programme evaluation of the programme: Master's Programme in Biomedicine

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Introduction

The programme's responsible parties, together with representatives from the faculty and students, should conduct a reflective self-evaluation by identifying strengths and areas for improvement in the programme. They should also describe and evaluate how these areas are addressed to ensure high-quality education. The focus of the self-evaluation should be on reflection rather than description. The self-evaluation should be supported with examples if possible. It should be based on the current status of the programme at the time of submission. The self-evaluation should be based on the four assessment areas listed below, which include ten assessment criteria.

1. Preconditions
1.1. Staff
1.2. Learning environment

2. Design, implementation, and outcomes
2.1. Goal attainment
2.2. Equal opportunities
2.3. Sustainable development
2.4. Follow-up, measures, and feedback

3. Student perspective
3.1. Student perspective

4. Work-life and collaboration
4.1. Work-life and collaboration
4.2. Internationalisation
4.3. Interprofessional competence

The self-evaluation should follow the provided headings. The headings, including the assessment criteria in the template, must not be removed. Subheadings may be added if necessary. The template's formatting, such as margins, must not be changed. The programme's text should consist of 1-3 pages per section, with font size 11 points and single spacing. The self-evaluation should provide the assessment panel with a comprehensive overview of the programme without including links to additional information. It should begin with a brief description of the programme's organisation, structure, and overall focus, with justification in relation to the degree regulations. The self-evaluation should also explain how long the education has been provided at KI. In the self-evaluation for the assessment criterion "Follow-up, measures, and feedback" and "Student perspective," an overall description at the KI level should also be included. This description is already prepared centrally by KI in this templet. The self-evaluation should conclude with the section "Other aspects," where the programme can describe relevant areas that are not included in any of the assessment criteria, such as other generic competencies and forward-looking developments to enhance the programme's quality.

The following attachments are to be included in the self-evaluation:
• Teacher table for teacher competence and capacity. The table should provide an overview of the main teacher competence and capacity for the programme. It is not necessary to report all teachers who teach. The teacher table is compiled in an Excel file that contains additional instructions.
• Mapping of the outcomes of a Master’s degree to course learning outcomes, learning activities, and assessments. The mapping should provide an overview of

which courses have learning outcomes related to the evaluated outcomes of a Master's degree. The mapping should also indicate which learning activities are used to support student learning to achieve the learning outcomes and how the learning outcomes are assessed. The mapping is compiled in an Excel file that contains additional instructions.

- Programme curriculum.
- Course syllabi for all courses included in the programme.
- Compilation of key figures regarding application numbers per place, number of students starting the programme, number of full-time equivalent students, and number of graduates.

The programme should compile the information in the teacher table and the mapping of outcomes for a Master's degree, while the programme curriculum, course syllabi, and key figures will be provided centrally by KI.

The academic advisor for the programme evaluation round, together with the coordinator for programme evaluations, should review that the programmes' submitted self-evaluations are complete before sending them to the assessment panel.

If necessary, the assessment panel may request additional supporting documents to ensure their assessment of the programme.

The self-evaluation should be approved by the committee responsible for the programme.

The Assessment Panel's Report

The Assessment Panel is required to summarise their assessment in a report that is written in the same document as the self-evaluation. For each assessment criterion, the programme's strengths and areas for improvement, as well as the Assessment Panel´s assessment, should be described under separate headings. Under the "Strengths" heading, the Assessment Panel should highlight the programme's strengths within the assessment criterion and describe them briefly, preferably in bullet points. Under the "Areas for Improvement" heading, the Assessment Panel should identify areas that are deemed in need of improvement and describe them briefly, also preferably in bullet points. Under the "Assessment" heading, the Assessment Panel should explain their assessment and motivate their conclusions.

A summary of the Assessment Panel´s work should be described under the "Assessment Panel´s Summary" heading. It should begin with a reflection on the conditions that the self-evaluation provided for assessing the programme's quality, such as whether the self-evaluation was easy to read, well-structured, provided answers to the questions posed, and followed the instructions. The summary should also briefly summarise the programme's most important strengths and areas for improvement. The Assessment Panel may also include any additional comments they wish to convey.

Once the Assessment Panel´s report has been submitted, the self-evaluation and the report should be published on KI's staff portal.

Self-evaluation

Programme: Master's Programme in Biomedicine

Degree: Master of Medical Science with a major in Biomedicine

Description of the programme

The programme's organisation, structure, and overall focus will be outlined in this section, along with a justification in relation to the degree regulations.
The programmes should also explain how long the program has been provided at KI.
The description should be between 1-3 pages, using font size 11 and single line spacing.

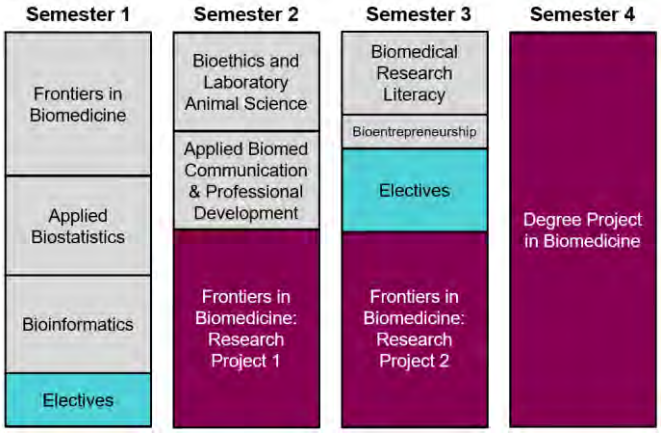
Programme description:
Introduction to the Master's Programme in Biomedicine at KI
Education in biomedicine started at KI in 1995 with the introduction of a 4-year "Magister" programme (240 ECTS). The programme was started to meet the increasing demand for graduates in molecular medicine, with knowledge and skills covering the concept of "from molecule to patient" (translational medicine/research). This was coupled to the accelerating development of techniques in the fields of molecular biology and bioinformatics, and the increasing need for graduates trained in these areas in medical research. In line with the Bologna process, biomedical education at KI transitioned into a 3-year Bachelor's Programme (180 ECTS) and a 2-year Master's Programme (120 ECTS) in 2007. From its initiation, the Master's Programme in Biomedicine was international, with all education performed in English and attracting students from across the globe. Initially the programme had 40 places, but this was increased to 50 in 2021 to coincide with the launch of the new curriculum (current targets are 33 state-funded and 17 fee-paying students). Each year some students who have previously completed the Bachelor's Programme in Biomedicine at KI are successful in gaining places in the Master's Programme in Biomedicine (numbers vary, but usually no more than 20% of the places). Admission to the programme is highly competitive, with over 600 eligible applicants each year, of which approximately 250 place the programme as their first choice. Once admitted to the programme, completion rates are extremely high with only occasional students failing to graduate. The programme was designed to produce graduates with the skills and competences necessary for careers in academic biomedical research, research in life science companies (start-ups and established pharmaceutical companies) and clinical trials, and after additional training, positions in marketing and media. Alumni contact/surveys show that the programme has been successful in this ambition.

Programme Organisation and Design
The Programme Committee for the Study Programmes in Biomedicine is responsible for the Master's Programme in Biomedicine. The programme leadership consists of the Programme Director (appointed by the Committee for Higher Education in 2021), the Director of Studies (appointed by the Programme Committee in 2021) and the Chairman of the Programme Committee (appointed by the Committee for Higher Education in 2022). All three have extensive experience in biomedical research and have complementary areas of expertise, ranging from basic molecular biology to cell and animal models and *in vivo* human studies. Administrative support is provided centrally by the Education Office for the Medical and Biomedical Programmes, including the Programme Officer and Study Counsellor. The Programme Committee is

also responsible for the Bachelor's Programme in Biomedicine and for the two "Stockholm Trio" Master's Programmes in Molecular Techniques in Life Science, and Biostatistics and Data Science, creating an environment for the four programmes to benefit from the respective competencies and skills represented. The Programme Committee holds meetings approximately once per month.

The overarching goal of the Master's Programme in Biomedicine is to investigate the human body in health and disease at the molecular level and to consider individual variation. This provides a basis for understanding the course of disease, for developing new treatment strategies and improving human health. Both practical and theoretical aspects of biomedical research are in focus. The programme is comprised of 10 compulsory courses and two elective periods (**Figure 1**).

Figure 1: Organisation of courses in the Master's Programme in Biomedicine. Elective periods are coloured in turquoise and research projects in plum.



The first semester starts with an introduction to translational medicine with a focus on molecular mechanisms in relation to common diseases (highlighting major research areas at KI), and training in the key biomedical competences of biostatistics and bioinformatics. In depth training in different biomedical methodologies is offered through elective courses. Training in central biomedical competences broadens in the second semester to cover bioethics and laboratory animal science, and biomedical communication and professional development. Students perform their first individual project in their chosen field of biomedical research. During the third semester, professional skills are strengthened through courses in biomedical research literacy and bioentrepreneurship, and the second research project. In addition, advanced, research-related elective courses (run in collaboration with doctoral education) in areas that were introduced in the first semester, enable students to specialise in a field of their choice, one that is usually linked to the topic of their research projects. The programme ends with a degree project that runs throughout the fourth semester.

With the above design, the programme provides broad knowledge within the field of biomedicine with a focus on scientific methodology and findings in frontline research. Students are trained to search and critically assess information as well as discuss ethical aspects of research. Practical skills form an essential component of the entire programme, trained primarily in the form of the three individual research projects, which together correspond to half of the programme, and which can be performed in laboratories in the academic or life science sectors. This ensures that students receive extensive interaction with working life. The training of professional skills (including oral and written communication, bioethical reasoning, teamwork, analysing and

reporting results), is integrated across the curriculum. The programme provides excellent training for future PhD studies in biomedical research.

The component courses are given by departments at KI (**Table 1**), with each course being awarded to the department that has the best conditions to deliver the course with high quality and with good connections to research, as assessed by the Programme Committee.

Table 1: Master's Programme in Biomedicine - courses and responsible departments

ECTS	Course	Department
	Semester 1	
10.5	Frontiers in Biomedicine	Medicine Solna
7.5	Applied Biostatistics	Institute of Environmental Medicine
7.5	Bioinformatics	Cell and Molecular Biology
4.5	Electives	
	- Introduction to Translational Pathology	Biosciences and Nutrition*
	- Computational Proteomics	Biosciences and Nutrition*
	- Sequencing and Genomics in Diagnostics and Personalized Medicine	Biosciences and Nutrition*
	Semester 2	
7.5	Bioethics and Laboratory Animal Science	Comparative Medicine
7.5	Applied Biomedical Communication and Professional Development	Cell and Molecular Biology
15	Frontiers in Biomedicine: Research Project 1	Medical Biochemistry and Biophysics
	Semester 3	
6	Biomedical Research Literacy	Biosciences and Nutrition*
3	Bioentrepreneurship	Learning, Informatics, Management and Ethics
6	Electives	
	- Cell Biology, Development and Regeneration	Cell and Molecular Biology
	- Circulation, Metabolism and Endocrinology	Medicine Huddinge
	- Immunology and Infection	Microbiology, Tumour and Cell Biology
	- Neuroscience	Neuroscience
	- Tumour Biology	Microbiology, Tumour and Cell Biology
15	Frontiers in Biomedicine: Research Project 2	Microbiology, Tumour and Cell Biology
	Semester 4	
30	Degree Project in Biomedicine	Biosciences and Nutrition*

*At the time of writing, the Department of Biosciences and Nutrition is merging with the Department of Medicine Huddinge and responsibility for courses will move to Medicine Huddinge.

The course giving department appoints the course director, examiner, and teachers for each course, and is responsible for quality development work and the study environment. This work is overseen by the departmental director of education (GUA) and the department's education committee. The requirements from the Programme Committee to the departments are formalised in the annual course assignments. Courses are run by 10 different departments, requiring clear and continuous dialogue between the programme leadership and departments/course directors to ensure the latter possess good insight into the contents and structure of the entire programme, and to coordinate development work, including progression across the programme.

Meetings are held each semester for course directors where different topics are discussed (eg progression, examination formats, feedback practices, assessment etc). In addition, an annual 2-day “retreat” (including an overnight stay) is held for all course directors under the Programme Committee, where topics of a more overarching nature are in focus (eg AI and examination, sustainable development, equal opportunities etc). These meetings provide an important opportunity for both formal and informal exchanges. Finally, short “dialogue” meetings are held online each month to facilitate communication between programme leadership, course directors and course administrators. Participation in all meetings is high, reflecting the engagement and commitment of the course directors and administrators.

Pedagogical approach

The programme utilises a range of teaching and learning activities, to offer a variety of instructional approaches to facilitate student learning. Most activities are performed face-to-face, but online elements are included, such as the elective courses in semester one, which are organised in the form of online educational resources. Individual work is combined with group assignments. Group work promotes collaboration and encourages students to contribute with their specific expertise, since they have different educational (and cultural) backgrounds. Developing these skills is important preparation for their future professions, whether in academic biomedical research or in associated careers. Activities that train students in critical analysis are prioritised, and the use of peer review is a recurring theme. Preparation for the broad skill set required for working within the field of biomedicine is achieved through training in core theoretical and practical skills and through the provision of opportunities for individual specialisation, combined with the broad training of professional skills relevant for biomedicine. The grading scale is fail, pass, or pass with distinction (U/G/VG) for all programme courses, while elective courses apply the scale fail or pass (U/G). The programme has a long-standing collaboration with an external educational developer, Cormac McGrath (Associate Professor of Education at Stockholm University and former Director of the Unit for Medical Education at KI), who is an active researcher in education and continued professional development. The programme is also currently establishing closer links with the unit of Teaching and Learning (UoL) at KI through the appointment (as of 2024) of an official UoL contact person for the Programme Committee.

Current curriculum

A major review of the programme resulted in the launch of the current curriculum in 2021. It was designed in consultation with students, alumni, teachers, an educational developer, stakeholders, and experts in the field of biomedicine. External input was obtained from Programme Directors of Master’s Programmes in Biomedicine in Lund, Copenhagen and Maastricht, and from teachers from Bergen and Kuopio with expertise in bioinformatics. The curriculum was modernised to mirror the rapid developments in the field of biomedicine and to ensure students graduating from the programme had received the training necessary to meet the demands/expectations of future workplaces. The curriculum maintains a strong focus on academic research, with the vast majority of graduates continuing to PhD studies. The first batch of students to follow this new curriculum graduated in 2023, and the results from their “exit poll” are presented in this self-evaluation. The analysis and conclusions of the present evaluation will contribute to further development and improvement of the new curriculum and the Master’s Programme in Biomedicine.

1 Assessment area: Preconditions

1.1 Assessment criterion Staff

In their education, students should receive high-quality teaching, which requires that the teachers collectively possess the necessary scientific/professional competence. However, teachers must also have pedagogical competence to support student learning. Furthermore, it is important that the teaching capacity is proportional to the scope of the programme, including teaching and assessment. A high-quality teaching resource is characterised by a stable supply of teachers. The department or committee responsible for the programme is responsible for designing and following up on course assignments for each course and allocating the assignments so that the programme's courses are conducted by the department that is best equipped to carry out the assignment with high quality, including strong research connection. The course responsible department is responsible, amongst other things, for staffing the department's courses in accordance with the course assignment and for developing, promoting, and ensuring the teachers' subject competence, research connection, and pedagogical ability. The programme, in collaboration with the course responsible departments, should therefore work long-term on both continuity and competence development among teachers in the specific programme, and there should also be strategies for how staff turnover is managed, for example, in the case of retirements. For a programme leading to a professional qualification, it is important that students have access to supervisors with adequate competence during practice-integrated learning, in order to provide students with high-quality education.

Assessment criterion - Staff
The number of teachers and their combined expertise (scientific, professional, and pedagogical) is adequate and proportional to the volume, content, and implementation of the education in both the short and long term.

Describe, analyse, and evaluate. Describe strengths and challenges, as well as how they are addressed to ensure high quality in the programme. Illustrate with examples. Refer to the completed and attached teacher table. The description should be between 1-3 pages, using font size 11 and single line spacing.

Programme description:

Description

The Master's Programme in Biomedicine is led by the Programme Committee for the Biomedicine programmes, that is placed directly under the Committee for Higher Education at Karolinska Institutet. Therefore, the Programme Committee has no formal employer responsibilities, which instead lie in the "line" organisation at the level of individual departments. The courses included in the programme are given by ten different departments at KI that receive assignments from the Programme Committee, in accordance with guidelines laid down by the Committee for Higher Education. According to the assignments, the department's responsibility includes "aspects related to **pedagogical leadership,** course syllabus and student involvement" (q. v. course assignment for the Master's Programme in Biomedicine, 2023). In addition, overall departmental responsibility for education at basic and advanced levels is regulated by guidelines issued by the Committee for Higher Education (Revised 17/06/2016, Ref. no. 3-1773/2015). These include responsibility to:

- appoint a teacher responsible for the course and one examiner per course,
- develop, prioritise and secure the teachers' competence in the subject area, research connections and teaching ability,
- quality assure that there is practical work-based training, i.e., ensure that the supervisors have sufficient clinical and scientific skills,
- ensure that there are sufficient education-related administrative resources (including different forms of administration such as study documentation, finance, archive/register, web publication, etc.).

Therefore, although the Programme Committee carries overall responsibility for the quality of the programme and teaching activities, the departments have the major responsibility to ensure teacher competence in the subject area and pedagogical competence, which presents some challenges for the programme, as described at the end of the section. The main role of the Programme Committee with regard to staff issues is to follow up the course assignments with a focus on how and by whom the teaching was carried out as well as to give input to departments as part of the quality development process. Ultimately, it is the Programme Committee that decides which courses are assigned to which departments.

Pedagogical competence of the staff:
The team of teachers involved in the programme has relevant pedagogical competence. Out of 16 course directors, 3 are professors (10 weeks of pedagogical education) and a further 11 are associate professors (at least 5 weeks of pedagogical education). All course directors except one have either formal pedagogical competence corresponding to 10 weeks of pedagogical education or report acquired pedagogical competence. The attached table listing teaching staff in the programme includes course directors and teachers with substantial contributions to the courses, such as responsibility for assignments, formative assessments, and examinations. Among those 23 teachers with substantial responsibility (excluding course directors), 6 are professors, 6 are associate professors and 18 report either formal or acquired pedagogical competence. Teachers of the three elective courses in semester 1 (described in more detail in section 2.1 “Goal fulfilment, the form of knowledge and understanding”) are employed at partner universities in the Nordic region – University of Southern Denmark, University of Eastern Finland and University of Turku. These universities and teachers were chosen due to the excellence in the subjects and pedagogical competence of the teachers.

Pedagogical education and support for teaching staff provided by the programme:
To support our course directors, to ensure programme-wide cross-course communication, to provide a good overview, logic and progression of the entire programme, and to address pedagogical challenges, the Programme Committee organizes monthly digital “dialogue meetings” (also involving teachers in the Bachelor’s Programme in Biomedicine as well as the Master’s Programmes in Molecular Techniques in Life Science, and Biostatistics and Data Science). In addition, at least two annual meetings that offer a pedagogical forum to share experiences, discuss programme development, quality and recent pedagogical challenges are organized. These meetings are part of the continuous pedagogical education where an external educational developer is actively involved. For example, course director retreats organized in 2022 and 2023 included mapping of courses ILOs (intended learning outcomes)/activities/examinations against programme outcomes, discussions and mapping of teaching activities related to SDGs, and pedagogical challenges and opportunities related to artificial intelligence. Such meetings provide a support to involved teachers and serve as a team building activity. In addition, the programme

has recently started a closer collaboration with the Teaching and Learning Unit (UoL) at KI. This collaboration is in an initial stage where the Programme Committee has received a contact person at UoL, who will participate in occasional Programme Committee meetings and possible action and synergy points will be identified. The Programme Committee encourages teachers to participate in KI's pedagogical forums, "Teachers Day" and pedagogical courses.

Involvement in research, subject competence:
All course directors are actively involved in research (research constitutes from 20% to 90% of their reported activities). Among the teachers, the percentage of research activities is even higher, in some cases being 99%. The fact that most of the teachers are active researchers holding external research funding strongly supports that they have competence in their subject. Some of the teachers are also clinicians, who are teaching the aspects related to diseases and clinical situations, thus ensuring a translational aspect in the Biomedicine education. Course directors' and teachers' dual roles in education and research add to the strength and competence of the teaching staff in the subject area and provides an excellent connection between the programme's content/activities and current research at KI. However, this also comes with challenges in prioritizing continuous pedagogical education and possibilities to participate in programme activities contra the demands of research.

Analysis

Although the Programme Committee has no formal responsibility for the recruitment of the teaching staff, the programme supports and monitors the pedagogical and subject competence of teachers via multiple activities such as the annual pedagogical forum during the programme's retreat, monthly "dialogue meetings", via individual feedback to the teaching staff and via the specific course assignments delivered to the departments. Most teachers have several roles in education and research and/or clinical practice. Such dual roles of the teachers come with the challenges described below but provide a good platform for the integration of research into the teaching activities of the Master's Programme in Biomedicine. The programme also actively supports and encourages continuous pedagogical education by regularly sending out information about pedagogical courses and on-line resources. However, the follow up of continuous pedagogical education has some challenges, where closer collaboration with course giving departments needs to be established.

Evaluation

Strengths
The programme has a strong teaching staff with relevant pedagogical and subject competence. The Programme Committee implements several regular activities supporting teachers' pedagogical education and their involvement in the quality work of the programme as a whole.

Weaknesses/Areas for improvement
Major challenges come with the fact that the courses of the programme are given by many different departments and the communication between the programme leadership and the leadership of the departments needs further development This is the case in spite of the course assignments that are delivered to the departments. Direct contact with the departmental staff responsible for undergraduate education (GUA) is sometimes required. There is scope for a more systematic collaboration with departments regarding formulation and follow-up of course assignments. To date, we do not have a resource effective system for this.

Another challenge is the lack of teaching-related career positions at KI and most of the course directors and teachers are dependent on external funding of their research. As mentioned above, this comes with challenges in prioritizing continuous pedagogical education and the possibility to participate in programme activities. This can also result in a potentially unstable composition of staff resources. Indeed, during recent years the programme has lost some very competent course directors due to their need to prioritize their research. This is a challenge that is difficult to address by the Programme Committee alone but is well understood by the KI leadership and it is one of KI's strategic focus areas (strategic and needs-driven skills supply).

Assessment panel's evaluation

Instruction
For each assessment criterion, the assessment panel should describe their evaluation under the following three headings below: **Under the heading Strengths:** The assessment panel should highlight the programme's strengths within the assessment criterion and briefly describe them, preferably in bullet points. **Under the heading Areas for improvement:** The assessment panel should identify areas that are assessed to need improvement and briefly describe them, preferably in bullet points. **Under the heading Evaluation:** The assessment panel should explain their assessment and motivate their conclusion. The evaluation should be specified in one of four levels of fulfilment: *Meets/Meets to a large extent/Meets to some extent/Does not meet*.
Strengths: • Well planned activities to ensure pedagogical development for teachers enrolled in the program with access to both frequent digital pedagogical dialogue meetings and access to external pedagogic support functions • The scientific focus of the program is supported with a strong connection of research through a high percentage of research activities among course directors and teachers. • Access to staff with excellent subject competence through strong research groups within the field of biomedicine which are connected to the program. • The program has many teachers that are also working as researchers which creates a good awareness about relevant content in courses, but also a close connection to work relevance for future career (PhD education). **Areas for improvement:** • The methodology for recruiting staff for the program can be improved which would both strengthen the staff competence and improve learning environment. The current method to recruit teachers to the program demonstrates that 8 of 41 teachers are listed with no formal pedagogic competence. Although the teachers may have acquired pedagogic

experience through research or other roles there is a risk that the self-reported judgement of pedagogic competence according to SUHF guidelines could be subjective.

- Improve the transparency for progression in courses and the program for both students and teachers. More specifically, to improve the knowledge of which courses are connected to each other. A clearer awareness of progression may improve quality, motivation and learning environment. Recommendation: Consult pedagogical developers at LIME to revise the ILOs of the program, links between courses, and progression of the courses.

- Although progression is described as a strength in the section for "learning environment", it is our impression that staff and students have another experience. Therefore, transparency may relate to lack of communication. Recommendation: A more well-defined plan for supporting communication and knowledge exchange among teachers in terms of pedagogical support and developments is needed (eg.. Discussion forums, presentation of learning outcomes and activities, peer feedback). At least one day per term where course responsible teachers meet to discuss the connections between their courses should be possible.

- The programme utilizes many different forms of pedagogical models, however there is a gap between the intended pedagogic methodology and the students experience. There is a need to explain and motivate the used pedagogic methodology to the students.
- There is no direct link between the program committee and the teachers on the courses, but the programme is well aware of this problem and has found suitable ways to work around this.

Evaluation: Overall, it is the evaluation that the programme meets to a large extent the assessment criteria. The justification for that evaluation is based on the program's well-pedagogical support and a strong foundation of staff with knowledge. However, the program needs to be aware of the limitation that a significant number of teachers are lacking the required pedagogical requirements. Also, some teachers are recruited based on personal recommendations, a fact that is also supported by interviews. Moreover, the programme also needs to improve the transparency and communication about the pedagogical progression in the for both students and teachers.

1.2 Assessment criterion - Learning Environment

The learning environment refers to the environment in which the education takes place and where students and teachers operate. A good learning environment is characterised by creativity and conditions for development, as well as a close connection between research and education. Guiding principles for KI's research-related education at first and second cycle are as follows: 1) students are involved in ongoing research, which means that they gain knowledge about ongoing research in both theoretical and practical contexts, and have the opportunity to participate in it during their education, 2) teachers are research-active and convey a scientific approach through appropriate pedagogical methods, 3) the main field and content of the education is grounded in scientific methods and updated research findings, and active research is conducted within the relevant field at the university and 4) the teaching is based on research in teaching and learning and is built on learning activities that contribute to the student's ability to understand, evaluate, and utilize the

processes through which scientifically based knowledge is generated and constantly reassessed (the research process). For a programme leading to a professional qualification, it is also important that students have access to a suitable practice-integrated learning environment.

Assessment criterion - Learning Environment
There is a scientific and profession-oriented environment for the education, and the activities are conducted in a way that establishes a close connection between research and education.

Describe, analyse, and evaluate. Outline the strengths and challenges, as well as how these are addressed to ensure high quality in the programme. Illustrate with examples. The description should be between 1-3 pages, using font size 11 and single line spacing.

Programme description:

Description

The programme aims to produce graduates with the skills and competences necessary for careers in biomedical research in different contexts (in both academia and companies). KI as a university provides a good platform for scientific and professionally-orientated environments as well as connection to research. The close collaboration with the research at KI is one of the major strengths of the programme. The programme is constructed to ensure integration of biomedical education into the KI research environment, which is achieved through the design of the course content, the team of teachers responsible for the courses, and the physical environment in which the education is spread over almost the entire KI, involving different departments and research areas/environments.

Biomedicine is a major area of research at Karolinska Institutet
KI is a medical university with biomedical research that is highly rated and acknowledged both nationally and internationally. Therefore, KI provides a relevant professional environment and subject-competent teaching staff as well as an easily accessible research environment for the students. Biomedicine Master students often participate in local conferences and retreats organised by research networks at KI.

The programme's content has a strong connection to biomedicine research at KI
Biomedicine Master students are actively involved in ongoing research, obtaining theoretical and practical knowledge and skills. The Master's Programme in Biomedicine collaborates closely with seven doctoral programmes at KI. The first course in the programme, "*Frontiers in Biomedicine*", presents five major research areas that are strongly established at KI. Each week of this course is organized by teachers from one or two doctoral programmes, where leading KI researchers give lectures, and students read their articles and discuss them with the authors during journal club sessions. In addition, students perform "task" assignments related to different areas of ongoing research at KI. In semester 3, students choose an elective course in one of these five broad research areas. Each of the elective courses offered by the programme contains a pre-defined package of doctoral courses giving master students further and deeper insight into the research area, specific state-of-the-art methodologies and research topics. During these elective courses, the Biomedicine Master students attend teaching activities together with doctoral students thereby providing an opportunity for direct interaction and to perform group assignments

together. “Frontiers in Biomedicine” and the semester 3 elective courses together provide an excellent integration of education and research.

In addition, the programme includes three project courses (“*Frontiers in Biomedicine: Research Project 1*” (15 ECTS), “F*rontiers in Biomedicine: Research Project 2*” (15 ECTS) and “*Degree Project in Biomedicine”* (30 ECTS)). These three projects are performed in research labs where the students actively participate in the research process; plan, perform, critically analyse, present and discuss research data. To ensure that the students get acquainted with different research environments, they must perform these three projects in at least two different laboratories.

Biomedicine is not only anchored in scientific methods through the project courses, where students actively apply the methods when conducting their research, but they also obtain theoretical knowledge of scientific method during the “*Biomedical Research Literacy*” course. The latter course provides students with theoretical knowledge of and some practical skills in the peer-review process, as well as teaching students how to provide professional feedback on scientific papers and how to plan a research project using a scientific method. Taken together, Karolinska Institutet provides excellent competence in the main field of study (Biomedicine) and the design of the programme enables students to gain both theoretical understanding and practical training of the scientific method. All course leaders in the programme are active researchers (see staff table in the appendix), participating in national and international research networks and leading high standard research.

Creative thinking and scientific method
The Master’s Programme in Biomedicine is focused on teaching students *scientific creative thinking and a research process.* Therefore, creative thinking and scientific method are major corner stones of the programme. Elements stimulating creative thinking are included in all courses, starting from the first one “*Frontiers in Biomedicine*” where students are asked to identify knowledge gaps and come up with solutions to scientific problems in a specific research area. Problem-solving tasks constitute a core of the methodological courses (eg in the “*Bioinformatics”* course, students receive an assignment to identify the function of “unknown DNA”). The same is true for the three project courses, that together compose 50% of the programme.

Pedagogical tools and digital platforms
Teaching is based on research in teaching and learning, aligning ILOs, TLAs (teaching and learning activities) and examinations in all courses and stimulating active learning of the students. The programme is based on in-class teaching (lectures, group work/peer learning, seminars, laboratory work, demonstrations), but also uses the Canvas platform as a digital interface where on-line lectures, tutorials, instructions, self-assessment questioners and quizzes, digital meetings and Q&A sessions are applied. The programme has a long-standing collaboration with an educational developer (see Programme Description section) who was involved in designing the new curriculum of the programme. He participates in course director meetings and retreats giving advice on pedagogical approach and tools in our teaching activities, organizing sessions in current pedagogical challenges such as AI, which ensures continuous pedagogical education for our teaching staff.

Student perspective on learning environment
The first students to follow the current curriculum completed the programme in June 2023. The exit poll (table below) provides an assessment of how well they evaluate their education to have trained them in various aspects.

Exit poll VT23 (21/42 responses, 50.0% response rate)	Mean ± SD (median)
The education's content was based on current research	5.5 ± 0.7 (6.0)
The programme contributed to my learning and development in understanding biomedical science, including knowledge of previous and current research questions within biomedical science	5.1 ± 1.2 (5.0)
I feel well-prepared for my future role's requirement to:	
• apply research-based evidence in my work	5.4 ± 0.7 (5.0)
• keep up to date with knowledge development within my field	4.8 ± 1.0 (5.0)
• critically review information	5.0 ± 1.1 (5.0)
I learnt about ongoing research during:	
• Theoretical learning activities	5.0 ± 0.8 (5.0)
• Practical/clinical learning activities	5.0 ± 1.2 (5.0)
I feel well-prepared to work within the area I have studied at KI	5.0 ± 1.0 (5.0)

Answers on a 6-point scale: To a very small degree (1) – To a very high degree (6).

Analysis

In general, the description of the learning environment (above) supports its scientific and profession-oriented nature. In addition, the learning activities are conducted in a way that establishes a close connection between research and education. Both programme content (including three research projects) and the broad availability of research environments open to the students (10 departments at KI giving courses, and the possibility to choose from all of KI's departments for project work) contribute to a diverse scientific milieu where students come into close contact with research groups and are able to specialise in different research areas at KI or beyond (at companies or other universities). In addition, having teaching staff that are actively involved in research contributes to a research- (and therefore professionally-) oriented environment.

In general, the students assess that the programme is well-connected to current research and contributes to their understanding of biomedical science (table above). Students also assess that in their future role they will be able to apply research-based evidence, keep up to date with knowledge developments and critically review information. They assess that they learned about on-going research during theoretical and practical activities.

Evaluation

Strengths

A major strength of the programme is the strong integration of on-going research via staff being active researchers, via course content and activities, that are planned to give the students a good insight into KI's scientific environment; via a close collaboration with the doctoral programmes at KI; and via three research project courses that directly prepare the student for their future career (bearing in mind that the majority of students continue with a PhD). In addition, scientific method is both taught during course activities and applied during project courses. Finally, collaboration with a pedagogical advisor, discussions of pedagogical challenges and novel tools during course director meetings and retreats contributes to the creation of diverse pedagogical instruments aimed at encouraging active student learning.

Weaknesses/Areas for improvement

Progression in teaching/applying scientific method throughout the programme can be developed and made more visible for the students. The programme leadership together with course directors will further work to establish a good and clear progression in teaching and applying scientific method as well as considering the integration of more diverse pedagogical tools, such as TBL sessions, flipped classroom etc. In addition, the fact that most teachers are active researchers that are dependent upon external financing contributes to difficulties in recruitment of leading KI researchers as teachers. The closer collaboration between the Programme Committee and UoL that is currently being established, although still in an initial phase, should enable more effective integration of KI's pedagogical strategy and pedagogical advances into the programme's activities.

Assessment panel's evaluation

Instruction
For each assessment criterion, the assessment panel should describe their evaluation under the following three headings below: **Under the heading Strengths:** The assessment panel should highlight the programme's strengths within the assessment criterion and briefly describe them, preferably in bullet points. **Under the heading Areas for improvement:** The assessment panel should identify areas that are assessed to need improvement and briefly describe them, preferably in bullet points. **Under the heading Evaluation:** The assessment panel should explain their assessment and motivate their conclusion. The evaluation should be specified in one of four levels of fulfilment: *Meets/Meets to a large extent/Meets to some extent/Does not meet*.
Strengths: • The programme has ensured a strong scientific learning environment by involving many departments in the teaching. This ensures a good foundation for the recruitment of teachers with different research focuses. • A close connection between research and education within the project courses creates a good learning environment. It is great that it is required for students to work in at least two laboratories to get the most experience possible. • The programme provides a good insight into the importance of working with visibility of progression in courses for both students and teachers. This is important for the whole program. Still, we have a note about this weakness in 1.1, connected to implementation on visibility of progression, based on interviews with students and teachers. • The programme is well suited for students aiming for a research career. **Areas for improvement:** • Improving knowledge about benefits and consequences regarding common courses for PhD and master students – it could be great but also

challenging. It is important to ask both students and PhD students about pros and cons.

- Work with incitement for teachers without teacher positions to improve the recruitment on both long- and short-term basis of new teachers.

- The program may improve the connection with the industry-connected research environment and other research environments outside KI. The program may improve connection to research environment through combined positions with industry. Or maybe transparent to focus on what you can best; prepare all students for PhD studies in the biomedical environment at KI?

- Improve the number of elective courses to ensure that students can get the first choice of selected courses.

Evaluation: Overall, it is the evaluation that the programme meets to a large extent the requirements of the assessment criterion. The justification for that evaluation is that the programme has a strong group of teachers well connected to research at KI. However, it is a gap of connection to research outside KI and academia. The programme could improve the work on awareness and connection to strong research environment in industry as well. This also includes the strength of an entrepreneurial mindset for research.

2. Assessment area: Design, implementation and outcomes

2.1 Assessment criterion Goal attainment

For each degree, there are a number of formulated qualitative targets (outcomes for the degree) in the System of Qualifications (Appendix 2 to the Higher Education Ordinance). In addition to the national outcomes, programmes may also have local outcomes, which are described in the programme's curriculum. In order to delimit the scope of the evaluation, KI makes a selection of outcomes prior to each programme evaluation. The principle of selection is that at least one outcome per form of knowledge is included in the selection. For programmes that provide both a general qualification and a professional qualification, at least one outcome from each degree must be included. For programmes with local outcomes, at least one local outcome must be included. The total number of outcomes chosen should not exceed six.

The qualitative targets (outcomes for the degree) define what the student should have achieved when the degree is issued. The programme must describe how the education ensures that the student is given the opportunity to achieve the outcomes when the degree is issued. Such a report may include, for example, the nature of the progression, the link between outcomes for the degree, intended learning outcomes in course syllabi, learning activities and assessments, grading criteria and how they are used, appropriate teaching methods and activities and the way in which student learning is promoted, and how the student's conditions and needs are considered.

Assessment criterion: Goal fulfilment, the form of knowledge and understanding

Assessment criterion for Goal Fulfilment – Knowledge and understanding
Through design and implementation, the programme enables, and ensures through assessment, that the student, when the degree is issued, can achieve the selected outcomes within the knowledge form knowledge and understanding in the system of qualifications.

Target
For a Degree of Master (120 credits) the student shall demonstrate knowledge and understanding in the main field of study, including both broad knowledge of the field and a considerable degree of specialised knowledge in certain areas of the field as well as insight into current research and development work.

Describe, analyse, and evaluate. Outline the strengths and challenges, as well as how these are addressed to ensure high quality in the programme. Illustrate with examples. The description should be between 1-3 pages, using font size 11 and single line spacing.

Programme description:

Description

The Master's Programme in Biomedicine is constructed to ensure that students gain both broad knowledge covering major research areas in biomedicine as well as specialized biomedical knowledge. To ensure that students gain "… knowledge and understanding in the main field of study, including … broad knowledge …" the programme covers a wide range of biomedical research areas and methodologies. The first course *"Frontiers in Biomedicine*" introduces research areas that are strongly represented at KI and which can be grouped into the following five broad categories: cell biology and regeneration; tumour biology; circulation, metabolism and endocrinology; neuroscience; and immunology and infection. The course is organized in five blocks, each representing one of these research areas and taught by expert researchers in the field. During semesters 1 and 2, students obtain broad knowledge of methodologies that are central components of modern biomedical research: biostatistics (in the course "*Applied Biostatistics*"); bioinformatics ("*Bioinformatics*"); handling and use of laboratory animals ("*Bioethics and Laboratory Animal Science*"); and written and verbal communication within the main field of study ("*Applied Biomedical Communication and Professional Development*" and "*Biomedical Research Literacy*"). These courses provide a solid knowledge background in areas of current translational research and state-of-the-art methodologies to safeguard that students can develop knowledge and understanding in the main field of study.

In addition, the Master's Programme in Biomedicine collaborates with three universities in the Nordic region in order to deliver online elective courses (semester 1) specialising in advanced methodologies within areas of particular expertise for each university. The "*Computational Proteomics*" course is taught by the University of Southern Denmark, which has a large protein research unit with state-of-the-art technologies. The "*Sequencing and Genomics in Diagnostics and Personalized Medicine*" course is taught by the University of Eastern Finland where genomic and genetic research is strongly grounded in both diagnostics and treatment. The course "*Introduction to Translational Pathology*", taught by Turku University, covers

comparative histology (murine versus human), which is important in translational research. These collaborations have developed over a number of years through the participation of the Master's Programme in Biomedicine at KI in a Nordic network of related programmes and with funding from Nordplus and Erasmus+. Each elective course has a course director and examiner at KI, but the teachers and material are provided by the partner universities.

Furthermore, to deliver "a considerable degree of specialised knowledge in certain areas of the field" as well as to provide "insight into current research", the Master's Programme in Biomedicine collaborates with doctoral programmes at KI, which allows students to study in depth within a specific research area. During semester 3, students can choose one of the five research areas that were introduced in the "*Frontiers in Biomedicine*" course (semester 1) as an elective course and deepen their knowledge in that particular topic *(Immunology and Infection; Tumour Biology; Neuroscience; Cell Biology and Regeneration; or Circulation, Metabolism and Endocrinology)*. Each of these elective courses is composed of a pre-determined package of doctoral courses where both basic and clinical research-related topics are included and which the master students take together with PhD students at KI. Courses include group work and assignments in mixed groups of master and PhD students, which serves as an interface between master and doctoral education at KI and enriches our students' perspective on on-going research in their selected area.

In addition, three research project courses (in semesters 2, 3 and 4) contribute to "specialized knowledge" and "research insight". "F*rontiers in Biomedicine: Research Project 1"* focuses on deepening understanding of one selected methodology, while "*Frontiers in Biomedicine: Research Project 2*" and the "*Degree Project in Biomedicine*" each focus on a specific chosen research topic. Literature studies during these projects combined with practical laboratory work enable the students to gain insights into current research and development within their selected areas.

All courses in the programme include ILOs/TLAs/examinations that map to the national outcome for a master's degree of "to demonstrate knowledge and understanding in the main field of study, including both broad knowledge of the field and a considerable degree of specialised knowledge in certain areas of the field as well as insight into current research and development work" and are presented in the table in the appendix.

The new curriculum (starting autumn 2021) was developed involving external experts that were in consensus that the programme was relevant and aligned with the needs of the field/society at large. The first students to follow the current curriculum completed the programme in June 2023. The exit poll (table below) provides an assessment of how well students evaluate their education to have trained them in various aspects, and several questions correspond to the national outcome under evaluation in this section. In general, the students assess that the programme is well-connected to current research and contributes to the understanding of biomedical science, including knowledge of previous and current research, and that they have learnt about ongoing research during both theoretical and practical activities, all of which connect well to the outcome concerning knowledge and understanding. Students also think that they will be able to apply research-based evidence in their future role.

Exit poll VT23 (21/42 responses, 50.0% response rate)	Mean ± SD (median)

The education's content was based on current research	5.5 ± 0.7 (6.0)
The programme contributed to my learning and development in understanding biomedical science, including knowledge of previous and current research questions within biomedical science	5.1 ± 1.2 (5.0)
I feel well-prepared for my future role's requirement to:	
• apply research-based evidence in my work	5.4 ± 0.7 (5.0)
• keep up to date with knowledge development within my field	4.8 ± 1.0 (5.0)
I learnt about ongoing research during:	
• Theoretical learning activities	5.0 ± 0.8 (5.0)
• Practical/clinical learning activities	5.0 ± 1.2 (5.0)
I feel well-prepared to work within the area I have studied at KI	5.0 ± 1.0 (5.0)

Answers on a 6-point scale: To a very small degree (1) – To a very high degree (6).

Analysis

The Master's Programme in Biomedicine trains and examines students regarding knowledge and understanding in the main field of study, which is biomedicine. This includes both broad knowledge of the field and specialised knowledge in certain areas. Analysis of the exit poll suggests that students feel strongly that the programme contributed to learning and understanding biomedical science as well as strongly supporting the notion that the education was based on current research (see above). The majority of students graduating from the Master's programme in Biomedicine proceed to Doctoral education, which suggests that the programme provides a successful research-related training allowing our graduates to become doctoral students. The majority of the remaining graduates find employment within industry (research, marketing, administration of clinical trials), governmental institutions such as the Swedish Research Council or the Swedish Medical Products Agency, scientific journals etc.

We have chosen to focus on five broad areas of biomedical research (most specifically in courses in semesters 1 and 3) and one can question whether this covers a sufficiently broad selection of biomedical research in order to fulfil the national outcome. However, each of these five research topics are strongly represented at KI, they are far-reaching in their scope with extensive research networks, and they are connected to KI's doctoral programmes. Therefore, we consider this choice to be appropriate and sufficient, providing students with a broad and relevant grounding in biomedicine and translational research. In addition, students can freely choose research areas for their projects (within the wide field of biomedicine and not restricted to the five areas discussed above), which together constitute half of the programme, thereby enabling students to obtain deeper knowledge in selected specific areas.

The programme collaborates with three universities (to provide the elective courses in semester 1) due to their expertise in the corresponding topics, which allows students to learn about current state-of-the-art methodologies, their advances and current developments.

Progression through the programme in the teaching of the subject area is provided by a good connection between the semester 1 course *"Frontiers in Biomedicine*" (broad knowledge) and the elective courses in semester 3 (more advanced/specialist knowledge). Course directors of the semester 3 elective courses are involved in organizing theme blocks in "*Frontiers in Biomedicine*". With this organization the semester 3 elective courses are a natural progression from "*Frontiers in Biomedicine*" in semester 1. Similarly, there is progression across methodological courses in semester 1 to the subsequent project courses (semesters 2-4) where the knowledge is

deepened and applied. During project courses students learn about selected methodologies that are applied in their projects, therefore they need to obtain specific methodological knowledge to be able to understand applications, limitations, possible improvements, and interpretation of the data that they obtain.

Evaluation

Strengths

The programme is constructed to give students both broad and specialized knowledge in the main field of study (biomedicine) and all activities have a very tight connection to current research. Indeed, the programme has a close connection to the very strong research environment/research groups at KI, there is an extremely strong research profile/experience amongst teachers, including clinical and pre-clinical research areas, and the programme contains an extensive range of ILOs, teaching and learning activities and formats of examination addressing this national outcome. In addition, there is progression from broad to specialised knowledge throughout the programme (semester 1 to 4). Finally, the exit poll confirms that the students are satisfied with the programme's contribution to their knowledge in the main field of study and in relation to current research.

Weaknesses/Areas for improvement

Although the programme delivers this national learning outcome well, we are aware of several areas that can be improved. To ensure progression through the programme, the programme leadership needs to work continuously with course directors. For example, progression through the project courses can be strengthened through cooperative work between the three course directors ("*Frontiers in Biomedicine: Research Project" 1 and 2* courses and the "*Degree Project in Biomedicine*") and the Director of Studies in developing examination formats and assessment criteria. In addition, coordination between the "*Applied Biomedical Communication and Professional Development"* course and three project courses that examine different formats of communication can also be improved. There are several such examples where the programme's leadership, course directors and an educational developer could work together to ensure better progression. We must also be aware of new and emerging fields in biomedicine (such as applications of AI in biomedical sciences) that will need to be incorporated in the programme's curriculum in future.

Assessment panel's evaluation

Instruction
For each assessment criterion, the assessment panel should describe their evaluation under the following three headings below: **Under the heading Strengths:** The assessment panel should highlight the programme's strengths within the assessment criterion and briefly describe them, preferably in bullet points. **Under the heading Areas for improvement:** The assessment panel should identify areas that are assessed to need improvement and briefly describe them, preferably in bullet points. **Under the heading Evaluation:** The assessment panel should explain their assessment and motivate their conclusion. The evaluation should be specified in one of four levels of fulfilment: *Meets/Meets to a large extent/Meets to some extent/Does not meet*.

Strengths:

- Good insights regarding progression
- Elective courses together with PhD students.
- Utilizes the strong research areas that are existing and put strong focus on this.

Areas for improvement:

- Clarify pros/cons with collaboration with Nordic Biomedicine programs, and common courses with Master and PhD students.
- If possible, increase the number of elective courses. Expectation from students to get access to elective courses of their choice.
- The self-evaluation mentions the need for improvement regarding progression and cooperation. The evaluation committee agrees, and the programme committee should continue their work in this area.
- The programme should use entrepreneurial learning as a pedagogical approach to promote the development of entrepreneurial mindsets of students. This would also benefit the entrepreneurial mindset in research.

Evaluation: *Overall, it is the evaluation that the programme meets the requirements of the assessment criterion. The justification for that evaluation is that the programme fulfils the criteria within the area of biomedicine but considering that the programme attracts the best students it may reach even further.*

Assessment criterion: goal fulfilment, the form of knowledge competence and skills

Assessment criterion: Achievement of objectives – competence and skills
Through design and implementation, the programme enables, and ensures through assessment, that the student, when the degree is issued, can achieve the selected outcomes within the knowledge form of competence and skills in the System of Qualifications.

Target
Degree of Master (120 credits) the student shall demonstrate the ability to identify and formulate issues critically, autonomously and creatively as well as to plan and, using appropriate methods, undertake advanced tasks within predetermined time frames and so contribute to the formation of knowledge as well as the ability to evaluate this work.

Describe, analyse, and evaluate. Outline the strengths and challenges, as well as how these are addressed to ensure high quality in the programme. Illustrate with examples. The description should be between 1-3 pages, using font size 11 and single line spacing.

Programme description:

Description

This national outcome covers the entire process of a research approach; including critical analysis of present knowledge, identification of scientific problems, planning how to address them using appropriate methods, practical implementation in

line with predefined timelines, critical evaluation of the obtained results and formation of new knowledge. The vision of the Master's Programme in Biomedicine is to train students to be able to work independently in different contexts of biomedical research and related careers, and therefore the ability to formulate questions and answer them by implementing scientific method forms a core of the programme.

The first part of this national outcome – the ability to "*identify and formulate issues critically*" – overlaps with programme-specific (local) outcome "*to demonstrate proficiency in critical analysis",* which is discussed below (end of section 2.1), and therefore this part of the national outcome is described and discussed in detail under the local outcome.

The subsequent part of the national outcome "*to plan and, using appropriate methods, undertake advanced tasks within predetermined time frames and so contribute to the formation of knowledge as well as the ability to evaluate this work*" is addressed by several courses. The programme starts with "*Frontiers in Biomedicine*" where journal clubs in different research areas introduce the students to the scientific process, to the alignment of research questions with methodologies and the interpretation of the results leading to new scientific knowledge. "*Frontiers in Biomedicine"* is followed by core methodological courses ("*Applied Biostatistics", "Bioinformatics",* elective courses ("*Applied Proteomics*", *"Translational Pathology"* and "*Sequencing and Genomics in Diagnostics and Personalized Medicine"*) and "*Bioethics and Laboratory Animal Science*", where students learn how to select suitable methodologies, apply them (in the case of biostatistics, bioinformatics and laboratory animal science), analyse and interpret the data.

During "*Frontiers in Biomedicine: Research Project 1"*, students use a selected research project-related methodology to undertake a task, within a defined timeframe and generate data that contributes to new scientific knowledge. Students also evaluate their own work and the work of others, as illustrated by the course ILO – "*to be able to account for and analyse own laboratory work by writing a scientific report according to scientific ethical rules for publication of results and discuss scientific methods and research results within a group of peers*". During "*Frontiers in Biomedicine: Research Project 2*", and the "*Degree Project in Biomedicine*", students plan their work and apply their methodological knowledge practically by performing a research project, and theoretically by analysing their results and identifying new knowledge, and by evaluating their own and other's work (peer review).

The part of this national outcome addressing the ability to plan advanced tasks/research projects can be well-illustrated by the collaboration between two courses in semester 3. In the "*Biomedical Research Literacy*" course, students develop their project plan for the research project that they will perform during the subsequent "*Frontiers in Biomedicine: Research Project 2"* course. Students are asked to critically review information that was given to them by the research group hosting them for research project 2, to formulate the plan, define methodologies and critically reflect on the contribution to new knowledge that the implementation of the project will provide. During "*Frontiers in Biomedicine Research Project 2"*, students are implementing the project under specific timeframes, and participating in the activities of the hosting research lab that involves critically analysing; the literature, methodologies used and the results obtained. Examination of the course includes, not only the project report in the form of a poster, but also a peer-review of a fellow student's report, where skills obtained during the "*Biomedical Research Literacy*" course are applied. All of the above components are authentic tasks which students may perform in their future work practices.

The "*Degree Project in Biomedicine*" during semester 4 involves implementation and examination of all parts of this national outcome. Under the entire semester, students work in research labs, planning and conducting their

projects, which involves critical analysis of the literature, selection and analysis of the methodologies, independent work and collaboration with peers in the laboratory undertaking advanced tasks, analysis of the data and planning of new experiments based on the data obtained. Critical analysis of the data and research questions as well as peer-review are included in the examination of the course.

The attached mapping of ILOs in the programme's courses illustrates that every course in the programme addresses some or all parts of this national outcome (see the table for mapping education outcomes in the appendix)

Answers to the questions stated in the exit poll (table below) provide an assessment of how well students evaluate their education in the aspects related to this national outcome. In general, the students assess that they feel well-prepared for their future role's requirements to critically review information (relates to ability "to identify and formulate issues critically") to work and solve problems independently (relates to "formulate issue autonomously") as well as to being able to use scientific methods and apply practical skills (relates to "to plan and, using appropriate methods, undertake advanced tasks within predetermined time frames and so contribute to the formation of knowledge").

Taken together, the exit poll suggests that the students feel well-prepared to use scientific method, apply practical skills, plan and perform tasks independently and critically review information and solve problems.

Exit poll VT23 (21/42 responses, 50.0% response rate)	Mean ± SD (median)
The structure of the education encouraged independence in my learning	5.1 ± 0.7 (5.0)
The programme had a good balance between theory and practice	5.1 ± 1.0 (5.0)
I feel well-prepared for my future role's requirements to:	
• critically review information	5.0 ± 1.1 (5.0)
• work independently	5.2 ± 0.9 (5.0)
• solve problems independently	5.0 ± 0.7 (5.0)
• being able to use scientific methods	5.0 ± 1.0 (5.0)
• apply practical skills	5.2 ± 0.9 (5.0)

Answers on a 6-point scale: To a very small degree (1) – To a very high degree (6).

Analysis

The programme emphasises teaching the students scientific method, as well as a broad range of specific methodologies. A successful implementation of this national outcome "*to demonstrate the ability to identify and formulate issues critically, autonomously and creatively as well as to plan and, using appropriate methods, undertake advanced tasks within predetermined time frames and so contribute to the formation of knowledge as well as the ability to evaluate this work*" gives a solid ground for the students to continue onto doctoral education, which is the most usual next step in their career. As mentioned previously, the majority of our graduates proceed to doctoral studies, which speaks for the relevance of the programme.

All courses included in the programme have one or more ILOs and TLAs related to this national outcome, which also shows the importance of this outcome for ensuring successful future careers of our graduates.

Some courses collaborate to support students in reaching this outcome (such as "*Biomedical Research Literacy*" and "*Frontiers in Biomedicine: Research Project 2*" as described above). In addition, there is a clear progression from "*Frontiers in Biomedicine: Research Project 1*" (includes mostly method implementation and analysis) to *"Frontiers in Biomedicine; Research Project 2"* (includes critical analysis, planning, implementation and analysis/new knowledge formation). The "*Degree*

Project in Biomedicine" examines all parts of this national outcome. Progressing from "*Frontiers in Biomedicine: Research Project 2"* to the *"Degree Project in Biomedicine"* in terms of this particular outcome, more focus is put on the critical analysis of the project conclusions, formation of new knowledge and ability to identify possible issues critically, as well as an increase in level of complexity, abstraction and degree of autonomy with which students work.

However, as project courses are performed in various research laboratories at KI, industry (around 10%) or internationally (around 20%), it is difficult to control which training each student receives in the individual labs. While the course directors of the three project courses engage in recurrent meetings to align ILOs/TLAs and examinations across these courses, we acknowledge that these efforts must be maintained to ensure very clear and harmonized instructions to the hosting labs and a good structure for regular follow-up of the students' progress during these courses. In addition, the three course directors need to work together to ensure a clear progression throughout the project course. At present, this work is initiated and ongoing.

In addition, the programme leadership organizes recurring meetings where the alignment between the courses is discussed, and possible points of collaboration and cooperation are identified. As mentioned above, all courses in the programme contain ILOs/TLAs and examinations related to this national outcome. Therefore, collaboration between the courses is essential to safeguard the progression throughout the programme. This is an area where the programme must remain diligent and mindful that the work of alignment is never fully completed but must be revised with every new cohort of students, and teachers.

Evaluation

Strengths

Four courses in the programme (the three research project courses and the Bioinformatics course) implement and examine all parts of this national outcome.

In addition, two courses ("*Biomedical Research Literacy*" and "F*rontiers in Biomedicine: Research Project 2"*) are well-aligned to fulfil this particular outcome.

Students in general assess that they are well-prepared to work independently, they are able to critically review information, solve problems, apply practical skills and use scientific methods. The majority of our graduates proceed with PhD studies, which reflects the strength of the programme in fulfilling this national outcome and in preparing students for a career in research.

The alignment between the courses and the progression through the programme is discussed during meetings between the programme leadership and the course directors, and actions are taken by organizing smaller working groups to take actions for the necessary improvements.

Weaknesses/Areas for improvement

The project courses are performed in different laboratories, and it is difficult to control if students indeed are trained and given the possibility to formulate ideas, plan and perform tasks independently. Although all students are examined at KI, the project implementation process can be better monitored, improving the instructions from the programme to the hosting laboratories, and ensuring there is feedback on each project/student from the host research groups to the course director.

In addition, the progression in teaching this national outcome can be improved by better coordination of and cooperation between the courses included in the programme. A final area for improvement is safeguarding that supervisors in the

laboratory settings are trained and empowered to better enable consistent assessment across the programme during the laboratory work.

Assessment panel's evaluation

Instruction
For each assessment criterion, the assessment panel should describe their evaluation under the following three headings below: **Under the heading Strengths:** The assessment panel should highlight the programme's strengths within the assessment criterion and briefly describe them, preferably in bullet points. **Under the heading Areas for improvement:** The assessment panel should identify areas that are assessed to need improvement and briefly describe them, preferably in bullet points. **Under the heading Evaluation:** The assessment panel should explain their assessment and motivate their conclusion. The evaluation should be specified in one of four levels of fulfilment: *Meets/Meets to a large extent/Meets to some extent/Does not meet*.
Strengths: • Good with specific focus for different project courses. • Good progression of skills and complexity of tasks throughout the theoretical and practical courses. **Areas for improvement:** • The process of feedback on the progress during the degree project could be made clearer. This is especially important for projects performed abroad. • Increase and formalize the way the students get feedback and make them reflect on how they use the feedback they got. • As the students spend half of their education in research labs and, thus, the need for structured feedback and progression needs to be strengthened during the projects. **Evaluation:** Overall, it is the evaluation that the programme meets to a large extent the requirements of the assessment criterion. The justification for that evaluation is that is a good progression of skills required and tasks to be performed throughout the theoretical and practical courses. The three different practical courses can cement the skills obtained during courses and prepare the students for a future career in research. There are areas of improvement regarding feedback on practical courses and how to make use and learn from this feedback.

Assessment criterion: Goal fulfilment, the form of judgement and approach

Assessment criterion: Goal fulfilment – judgement and approach
Through design and implementation, and through assessment, the programme ensures that the student, when the degree is awarded, can achieve the selected outcomes within the form of knowledge of judgement and approach in the System of Qualifications.

Target
For a Degree of Master (120 credits) the student shall demonstrate the ability to make assessments in the main field of study informed by relevant disciplinary, social and ethical issues and also to demonstrate awareness of ethical aspects of research and development work.

Describe, analyze, and evaluate. Outline the strengths and challenges, as well as how these are addressed to ensure high quality in the programme. Illustrate with examples. The description should be between 1-3 pages, using font size 11 and single line spacing.

Programme description:

Description

The programme aims to provide training that will support students in becoming "global citizens", with an awareness of the world around them and their role in it, and who in their professional careers can make assessments based on scientific, social, societal and ethical considerations.

The ability to make assessments in the main field of study (biomedicine) informed by relevant disciplinary (scientific), social (societal) and ethical issues and to demonstrate awareness of ethical aspects of research and development work lies at the core of the programme. Throughout the education students learn scientific critical thinking and application of scientific method when addressing biomedical research questions and challenges. This aspect is covered by multiple sections of this self-evaluation (including national outcomes on "knowledge and understanding", "competence and skills" and a local outcome). Therefore, teaching the ability to make scientific assessments in the field of biomedicine will not be discussed in this section.

Ethics constitutes a major and important part of the programme. When designing the new curriculum, an expert in bioethics (and teacher in the programme) was involved to ensure that the teaching of ethics that is relevant for biomedicine was structured through the programme, with topics assigned to different courses. Consequently, an introduction to the basic principles of ethics was included in "*Frontiers in Biomedicine*" (semester 1), progressing to the major bioethics content (ie ethics in a biomedical context) in the course "*Bioethics and Laboratory Animal Science"* (semester 2). In addition, most courses in the programme discuss ethical aspects and challenges in biomedical research providing a strong basis for our students to be able to judge and evaluate their own work and that of others in the light of ethical considerations, as well as taking actions in their future careers that are well-grounded in ethical judgement. For example, the first course in the programme, "*Frontiers in Biomedicine*", includes the ILO "*reflect on ethical aspects of research involving humans and animals*", which is taught during a workshop on bioethics and examined with a written bioethical reflection. During semester 2, students take "*Bioethics and Laboratory Animal Science",* where a large part of the course is devoted to ethical aspects of biomedical research and ethics of animal science. This course has six ILOs related to ethics that are examined by different written and oral assignments. All three project courses examine the student's ability to discuss their project work in relation to ethical regulations or ethical judgements.

Social, societal and global aspects of biomedical research are discussed and examined in different contexts; in biomedicine research ("*Frontiers in Biomedicine*", "*Bioinformatics*", the elective courses in semester 3, and in the three research project courses), communication ("*Frontiers in Biomedicine", "Applied Biomedical Communication and Professional Development*", and "*Biomedical Research Literacy"*), collaboration ("*Applied Biomedical Communication and Professional Development"*),

entrepreneurship ("*Bioentrepreneurship*") (see the detailed mapping of course ILOs in the appendix). For example, in "*Bioentrepreneurship"* students are required to "*Reflect on the possible value of entrepreneurship(s) to the field of biomedicine from the perspectives of science and society*" (an ILO of the course). The topic is addressed by lectures and group discussions and examined by a written assignment where students reflect on the entrepreneurship process from the perspectives of science and society.

In addition, ethical and social aspects of research, drug development and entrepreneurship are analysed and discussed with peers and teachers during an inter-disciplinary event "Getting Down to Business!" where students from three Master's programmes (Biomedicine, Toxicology and Bioentrepreneurship) meet to analyse a case describing an interphase between an academic research and pharmaceutical company, which includes multiple ethical and societal aspects.

Analysis of the exit poll, which provides an assessment of how well students evaluate their education to have trained them in ethical and societal aspects, indicates that the students consider themselves as rather well-prepared to deal with ethical aspects in their future work. However, they do not feel confident in applying a global health perspective or having an understanding of international context of events, which relates to social and societal assessments of this national outcome.

Exit poll VT23 (21/42 responses, 50.0% response rate)	Mean ± SD (median)
I feel well-prepared for my future role's requirements to:	
• be able to deal with the ethical considerations I face	4.8 ± 1.1 (5.0)
• apply a global health perspective on a variety of issues	4.6 ± 1.4 (5.0)
• have a broad understanding of international events shaping the world	4.4 ± 1.4 (4.0)

Answers on a 6-point scale: To a very small degree (1) – To a very high degree (6).

Analysis

The national outcome "*to demonstrate the ability to make assessments in the main field of study informed by relevant disciplinary, social and ethical issues and also to demonstrate awareness of ethical aspects of research and development work*" is addressed in multiple courses throughout the programme and students are given a good opportunity to reach this national outcome. Teaching to make assessments based on disciplinary (scientific) and ethical aspects is given a large place in the programme. On the other hand, teaching the social and societal aspects is less visible. Student evaluation of their preparedness to apply a global health perspective also receives lower scores compared to the other aspects evaluated by the exit poll (compare with the scores listed in the tables included for the national outcome in "knowledge and understanding" and "competence and skills").

The progression in the teaching of this national outcome can be questioned. Different aspects have been mapped against course ILOs and course directors have discussed this mapping during course director meetings as a step to improve continuity and progression. However, there is no structured connection between the courses including ILOs covering ethical and social/societal aspects. For example, teaching of social and societal aspects in different courses is not coordinated. In addition, during the mapping of this outcome, it transpired that there are courses where students are required to discuss aspects related to this outcome, but that lack a specific ILO related to these questions. Although the evaluation regarding these questions has markedly improved compared to previous years (which were in relation to the old curriculum of the programme), there is a room for additional work.

Taken together, the programme extensively addresses scientific and ethical aspects of this national outcome as well as several aspects of social/societal

assessments. However, the progression in teaching/examining this national outcome throughout the programme can be improved.

Evaluation

Strengths

The programme's courses include many relevant ILOs that are well-aligned with this national outcome for master's education.

The ethical aspects are particularly well covered, most of the courses include ILOs related to ethics and a large part of the course "*Bioethics and Laboratory Animal Science*" is devoted to ethics in biomedicine. In addition, students think that they are quite well prepared to deal with ethical aspects in their future work. Furthermore, the programme addresses ethics in different areas (handling of big data sets, laboratory work, ethics in animal and human research, responsible presentation of the data in figures and in writing).

Social, societal and global aspects in biomedicine research are also included in ILOs throughout the programme, and are discussed and examined, covering different aspects of biomedicine research.

In addition, the requirement for course directors to complete the KI Canvas course in SDGs is included in course assignment for the departments in 2023 and Agenda 2030 has been discussed with our course directors on several occasions during course director meetings.

Weaknesses/Areas for improvement

The alignment between courses regarding reflection on ethical and social aspects is currently weak. Many courses include topics related to ethics, which can be perceived as fragmented and the connection between the courses is not always sufficient. The cross-course communication and visualization of the progression in learning ethical and social aspects can be improved.

There is a somewhat weak progression in the ILOs related to societal aspects, which needs better implementation. In addition, integration of aspects related to Agenda 2030 into the courses is also fragmented without good progression and connection between the courses. Not all teaching occasions related to societal and global aspects are visible in ILOs and examinations. The programme is currently working on improvements. One exciting possibility would be to create an interprofessional day across KI's Global Master's programmes around ethics in scientific communication and global health.

In addition to the above, the assessment of ethical reflections might be challenging since it can be difficult for a teacher lacking expert knowledge in the field of biomedicine to assess the arguments required for high quality and nuanced texts reasoning around bioethics.

Assessment panel's evaluation

Instruction
For each assessment criterion, the assessment panel should describe their evaluation under the following three headings below: **Under the heading Strengths:** The assessment panel should highlight the programme's strengths within the assessment criterion and briefly describe them, preferably in bullet points. **Under the heading Areas for improvement:** The assessment panel should identify areas that are assessed to need improvement and briefly describe them, preferably

in bullet points.

Under the heading Evaluation: The assessment panel should explain their assessment and motivate their conclusion. The evaluation should be specified in one of four levels of fulfilment: *Meets/Meets to a large extent/Meets to some extent/Does not meet*.

Strengths:

- The programme committee has reflected well on this subject in the self-evaluation.
- Integration of ethics in the courses. The exit poll states that the students are well prepared for ethical considerations in future roles.

Areas for improvement:

- Ethics may also include fraud, and consequences for the researcher and society. Make clear the students' responsibilities and rights concerning published data.
- A relative weak alignment between courses regarding social aspects and global health (self-assessment). This could possibly be improved by using real world examples for discussions and reflections e.g. unethically clinical trials, the access to biomedicine research and innovations in developing countries, the effect of environment and access to health care on life expectancy.
- Include a similar approach for integrating agenda 2023 in the courses as for ethics.

Evaluation: *Overall, it is the evaluation that the programme meets the requirements of the assessment criterion. The justification for that evaluation is that the students are well prepared for ethical considerations in future roles. A reflection is that the programme should make clear not only the fundamentals of critical thinking but also the responsibilities and rights of the students concerning data collection and published data.*

Assessment criterion for goal fulfilment, local outcome

Assessment criterion Goal fulfilment – local outcome
The education enables through design and implementation and ensures through assessment that the student, when the degree is issued, can achieve the selected local outcome.

Target
Master's Programme in Biomedicine
The student should be able to demonstrate proficiency in critical analysis and peer review.

Describe, analyse, and evaluate. Outline the strengths and challenges, as well as how these are addressed to ensure high quality in the programme. Illustrate with examples. The description should be between 1-3 pages, using font size 11 and single line spacing.

Programme description:

Description

When the programme's curriculum was revised (running for the first time in autumn 2021), an active decision was taken to highlight critical analysis of biomedical knowledge and methodologies, and peer review of scientific reasoning. The vision was to ensure the programme trained students to ask questions and be able to critically analyse and discuss complex topics in biomedicine. These skills lie at the heart of biomedical research and training students in these competences is an excellent preparation for their future careers, whether it be in academia, industry or elsewhere. Indeed, peer review and critical analysis are critical aspects of PhD studies, which the majority of students progress to after completion of their Master's degree. Hence the local outcome of "be able to demonstrate proficiency in critical analysis and peer review" was included in the curriculum.

Peer review is a valuable pedagogical tool, which trains the student's ability to critique their own works and the work of others, enabling self-evaluation and critical analysis. Peer review is a necessary skill in a research career, not least in the context of reviewing manuscripts and grant applications, which is a key part of biomedical research. Furthermore, in addition to the documented improved learning associated with the performance of peer review, this practice can be used to maximise the finite teacher resources that are available. Therefore, critical analysis and peer review were central concepts during the development of the syllabi for the programme's component courses. While this local outcome is partially covered by the national outcomes (although phrased in different ways), the wish was to highlight the importance of these aspects in the Master's Programme in Biomedicine and make them visible. Over the past two years, the programme leadership has appointed a project leader (teacher) who, with support from an educational developer, has worked to support course directors in their development of peer review practices through workshops and individual consultation.

The variety of course ILOs that correspond to the local outcome of "demonstrate proficiency in critical analysis and peer review" are presented in the appendix, together with a summary of the corresponding teaching and learning activities, and examinations. ILOs in semester 1 include the concepts of evaluation, interpretation, and analysis. In semester 2, peer review and the concept of independent analysis is introduced. Semester 3 contains ILOs that focus on the peer review process and on critical analysis in both theoretical and practical contexts. The course "*Biomedical Research Literacy*", for example, targets the student's ability to understand and engage in academic peer review. In the Master's Thesis in semester 4, the ILOs focus on independence in evaluation, interpretation, analysis and peer review. Below are selected examples of ILOs that address critical analysis and peer review.

Semester 1 ("*Frontiers in Biomedicine*"): evaluate, interpret and discuss (in both written and oral forms) specialised information in relation to topics covered within the course
Semester 2 ("*Frontiers in Biomedicine: Research Project 1*"): show independent, critical and creative thinking when applying a method to investigate a scientific issue
Semester 3 ("*Biomedical Research Literacy*"): critically evaluate manuscripts in the field of biomedicine according to standard praxis for peer review
Semester 4 ("*Degree Project in Biomedicine*"): critically and objectively assess their own scientific work and that of others and give relevant feedback

Examination is performed through activities such as journal clubs, written research proposals, reviewing a manuscript, and peer review of another student's research project report.

Course evaluations and the exit poll assess how well the students judge the programme to have trained them in critical analysis and peer review. To date the first batch of students following the new curriculum completed the programme in June 2023. In answer to the question "I feel well-prepared for my future role's requirements to critically review information" (answers from 1 = to a very small degree, to 6 = to a very high degree) the students responded with a mean value of 5.0 ± 1.1 (median 5). However, there is currently no question in the exit poll that directly addresses peer review. A compulsory question in all course evaluation surveys is "In my view, the course has promoted a scientific way of thinking and reasoning (e.g. analytical and critical thinking, independent search for and evaluation of information)", answers from 1 = to a very small extent, to 5 = to a very large extent. Over the period HT22VT23 the mean value for all programme courses was 3.8 ± 0.8.

Analysis

Throughout the programme, students perform critical analysis and peer review in many different contexts. This repeated training represents a form of progression across the four semesters. While the ILOs are written in a broad sense and are near identical in the three research project courses, progression is achieved in the programme as the students engage with increasingly more complex and abstract material and do so more autonomously. Progression is then measured by the corresponding assessment criteria which identify the degree of complexity, abstraction and autonomy required. Moreover, the ability to perform the following aspects could be a basis for defining progression in critical analysis through the incorporation of increasing levels of complexity:

- Structure information with precision and specificity.
- Identify which aspects are important in a specific context/question.
- Make/weigh arguments and make judgements relevant for a specific context/question.
- Draw specific conclusions relevant for a specific context/question and show understanding for how strong the conclusion is and what other conclusions are possible.

For peer review progression through the programme is clearer. The first ILOs introduce assessing another's work and giving feedback, and then progress to ILOs discussing the role of peer review and performing the formal process of peer review. For the latter, the intention is to increase the student's ability to reflect critically about how to best conduct biomedical research/science and write coherently about it. However, improving student understanding of the value of peer review, leading to greater engagement in this practice, remains a communicative challenge for each new student cohort as they place their focus on learning about and how to do biomedicine. Our ambition is to engage students in peer review to better prepare them for their future workplace, where we believe that peer review plays an inherent role in a career related to biomedicine.

Results from the course evaluation surveys and exit poll provide no direct information as to how well the students assess the programme to have succeeded in its ambition to train them in peer review. However, there are questions related to critical thinking. A question in course surveys relates to a "scientific way of thinking and reasoning" and

encompasses analytical and critical thinking. With a mean value of 3.8 (max = 5) across all courses, this result indicates that the students do feel well trained, but that there is room for improvement. The question in the exit poll related to critically reviewing information backs up this conclusion, with a mean response of 5.0 (max 6).

Evaluation

Strengths

A clear strength is that all courses in the programme have ILOs that address aspects of the local outcome of "demonstrate proficiency in critical analysis and peer review". The ILOs are diverse, representing the different contexts/teaching and learning activities that the students experience. As discussed above, there are elements of progression regarding the repeated training throughout the programme (critical analysis) and through the complexity of the ILOs (peer review). Critical evaluation is a central concept throughout the programme, with the majority of the examinations testing the student's ability to think critically, with a wide variety of examination formats, eg journal club, method selection, interpretation of data etc. Specific examples of peer review are found in the course "*Biomedical Research Literacy*" (semester 3), in which the student's ability to critically evaluate a manuscript according to standard praxis for peer review is examined, and in the "*Degree Project in Biomedicine*" (semester 4), the examination includes peer review of a fellow student's research project report. The programme has actively supported course directors in developing critical analysis/peer review practices, and the students assess that they are well prepared to perform critical analysis, as evidenced by their responses to questions related to critical thinking in course evaluations and in the exit poll.

Weaknesses/Areas for improvement

The ILOs pertaining to critical analysis are written in a broad sense which aligns with KI's recommendations. Moreover, they were checked during the development of the programme with external consultants. Still, we feel more could be done to diversify the ILOs in the research project courses. To address this, components of critical analysis need to be defined that correspond to increasing levels of complexity (as discussed above under the heading "Analysis"). Corresponding assessment criteria need to be developed and ILOs modified to reflect this progression. An additional challenge associated with the three research projects, that together account for half of the programme, is that they create a wide variety of learning environments for the students (different research groups with different supervisors and "cultures"). This raises the possibility that students may receive very different training in/examination of their ability to critically analyse. The provision of clear directives for project supervisors regarding the programme's expectations and requirements is necessary, and such instructions are indeed in place, but a tighter follow up would be beneficial to ensure adherence to these directives. Continued focussed dialogue on these matters in course director meetings must target these concerns specifically.

The local outcome is to "demonstrate proficiency in critical analysis and peer review", but peer review is less visible in the programme than is critical analysis, which is a weakness. One reason for this, which has been identified during the preparation of this self-evaluation, is that many courses contain elements of peer review, and some also include formal assessment, there are no corresponding ILOs, for example as is the case in "*Applied Biomedical Communication and Professional Development*" (semester 2). This can be addressed through modification of course syllabi and updating the ILOs. However, in general the formal examination of peer review is somewhat restricted in the programme, not least due to the fact that peer review is time consuming and

resource intensive, meaning that it is often not assessed. There are recurring instances where students are required to ask “critical” questions and discuss with their peers, but it is unclear how/if this is assessed. Opportunities for increasing the occasions on which students utilise the peer feedback that they receive, combined with assessment of both the feedback given and the utilisation of feedback received, need to be investigated. The development of exemplars to assess a student’s ability to give feedback on a standardised text will enable evaluation of their ability to critically appraise and give feedback, and this should be implemented early in the programme. We aim to identify one course, potentially “*Applied Communication and Professional Development*”, to initiate development in line with the views expressed here.

There is currently no programme-wide evaluation (ie exit poll) of how students view their ability to perform peer review (although some individual course evaluation surveys contain relevant questions), and the question in the exit poll related to critical analysis lacks specificity. This should be rectified through the inclusion of appropriate “programme-specific” questions in the exit poll, which is organised/administered centrally at KI. Finally, this local outcome is essentially a reformulation of what is contained in the national outcomes for a Master’s degree. Improving the quality of teaching and examination of critical analysis and peer review in the programme, as discussed here, would strengthen the rationale for including this outcome in the programme’s curriculum.

Assessment panel's evaluation

Instruction
For each assessment criterion, the assessment panel should describe their evaluation under the following three headings below: **Under the heading Strengths:** The assessment panel should highlight the programme's strengths within the assessment criterion and briefly describe them, preferably in bullet points. **Under the heading Areas for improvement:** The assessment panel should identify areas that are assessed to need improvement and briefly describe them, preferably in bullet points. **Under the heading Evaluation:** The assessment panel should explain their assessment and motivate their conclusion. The evaluation should be specified in one of four levels of fulfilment: *Meets/Meets to a large extent/Meets to some extent/Does not meet*.
Strengths: • Several good examples on how to use critical thinking in the self-evaluation! The students should be well prepared for their future roles as researchers. • Awareness of the need to improve how peer review is assessed and monitored. **Areas for improvement:** • Be more active in discussing the consequences of lack of critical thinking. It can be challenging since students spend so much time in laboratories. • Include more teaching activities on how to receive and use feedback on their own work.

Evaluation: Overall, it is the evaluation that the programme meets the requirements of the assessment criterion. The justification for that evaluation is that the programme offers plenty of opportunity to practice critical thinking and peer review. The programme should continue to teach students on methods on how to make the best use of feedback on their own work.

2.2 Assessment criterion Equal opportunities

Integrating equal opportunities into all levels of the education is a natural part of how KI should work in accordance with applicable laws and regulations. The goal of KI's courses and programmes is as expressed in Strategy 2030: "It must be ensured that the programmes provide the knowledge about gender, power and equal opportunities required to provide the conditions for equal health and social care".
Equal opportunities is an umbrella term for KI's work to promote equal rights, opportunities and obligations, and to counteract all forms of discrimination, harassment, sexual harassment, victimisation and exclusion. The Equal Opportunities area includes the seven grounds of discrimination established in the Discrimination Act (2008:567): sex, transgender identity or expression, ethnicity, disability, sexual orientation, religion or other belief, and age. In addition, the area of socio-economic background is also included in the equal opportunities work. Broadened participation, i.e. a student's opportunity to complete their studies regardless of their background and their circumstances, is also part of the equal opportunities work.

The integration of equal opportunities in KI's education will take place at three levels:

- Content – which means that equal opportunities is an area of knowledge that is taught and examined.
- Implementation – which means that equal opportunities characterise the pedagogy so that the teaching becomes inclusive and accessible.
- Design – which means that there is a structure for how and where equal opportunities are to be integrated, and that there is progression.

Assessment criterion Equal opportunities
An equal opportunities perspective is taken into account, communicated and anchored in the content, design and implementation of the education.

Describe, analyse, and evaluate. Outline the strengths and challenges, as well as how these are addressed to ensure high quality in the programme. Illustrate with examples. The description should be between 1-3 pages, using font size 11 and single line spacing.

Programme description:

Description

Design and Content
The predominant aspects of equal opportunities that are addressed across the programme concern age, gender and ethnicity in biomedical research and implications for equity in health care. Specific ILOs are included throughout the programme, ensuring that equal opportunities is a topic that is both taught and examined. Selected examples are summarised in the table below and documented in the analysis section in more detail.

The ILOs exemplified below provide a structure for how and where equal opportunities are integrated in the programme (there are additional ILOs of relevance, but space constraints prevent a more extensive presentation). Equal opportunities as an umbrella concept returns throughout the programme. In "*Frontiers in Biomedicine*" the perspective of gender is discussed. In the second semester, the course "*Bioethics and Laboratory Animal Science*" engages with the question of ethics and equity in relation to the field of biomedicine. Moreover, the interprofessional day "Getting Down to Business!", also presented in section 4.3, is used to discuss matters of equity and equal opportunity with respects to research and drug development. A further example is the "*Degree Project in Biomedicine*" where students are required to consider their project from an equal opportunities perspective and to write a reflective statement on how to approach equitable health for all, including sex and gender aspects of the project. Similar reflections are part of the two shorter project courses in semesters 2 and 3 ("*Frontiers in Biomedicine: Research Project 1*" and "*Frontiers in Biomedicine: Research Project 2*").

Intended learning outcome (ILO)	**Teaching and learning activities**	**Examination**
Semester 1 – *Frontiers in Biomedicine*		
Consider disease development, diagnosis and treatment from the perspectives of global health and gender dimension	Lectures and seminars covering sex and gender in biomedical research	Journal clubs and project work (presented in written and oral forms) in which perspectives related to gender dimension in different areas of biomedical research are discussed
Semester 2 - *Bioethics and Laboratory Animal Science*		
Reflect on one's own and others' values and norms	Online material including quizzes, discussions, and self-paced reading on bioethics	Discussion and presentations covering ethics of equal treatment in biomedical research, including global equity
Semester 4 - *Degree Project in Biomedicine*		
Place and evaluate their own work in the specific research field of the project and in a broader scientific perspective	Perform research project and reflect around the equity of the project during peer discussions/review	Written and oral presentation of research project, including sections on the ethical and gender dimensions and its impact on society

Implementation

Our point of departure is that the programme should be typified by equal opportunities in its broadest sense. This involves engaging both teachers and students and establishing a dialogue to ensure that equal opportunities characterise the pedagogy and that teaching is inclusive and accessible. For students, this begins at the start of the programme when a code of conduct is discussed and students are invited to sign the document (signature is not a requirement, but every student has signed voluntarily). The section on human relations covers equal treatment, respect, discrimination, and harassment. The student ombudspersons also meet the students at the start of the programme, raising discussions in a neutral environment and making the topic of equal opportunities visible and approachable. Subsequent specific course activities (summarised above) engage students in equal opportunities in the context of biomedicine and professional skills. In 2023, the requirement for course directors to have completed the KI Canvas course in equal opportunities was included in the programme's course assignments. This has been followed up through the inclusion of discussions around diversion, equality and inclusion on the agenda for meetings of programme leadership, the Programme Committee, and course directors, for example at the annual retreat for all course directors in the Biomedicine

Programmes, as well as at an annual meeting of the programme leadership of a selection of KI's global programmes, organised by the Biomedicine Programme Committee. Through discussion and problematising equal opportunities we aim to support staff to become more aware and self-reflective about how they act, react, and are perceived and ensure that equity permeates all aspects of the programme. Questions from the exit poll (table below) provide an assessment of the student perspective on their study environment and their training in different aspects of equal opportunities.

Exit poll VT23 (21/42 responses, 50.0% response rate)	Mean ± SD (median)
The psychosocial study environment (psychosocial environment refers to, among other things, comfort, support, stress, equal treatment and discrimination) has worked well based on my needs on the whole	4.8 ± 1.3 (5.0)
I feel well-prepared for my future role's requirement to be able in my work to encourage:	
• gender equality (female, male, non-binary)	5.2 ± 1.0 (5.5)
• equal treatment based on ethnic background, religion, social class, age etc	5.3 ± 1.1 (6.0)
• equal rights from LGBTQIA+ perspectives (Lesbian, Gay, Bisexual, Transgender, Queer, Intersex and Asexual/Aromantic)	5.3 ± 1.1 (6.0)
• equal treatment of people with functional variations (sensory, physical and cognitive abilities)	4.8 ± 1.4 (5.0)

Answers on a 6-point scale: To a very small degree (1) – To a very high degree (6).

Female students predominate in the programme (approximately 75%) and there has been a trend towards decreasing numbers of male students over the past years. Of the course directors, approximately 35% are female, and both the Programme Director and the Director of Studies are women. While the Programme Committee does not appoint course directors (this is the role of the Department responsible for the course), gender balance is an important consideration when making internal appointments (eg Director of Studies, project leaders) as a component of our work to create an equal opportunities environment.

Analysis

The findings of the exit poll suggest that students perceive themselves to be prepared to work in different environments and to promote equity, giving them a solid foundation on which to build a platform for future work with equal opportunities. While the questions in the exit poll focus on equal treatment, the programme also addresses wider issues of equal opportunities and biomedicine. Dimensions such as the inclusion of different social groups in biomedical research, and equity regarding research and health are covered, and these are captured in the ILOs and teaching/learning activities. The programme has previously identified equal opportunities as an area for development and over the past year the SDGs (which include a range of aspects concerning equal opportunities) have been mapped throughout the programme. The identification of specific courses where teaching and learning activities can be introduced or strengthened to provide a training that is more complete and of improved quality regarding equal opportunities is the next part of this project. The range of learning activities and forms of examination across the programme helps to cater for students with different learning styles.

While the exit poll suggests that students assess their psychosocial study environment to have worked well, it provides only limited information. To investigate in more detail how students at KI perceived their study environment in relation to equal opportunities, a pilot survey was sent out (by central KI) to all students at KI from semester two onwards in autumn 2022. Only a small sample (n=9) from the Master's Programme in Biomedicine responded to the survey and as such the results are not representative for the whole cohort. However, the survey identified individual cases of students experiencing abusive or derogatory statements as well as those of discrimination, harassment or sexual harassment. While cases were only small in number, they are at odds with KI's zero tolerance policy towards discrimination, harassment, sexual harassment, bullying and victimisation, and they highlight the potential risks for discriminatory behaviour towards students attending the Master's Programme in Biomedicine. None of the cases of discrimination were reported by students, and the survey indicated that students may not be confident that other students or KI personnel speak up if someone makes an abusive or derogatory statement. Taken together, this highlights the need to take actions to raise awareness surrounding harassment and/or discrimination, promote discussion and dialogue with teachers, staff and students around the many facets of equal opportunities, and to work to improve a feeling of safety/confidence amongst students to report cases of harassment and/or discrimination. Our means to address these shortcomings are outlined below.

Evaluation

Strengths

The programme contains ILOs, teaching and learning activities and examinations that incorporate aspects of equal opportunities. Furthermore, there are discussions involving both students and teachers around equal opportunities, and this is an area that the programme has worked with actively to raise insight and improve the quality. On completing the programme, students assess themselves to be well-prepared to work with equal opportunities in the future.

Weaknesses/Areas for improvement

This self-evaluation has highlighted the need to improve progression through the programme such that students recognise the development of equal opportunities in relation to both the biomedical content and level, and in the contexts of both theoretical and practical training.

Accessibility in Canvas and learning materials can be improved such that the programme is better adapted to support students with special needs. Inspiration from universal design for learning (UDL) can be sought from Teaching and Learning (UoL).

Data discussed above indicate that the programme needs to promote inclusion linked to the grounds of discrimination and socio-economic background and to provide information on how/why one should report victimisation. A closer interaction with the student ombudspersons would be beneficial and the code of conduct should be revised to include all grounds of discrimination in the Discrimination Act and emphasise that everyone has a common responsibility to prevent discrimination/harassment and promote inclusion. In addition, the results of the equal opportunities survey need to be raised with course directors, using examples for case discussions, and work to remove unconscious bias (eg using examples of only white men in teaching activities) needs to be prioritised. Furthermore, the programme leadership will take actions to follow up on the results of the survey by working with course directors to instigate discussions around equal opportunities in course councils/meetings with class representatives.

Assessment panel's evaluation

Instruction
For each assessment criterion, the assessment panel should describe their evaluation under the following three headings below: **Under the heading Strengths:** The assessment panel should highlight the programme's strengths within the assessment criterion and briefly describe them, preferably in bullet points. **Under the heading Areas for improvement:** The assessment panel should identify areas that are assessed to need improvement and briefly describe them, preferably in bullet points. **Under the heading Evaluation:** The assessment panel should explain their assessment and motivate their conclusion. The evaluation should be specified in one of four levels of fulfilment: *Meets/Meets to a large extent/Meets to some extent/Does not meet*.
Strengths: • The programme has included many aspects of equal opportunities in the curriculum and seems to cover most aspects. • Exit poll supports that students are well prepared to work with equal opportunities in the future. • The evaluation committee agrees with the programme that reflections on online/offline learning material could be improved. **Areas for improvement:** • Code of conduct may also be presented to supervisors in practical courses. • Clear guidelines and a programme policy on how to handle alternative examination forms for students with special needs could be helpful for examiners and minimising the risk of differences between courses. • We agree with the programme management that there is a need to increase the awareness among the students of harassment and discrimination. **Evaluation:** Overall, the programme meets the assessment criteria. The justification for that evaluation is that equal opportunities are well integrated in the curriculum and that both the programme and KI have a clear strategy.

2.3 Assessment criterion Sustainable development

In their activities, higher education institutions must promote sustainable development, which means that present and future generations are ensured a healthy and good environment, economic and social well-being and justice.

Education conducted at KI should aim to contribute to improved health for all, which is an important prerequisite for sustainable social development. It is of particular importance that educational activities highlight the link between health, socio-economic factors and human environmental impact. In accordance with KI's climate strategy, by 2024 there will be intended learning outcomes in courses in all programmes at first and second cycle, which means that students will gain knowledge and skills about climate and sustainable development.

Students who graduate from KI must have worked with issues related to sustainable development and the UN's global goals during their education. It requires that the teachers have good knowledge in the area. Teachers need to teach about the goals and the underlying challenges. Students should also be challenged to develop an ability to create visions, use critical thinking, reflect on their own role in the development of society, apply systems thinking, create partnerships and be prepared to act.

Assessment criterion Sustainable development
Through design and implementation, the programme enables the student to have worked with issues related to sustainable development and the UN's Sustainable Development Goals (SDGs).

Describe, analyse, and evaluate. Outline the strengths and challenges, as well as how these are addressed to ensure high quality in the programme. Illustrate with examples. The description should be between 1-3 pages, using font size 11 and single line spacing.

Programme description:

Description

Biomedicine has an important role to play in achieving the UN's Sustainable Development Goals (SDGs) to end poverty, protect the planet, and ensure prosperity for all. Biomedicine is pivotal in the development of new treatment strategies to combat diseases (SDG 3 "Good Health and Well-being"), can contribute to developing new methods to increase crop yields and improve animal reproduction (SDG 2 "Zero Hunger") and to the development of new technologies to address environmental challenges, such as combating the changing disease pattens as a consequence of climate change (SDG 13 "Climate Action"), and through promoting gender equity in research and healthcare (SDG 5 "Gender Equality"). Biomedicine can help create a healthier, more sustainable, and more equitable world. As such, the programme strives to integrate these aspects, make them visible to teachers and students, and engage in an active debate, even when data are limited and uncertainly prevails. As a step to increase awareness and competence in the field, the requirement that all course directors should take the KI Canvas course "Getting started with the SDGs" was included in the course assignments for 2023. The course provides a broad understanding of which SDGs are relevant for biomedicine and provides inspiration for integration into teaching activities. Sustainable development, global health and the SGDs are discussed at course director meetings, both regular on-site meetings, as well as the annual retreat (2022 and 2023), which provides opportunities for deeper discussion and reflection, to provide examples of best practice, to create an environment offering mutual support/inspiration, and to close the gap between intended and actual actions.

In 2022 the Programme Committee initiated a project to map the SDGs across the three biomedicine programmes and appointed a teacher/researcher with expertise in global health and the SDGs to lead the project. All course syllabi were surveyed and followed up with course director interviews. ILOs related to sustainable development and the SDGs, and corresponding learning activities/examinations were mapped. In addition, "hidden" aspects were identified where relevant topics were taught and discussed, and sometimes examined, but not formally documented in the course syllabus. A summary of the findings was presented to the Programme Committee in

September 2023 and to all course directors (at the annual retreat) in October 2023. The ILOs exemplified below provide a structure for how and where sustainable development is taught and examined in the Master's Programme in Biomedicine (space constraints prevent a more extensive presentation). In semester 1, sustainable use of resources in the context of large biomedical data sets (sequencing) is discussed in the "*Bioinformatics*" course. In semester 2, students present and discuss global health challenges and sustainable development in society from the perspective of biomedicine ("*Applied Biomedical Communication and Professional Development*"). The research projects in both semesters 3 and 4 include mandatory reflection and discussion segments (written and verbal) addressing aspects of sustainable development that are relevant to the student's individual research projects ("*Frontiers in Biomedicine: Research Project 2*" and "*Degree Project in Biomedicine*").

Intended learning outcome (ILO)	**Teaching and learning activities**	**Examination**
Semester 1 – *Bioinformatics*		
Demonstrate knowledge of the emerging challenges and opportunities of bioinformatics in a societal context, for example in a global health or sustainable development perspective	Literature + teacher-led group discussions covering inequalities in access to treatments and resources/ waste due to technology progress (focus on access to sequence data + gene-editing)	Written reflection covering sustainability aspects of genomic sequences and gene-editing
Semester 2 – *Applied Biomedical Communication and Professional Development*		
Reason and reflect on a biomedical problem/project from a global health perspective	Seminars highlighting global health challenges and sustainable development in society from the perspective of biomedicine, and the role of different stakeholders	Digital exhibition "Biomedicine beyond the Eppendorf" (general public as target audience) raising the challenges facing biomedicine in tackling a global health challenge (including sustainable development)
Semester 3 – *Frontiers in Biomedicine: Research Project 2*		
Demonstrate awareness of ethical-, gender- and sustainability-related issues regarding the research topic	Seminar and discussions around biomedical research and aspects of sustainable development	Reflection/discussion around issues related to sustainable development that are of relevance for the specific project forms part of final written report and oral presentation
Semester 4 - *Degree Project in Biomedicine*		
Reflect on the ethical dimensions of the project and its impact on society in terms of addressing the Sustainable Development Goals (SDGs)	Perform research project, reflect around its relation to the SDGs and sustainability (topic discussed at start of course), and discuss during peer discussions/review	Written and oral presentation of research project, including appendix with reflections on ethical and gender dimensions placed in relation to SDGs, sustainable development, and impact on society

Analysis

The aforementioned mapping revealed the breadth of topics covered within the programme related to sustainable development/SDGs but has also identified areas of weakness. For example, while global health and the SDGs are a clear, recurring theme, specific focus on aspects of sustainable development and climate change in relation to biomedicine is less prominent. We are currently following up on the mapping by i) identifying areas requiring strengthening (ILOs that are currently not fully examined),

ii) ensuring that topics covered in the programme are included in course syllabi (introduce ILOs that are taught and examined), iii) introducing ILOs (+ teaching-and-learning activities) to cover relevant topics that are not currently covered, and iv) ensuring there is progression through the programme, as well as from the Bachelor to the Master level (introduction of more complex problems combined with a requirement to work with a greater degree of autonomy).

On completion of the programme (exit poll, results in the table below), students report that they are well prepared to work in the field of biomedicine, which, through the development of new treatments, technologies, and methods, contributes to better health and a more sustainable world. More specific questions in the exit poll reveal that the students' assessment is generally good regarding their training in aspects of the SDGs (global health perspective and understanding of international events). However, the lower score for the question about promoting sustainable development may be, at least in part, a reflection of the complexity of this topic and the global challenges society faces (indeed, few people can truly say that they are well prepared to understand and address climate change). Overall, students graduating from the programme assess themselves to have attained a relevant skill set to address the complex challenges that lie ahead in relation to sustainable development.

Exit poll VT23 (21/42 responses, 50.0% response rate)	Mean ± SD (median)
I feel well-prepared to work within the area I have studied at KI	5.0 ± 1.0 (5.0)
I feel well-prepared for my future role's requirements to:	
• apply a global health perspective on a variety of issues	4.6 ± 1.4 (5.0)
• have a broad understanding of international events shaping the world	4.4 ± 1.4 (4.0)
• promote sustainable development	4.0 ± 1.5 (4.0)

Answers on a 6-point scale: To a very small degree (1) – To a very high degree (6).

Evaluation

Strengths

When the current curriculum was designed, emphasis was placed on the inclusion in course syllabi of ILOs related to the SDGs (with corresponding learning activities and examinations). Additionally, the programme works actively to improve the competence of course directors and teachers in this area, and to promote discussion around the role of biomedicine in planetary health and sustainable development, with the goal of making this an integral component of the Master's Programme in Biomedicine. As a result, the programme contains a generally good coverage of ILOs that are related to the global perspective and to many aspects of the SDGs. The corresponding examination formats are varied, and students are repeatedly required to reflect on how their work within biomedicine/biomedical research impacts on aspects of sustainable development. As stated in the template's introductory text to this section "s*tudents should also be challenged to develop an ability to create visions, use critical thinking, reflect on their own role in the development of society, apply systems thinking, create partnerships and be prepared to act*". Many of these concepts are central to the Master's Programme in Biomedicine (and are discussed in different sections of this self-evaluation) and hence students have competences necessary to work with the challenges of sustainable development, including an ability to work with complexity and uncertainty, and to take a systems approach. Indeed, students assess themselves to have attained a relevant skill set. Finally, the Programme Committee has prioritised the mapping of sustainable development/SDGs throughout the programme and the subsequent formulation an action plan to address weaknesses

identified. This ongoing project is led by a teacher/researcher with excellent expertise/insights into biomedicine, the programme itself and the SDGs, providing a valuable resource to support us in this work.

Weaknesses/Areas for improvement
ILOs and teaching-and-learning activities directly related to biomedicine's role in addressing climate change, and with a clear focus on sustainable development need to be developed. To support this, existing digitally available material about sustainable development in education (for example, the resources available via KI's "common perspectives in education", which includes sustainable development, form a starting point,) can be used as a basis for discussion and can be integrated into appropriate courses. This will expand the competence of our course directors/teachers, which is necessary to strengthen their confidence in being able to discuss sustainable development with students, even without possessing specific expertise, and increase the willingness of teachers and students alike to engage and contribute with their knowledge and perspectives. The programme leadership must underline the pressing nature of climate change and the urgent need for sustainable development, and raise discussion/awareness throughout the programme of biomedicine's role in addressing these issues. Individual students within the programme can be an important resource in these discussions, since there are some highly informed and active participants in the sustainable development field (for example in the student union committee "Students for Sustainable Development – SSD"), who can act as a source of inspiration. In the longer term, progression and critical alignment through the programme needs strengthening. ILOs need to be reformulated to target more explicitly specific SDGs, and requirements/assessment criteria for the reflections included in research project reports need development/coordination. Moving forward this work will form part of the SDG project currently being driven by the Programme Committee.

Assessment panel's evaluation

Instruction
For each assessment criterion, the assessment panel should describe their evaluation under the following three headings below: **Under the heading Strengths:** The assessment panel should highlight the programme's strengths within the assessment criterion and briefly describe them, preferably in bullet points. **Under the heading Areas for improvement:** The assessment panel should identify areas that are assessed to need improvement and briefly describe them, preferably in bullet points. **Under the heading Evaluation:** The assessment panel should explain their assessment and motivate their conclusion. The evaluation should be specified in one of four levels of fulfilment: *Meets/Meets to a large extent/Meets to some extent/Does not meet*.
Strengths: • Sustainable development and SDGs are a natural part of the programme and ILOs are well integrated in the courses. • KI's strategy gives the programme support and course directors enroll in the course "Getting started with the SDGs". **Areas for improvement:**

- Open up for a wider vision of sustainable development. How can the field of biomedicine improve sustainability for health care and industry?
- Consider enrolling all students in the course “Getting started with the SDGs”
- Although a complex task the programme could consider learning tasks with cases, reflections and discussions about the role of biomedicine in global warming, pandemics, crises and war, and to partner up with industry or charity organizations.
- Sustainability could also include a sound and healthy work environment (leadership, act professional in teamwork, psychosocial environment etc)
- Consider the use of Toxicology Master’s Programme collaboration with JRC/ECVAM for alternative approaches to animal testing in the course Bioethics and Laboratory Animal Science.

Evaluation:
Overall, the programme meets the assessment criteria. The justification for that evaluation is that sustainability is well integrated in the curriculum and that both the programme and KI have a clear strategy.

2.4 Assessment criterion Follow-up, measures and feedback

In order to ensure that an education is of high quality in both the short and long term, follow-up of the education's design, implementation and results is required. It concerns how follow-up, action and feedback routines in the systematic quality work at the educational level contribute in a systematic way to ensuring and developing the quality of the programme. The self-evaluation must describe how the various parts of the programme are continuously followed up and how the results are taken care of. An important part of taking care of results from follow-ups is to inform interested parties such as teachers, supervisors and students about any measures and changes to strengthen the quality and the continuous learning.

The assessment criterion for follow-up, measures and feedback also includes how those responsible for the programme work with student completion. The programme should therefore describe its analysis of student completion of the programme and the drop-outs that occur. The programme must also describe the measures taken and the support provided, if necessary, to create the conditions for students to complete the education within the planned study time.

Assessment criterion Follow-up, measures and feedback
The content, design, implementation and examination of the programme are systematically monitored. The results of the follow-up are translated into quality development measures as necessary, and feedback is given to relevant stakeholders.

The programme works to ensure that the student completes the education within the planned study time.

Describe, analyse, and evaluate. Outline the strengths and challenges, as well as how these are addressed to ensure high quality in the programme. Illustrate with examples. The description should be between 1-3 pages, using font size 11 and single line spacing.

Please note that the assessment criterion has two parts, quality work and student completion, and both must be included in the programme's report.

Presentation of Quality Assurance of first and second cycle education at KI – central level

The quality assurance system for first and second cycle education at KI runs in annual cycles, with some components included each year while others are implemented at longer intervals. The system thus also allows for flexibility in question formulations, themes and priorities between years. Overall, the system's components for quality assurance routines, regulations, follow-ups, reviews, feedback and improvement, ensure continuous improvement of the education. In order to improve and develop the programmes, the education assignment at the departments is followed up annually. The feedback forms the basis for development and ensures that KI's educational activities are of high quality. The feedback consists of a number of questions within a strategic selection of the areas that the Committee for Higher Education identifies as important for the quality of education. The questions vary from year to year and over time new areas may be added. The purpose of the questions is to stimulate the quality development process locally and to provide KI's management with a basis for following up, developing and assuring KI's educational activities.

The reporting of the education assignment is supplemented by quality plans at department level and programme level according to established templates, which is a tool for quality development at each level.

In order to clarify what the committee responsible for the programme expects from the department responsible for the course in terms of implementation and quality development of courses, course assignments within programmes must be established. After each course occasion, the department responsible for the course must carry out a final course evaluation. Based on the results of the course evaluation, the course coordinator must carry out a course analysis.

Perceived quality – Recurring surveys

1. **A survey** is conducted every two years among students who are just starting their studies on one of KI's programmes
2. **Course evaluations** consists of five mandatory questions, which provides an opportunity to follow the quality development over time and make comparisons between different courses and programmes. It is also possible to add programme- and department-specific questions.
3. **Practical placement (VFU) survey**, measures student experience of the learning environment, supervision and work with patients (clients in clinical education) in health care.
4. **The student barometer** is conducted every four years through focus panel interviews. The aim is to provide strategic guidance to build student' engagement in studies and for KI.
5. **A graduate questionnaire (exit poll)** is sent to all programme students in connection with the completion of their education.
6. **Alumni survey** is conducted every four years among alumni who graduated three years earlier.
7. **Stakeholder survey**, conducted by the programmes every four years. The purpose is to investigate whether KI's educational programmes correspond to the needs of the labour market, i.e. whether recent graduates have developed useful skills.

8. **The "Equal Opportunities" survey** is planned to be carried out every four years from 2022, the aim is to measure student experience of risks of discrimination, harassment, sexual harassment, reprisals and victimisation in order to obtain a basis for following up and evaluating KI's work to prevent discrimination and work for an inclusive and good work environment for students.

Peer review and learning

1. In addition to our own analyses, peer review and learning is an important component of improvement and development work. Peer review and learning concerning quality plans is carried out every spring.

Programme description:

Description

Quality work

The Programme Committee has the overall responsibility for the quality work, follow-up of the education's design, structure, implementation and results. The committee takes quality development measures as required and gives feedback to relevant stakeholders ("relevanta intressenter") – teachers, students, course directors and administrators.

Tools for follow-up:

Course evaluation and course analysis

After each course occasion, course directors are required to send out a course survey to all students and encourage them to participate. In addition, the course directors are also required to write a course analysis report according to a standard template provided by the Programme Committee. In this analysis, the course director identifies strengths and areas for improvement. The results of the survey and the course analysis are sent to the programme officer and the Director of Studies. The Director of Studies reviews course evaluations, compares them to surveys from recent years to monitor trends in a relation to course development activities, and to identify any potential measures that need to be implemented. The summary of this analysis is presented to the Programme Committee. Results from the course evaluation surveys and course analysis are published on the open course webpages and made available to students.

Exit poll

Each year newly graduated students are asked to fill in a graduate questionnaire (exit poll). The student responses in exit polls are used to follow up the success of the programme regarding different aspects such as a common thread and progression through the programme; success in achieving the programme's learning outcomes, general learning environment, readiness of the students to take different skills into their future career. Exit polls are analysed by the Director of Studies and the analysis is presented to the Programme Committee. Strengths and weaknesses are identified, which results in measures being planned and implemented (see below).

Other recurring surveys

The other surveys, the student barometer, alumni survey and stakeholder survey (avnämarundersökning), are not available for the new curriculum. The last alumni survey (sent out by the evaluation unit at KI) was performed in 2021 and was answered by only 4 former students from the Masters' programme in Biomedicine, hence this survey is of little value and highlights the challenge for the programme in contacting alumni due to the lack of a system at KI to maintain contact with alumni, especially amongst the international programmes. The student barometer was performed in autumn 2023 and the results will be available during spring 2024. The programme will carry out a new stakeholder survey (avnämarundersökning) during the

coming year. The “Equal Opportunities” survey is discussed in section 2.2. Results from all these surveys are reviewed by the programme leadership and discussed within the Programme Committee.

Follow-up and feedback given by student representatives

Student representatives in the Programme Committee give regular feedback on course occasions and progression through the programme at each committee meeting. They also raise any issues related to the quality of the education that require urgent/immediate attention. If measures need to be taken, the students are informed as to the actions taken and how the issue is followed up. Furthermore, informal discussions between course directors/programme leadership and students regarding different teaching/learning activities take place continuously.

Measures and feedback to students and stakeholders (“relevanta intressenter”)

Feedback to the course directors is given by the Director of Studies after each course occasion and the strengths, weaknesses and possible improvements are discussed. If larger measures need to be taken to implement the improvement or development of the course, a specific working group consisting of programme leadership, course director and student representatives is formed. Sometimes a working group from several course directors is formed if the progression and coordination of the course activities is necessary. At present, such a group is working with implementation of progression between the “*Applied Biostatistics*” and “*Bioinformatics*” courses. Course administrators participate in the monthly “dialogue meetings”, which keeps them updated as to news, developments and focus areas in the programme.

Merged analysis of course surveys and exit pools is used to identify areas where measures need to be taken for the entire programme and involve all or most course directors. To implement such measures the Programme Committee initiates specific projects led by teachers appointed by the Committee. The measures are discussed during annual course director meetings and a follow-up is performed either individually or again during course director meetings. For example, in 2022-2023 one such project focused on the teaching and examination of the SDGs, which was indicated as being a weaker aspect of the programme in the exit polls of students graduating in previous years (albeit for a previous curriculum). Another project focused on teaching and implementation of peer review and peer feedback in the programme’s courses.

These aspects for improvement are also included in the programme’s quality plan, which is monitored during Programme Committee meetings throughout the year to follow implementation of the planned measures. Quality plans are also discussed with and peer-reviewed by other global master programmes at KI.

Student completion

The programme’s completion rate is generally very high and not viewed as problematic. Of the 44 students starting the programme in 2021 (the first time the new curriculum was given), 42 students completed their studies within 2 years. One student left to start a PhD at KI and another took a study break (currently expected to graduate in 2024). Extremely high completion rates have been consistently observed over the past years.

To ensure and support student completion of the programme, several measures are taken. Students have up to six occasions for re-examination. Times for re-examination are set to enable students to follow the course that is running when the re-examination takes place, which helps them to progress successfully through the programme. There is a good communication between course directors, the study counsellor and the Director of Studies in cases where a student needs extra support to progress through the programme. In such cases, an action plan is drawn up together with the student and followed up by the study counsellor and/or Director of Studies.

Issues related to student progression through the programme can also be raised by student representatives in Programme Committee meetings. If these cases require immediate action, the programme leadership coordinates implementation of the necessary measures and provides feedback to the student representatives on the actions taken.

Analysis

In summary, the programme has multiple channels to systematically monitor content, design, implementation and examination. The results of the follow-up are translated into quality development measures as necessary, and feedback is given to relevant stakeholders ("relevanta intressenter").

Students have multiple opportunities to provide their opinions via surveys, class councils and participation in the Programme Committee's activities. Some of these feedback tools (such as course surveys) are anonymous. The survey data are made available to teachers only if more than 5 students submit answers, which is potentially an issue in the elective courses, which have fewer participants and as such may result in the submission of too few responses to permit the generation of a report. A general challenge in collecting data from the surveys is the participation rate. The usual participation rate in the course surveys varies from 36% to 81% (years 2021-2022). Course directors are expected to work actively to increase student participation by explaining importance of the surveys for the quality work of the programme (presenting the previous course evaluation at the start of each course occasion together with information about the changes implemented as a result).

There are several mechanisms to provide feedback to stakeholders ("relevanta intressenter"), which include individual meetings with the programme leadership, course director meetings, and meetings with teachers responsible for the development/improvement of specific aspects (for projects driven by the Programme Committee). However, to understand better how well these mechanisms function, a closer review and a survey aimed at course directors would be helpful.

Overall students report that they are encouraged to participate in course development and receive feedback from teachers on the progress with their studies. However, their responses highlight their wish for improved feedback on examination results. This is important to improve to facilitate the application of knowledge and skills in subsequent courses in the programme.

Exit poll VT23 (21/42 responses, 50.0% response rate)	Mean ± SD (median)
Over the course of the education, I received information on my opportunities to influence the programme's courses	4.8 ± 1.1 (5.0)
I was encouraged by the teachers to participate in the development of the courses in the programme	4.9 ± 1.0 (5.0)
I regularly received useful feedback on:	
• Theoretical activities (lectures, group work, seminars, oral presentations /presentations, etc.)	5.0 ± 1.0 (5.0)
• Practical activities (e.g. on-site training VFU, laboratory work, interprofessional learning, observations, KTC training)	4.7 ± 1.5 (5.0)
• Examination results (written examinations, OSCE, etc.)	4.1 ± 1.4 (4.0)
I received guidance and support from teachers or supervisors in my learning	5.0 ± 1.1 (5.0)

Answers on a 6-point scale: To a very small degree (1) – To a very high degree (6).

Student completion rates are repeatedly very high and no specific measures for improvement are currently planned.

Evaluation

Strengths

The programme has an established and well-functioning organisation to monitor the content, design, implementation and examination of its component courses. The follow-up of weaknesses and the implementation of improvements are incorporated into the quality plan and in the form of specific projects that are led by appointed teachers. Additionally, there are recurring forums for teachers, students and programme leadership for follow-up and feedback on the quality and development of the courses and the programme as a whole. High student completion rates are a strength of the programme.

Weaknesses/Areas for improvement

Challenges that arise as a result of the many departments involved in the programme include monitoring whether each course assignment is followed by the respective department, and ensuring that communication between the Programme Committee, the responsible department and the course director regarding quality assurance and development of each course is safeguarded. Not all departments participate actively in this quality work. The information flow regarding course assignments, follow up of the course quality and review of course syllabi at the responsible departments can be improved. Finally, we should recognise that the power of students to influence the design of the programme might sometimes be at odds with efforts by the programme leadership and course directors to develop learning activities and promote creative thinking. Such situations require clear and transparent dialogue between students and teachers, which must be based on mutual respect and a shared goal of quality improvement and pedagogical development.

Assessment panel's evaluation

Instruction
For each assessment criterion, the assessment panel should describe their evaluation under the following three headings below: **Under the heading Strengths:** The assessment panel should highlight the programme's strengths within the assessment criterion and briefly describe them, preferably in bullet points. **Under the heading Areas for improvement:** The assessment panel should identify areas that are assessed to need improvement and briefly describe them, preferably in bullet points. **Under the heading Evaluation:** The assessment panel should explain their assessment and motivate their conclusion. The evaluation should be specified in one of four levels of fulfilment: *Meets/Meets to a large extent/Meets to some extent/Does not meet*.
Strengths: • Well structured evaluation program. • Student representatives in the programme committee. • Regular monthly dialogue meetings between programme committee and course directors. **Areas for improvement:**

- The programme committee's influence over the quality in the courses could be strengthened. In terms of course evaluations/course-analyses the departments are responsible, but the programme committee could take a more active role and being represented, as well as student representatives.
- The outcome of course evaluations in terms of changes and courses assignments needs to be strengthened.
- Exit polls are not mandatory and could lead to biased results. The response rate was higher when the exit polls were done on programme level. KI should consider that the programme committees are given more responsibility to perform these in the future.
- The feedback on examinations is not standardized. One suggestion could be to instruct the departments to conduct written feedback on examinations or verbal feedback in small groups if consented by the students.

Evaluation: Overall, it is the evaluation that the programme meets to a large extent the requirements of the assessment criterion. The justification for that evaluation is that the presented evaluation procedures are well structured and there is a platform for timely discussions regarding evaluation and pedagogic development. Improvements can be made regarding exit polls and timely feedback on written examinations. The programme could be given more responsibility regarding evaluations.

3 Assessment area: Student perspective

3.1 Assessment criterion: Student perspective

The student perspective concerns the actual student influence in their education, both formally and informally. Formal influence means, amongst other things, student representation in various bodies and platforms. It is relevant how students participate in decision-making processes, including the preparation of issues related to the education, and what the information channels look like to reach out to students so that they can take an active role in the work of developing the education.

Student influence is also about individual influence, that which is more informal and that concerns the individual student, e.g. what the work looks like so that a student can take an active part in developing their education and their learning processes. The programme should describe a student's opportunities to participate in the quality work of the programme and in the development of the programme, as well as describe the information channels available to pick up and take student views into account.

Assessment criterion: Student perspective
The student is given the opportunity to take an active role in the work of developing the content and implementation of the education.

Describe, analyse, and evaluate. Outline the strengths and challenges, as well as how these are addressed to ensure high quality in the programme. Illustrate with examples. The description should be between 1-3 pages, using font size 11 and single line spacing.

Presentation of the organisation of student influence at KI
The students are co-actors in the university's QA-activities and thus also have a shared responsibility in influencing and developing the education. In order for student influence to be realised, students are expected to take an active and committed role both as individuals and as a collective. A prerequisite for this is that the students' views, opinions and suggestions are asked for and met with respect. KI has a responsibility to facilitate and encourage the students' involvement in the development work.

KI's management meets regularly with the student unions for information exchange and consultation. At these meetings, it is discussed how student influence and collaboration with the student union works formally and in practice. In order to create a good study environment, it is required that the students' views on the education and the study environment are taken into account. The Academic Vice President for first and second cycle education meets regularly with representatives of the student unions for information exchange and consultation on these issues.

To ensure that student influence is realised at all levels, an agreement is reached annually between KI and the student unions on how student influence is to be secured in the bodies that deal with issues relating to education or the students' situation. The student unions are responsible for allocating places between the unions, conducting elections/appointing student representatives and that a gender equality perspective is taken into account. The student representatives who are appointed represent all students regardless of level of education, programme affiliation or union membership.

Programme description:

Description

Historically, student engagement in the Biomedicine Programmes has been high. Additionally, students from the Biomedicine Programmes have a strong history of contributing to educational development centrally at KI (eg representatives in the Committee for Higher Education and Faculty Board). This active contribution is highly valued by the programme leadership, and we strive to maintain and build upon it.

At the organisational level, the Biomedicine Programme Committee has three student representatives with voting rights (this number is decided by the Committee for Higher Education). These representatives are selected by BUS (Biomedicinska Utbildningssektionen) at Medicinska Föreningen (MF) to represent the three programmes under the jurisdiction of the Programme Committee – the Bachelor's and Master's Programmes in Biomedicine, and the Master's Programme in Molecular Techniques in Life Science. Of note, during 2023 a fourth programme was added to the Programme Committee – the Master's Programme in Biostatistics and Data Science. However, the number of students in the committee remains three and it is important that they represent all four programmes. The tight dialogue that is in place within BUS ensures that reports from all programmes (irrespective of which programmes the three student representatives are studying) are given at each Programme Committee meeting by the appointed student representatives. Affiliating additional student representatives is also a possibility, as was done for the Chairperson of BUS during HT22/VT23. There are usually 10-11 Programme Committee meetings each year (approximately once per month during term time). Reports from the student representatives are a standing point on the agenda. We encourage issues of overarching importance to be raised, rather than very specific comments on individual courses (which should be taken up with the respective course director in the first

instance and only raised at the Programme Committee if students experience difficulties in this communication or feel issues they raise are not resolved). Student representatives are also included in preparatory work for decisions to be taken in the Programme Committee, such as during the preparation of the budget, or selection of departments for course responsibility.

At the departmental level, MF is requested to appoint student representatives to all departmental educational committees. However, it has proved difficult for MF to identify sufficient numbers of students and consequently the majority of the departments that run courses in the Biomedicine Programmes have no student representatives in their educational committees. This challenge is not unique to the Biomedicine Programmes and reflects a KI-wide challenge to fill these positions, but dialogue is ongoing between central KI (Professional Services, Education Office: first and second cycle) and MF to identify ways of improving student recruitment. For the Master's Programme in Biomedicine, student feedback at the departmental level is therefore *de facto* usually at the course level.

At the course level, there are a wide variety of opportunities for obtaining the student perspective. The course survey at the end of the course is the most structured of these. The template for the Master's Programme in Biomedicine contains the five KI compulsory questions followed by 10 programme-specific questions, of which two are free-text answers: "*What were the strengths of this course?*" and "*Do you have any suggestions as to how to improve this course? (Give as constructive suggestions as possible!)*". There is also the option of adding course-specific questions, which many of the courses do. The response rate for the course surveys (for the programme's compulsory courses) in the period HT22-VT23 was 65.4±11.6% (range 45.5-82.2%), indicating a relatively robust student participation. One of the compulsory KI questions is "*In my view, during the course, the teachers have been open to ideas and opinions about the course's structure and content*." The average answer across all programme courses was 3.7 ± 0.6 (range 2.5-4.3). Students answer on a 5-point scale: To a very small extent (1); To a small extent (2); To some extent (3); To a large extent (4); To a very large extent (5).

The course survey (without free text answers) and the course analysis (written by the course director) are placed on the open course webpage (Drupal) to ensure that the information is freely available. The results of the previous survey are to be presented at the start of each course together with an explanation of any changes that have been implemented as a result of information obtained in the survey, as well as an explanation of why other things may not have been changed. However, while preparing this self-evaluation, we have become aware that this practice is not adhered to by a few courses. Nonetheless, all course directors are now aware of this routine and will implement it in future. Every course that is 5hp or longer is expected to hold a course council, providing a forum for open discussion between the course organisers and either the entire class or class representatives (selected by the students). Minutes are taken to document the topics covered and this serves as a complement to the course survey. Recent examples of changes that have been implemented in the programme as a result of feedback/comments from students include moving an introduction to the statistical computing package "R" from the "*Bioinformatics*" course into the "*Applied Biostatistics*" course, and revising the "*Bioentrepreneurship*" course, including updating the examination format (the group assignment was changed to exploration of a wicked problem in biomedicine, and the individual assignment was changed to focus on AI as a tool to understand the relationship between the entrepreneurial process and the traditional biomedicine research approach).

The exit poll provides a final opportunity for students to give their perspective on their education, from a holistic viewpoint. Scores for questions in the exit poll about opportunities to influence etc are presented in the table below.

Exit poll VT23 (21/42 responses, 50.0% response rate)	Mean ± SD (median)
Over the course of the education, I received information on my opportunities to influence the programme's courses	4.8 ± 1.1 (5.0)
I was encouraged by the teachers to participate in the development of the courses in the programme	4.9 ± 1.0 (5.0)

Answers on a 6-point scale: To a very small degree (1) – To a very high degree (6).

The programme aims to create an environment in which dialogue between students and teachers is a natural part of the education. To enable this informal route of student influence, students need to feel comfortable sharing their views and opinions. For this, teachers must have a respectful attitude towards student dialogue. The programme encourages this proactively through discussions with course directors and teachers about equal opportunities and the importance of gathering, and welcoming, feedback from students. Towards the students, the programme emphasises how important their opinions are for the development of the courses and programme as a whole, while raising the need for a constructive dialogue in which mutual respect is paramount. We believe in a shared responsibility for creating this dialogue. That such a dialogue is indeed in place in the programme is demonstrated by the range of channels that exist. Examples of informal contact between teachers and students include conversations in connection with teaching and learning activities, through forums on Canvas (which can be anonymous) or individual emails, through course administrators, and through conversations between course/programme leadership and student representatives.

Analysis

The above description highlights the variety of ways through which student influence and the student perspective permeates the programme. Both formal and informal mechanisms are in place to ensure that the student voice is heard and acted upon. The results of course evaluations suggest that in general students feel that they are encouraged to give their ideas and opinions about course structure and content, but the range of responses across courses indicates the need for follow up at the programme leadership level with some courses to ensure a constructive and open dialogue is maintained. Equally, the exit poll demonstrates that students assess that they were given good opportunities to contribute to the education and were encouraged to do so throughout the programme. Additionally, the relatively high response rates for the course surveys reveal a willingness by the students to contribute and presumably reflect a belief (based on experience) that their input will be listened to and used to make improvements to the programme. The programme leadership and course directors are regularly contacted directly by individual students leading to an open exchange of ideas and information.

Evaluation

Strengths

The Master's Programme in Biomedicine is fortunate to have excellent student engagement in activities such as the Programme Committee and overarching KI committees. We believe that this is at least in part a reflection on our students'

experiences from the programme where their involvement and views are actively sought, listened to, and used in developing the education. The student union section BUS is extremely active and makes a very valuable contribution to the programme in a range of ways.

Weaknesses/Areas for improvement
While there is generally a good and open dialogue between teachers and students, there is always room for improvement, and it is essential that the programme follows up on routines for ensuring that the student voice is heard and acted upon and that students can see that their opinions are listened to and can lead to change. Strengthening course director engagement in and insight into the programme as a whole is key, and this is an area that has been focused on in recent years through regular and structured meetings between course directors and the programme leadership. This will continue moving forward. The high level of student engagement demands clear, structured communication between students and teachers to ensure constructive discussion is maintained and that lines of communication between students and course directors are agreed upon and followed. In dialogue with students, the programme leadership should delineate these lines of communication and emphasise the importance of adherence to the agreed structure. Finally, the Programme sees an opportunity to develop course councils as an important component of integrating the student perspective, and this is a prioritised focus area.

Assessment panel's evaluation

Instruction
For each assessment criterion, the assessment panel should describe their evaluation under the following three headings below: **Under the heading Strengths:** The assessment panel should highlight the programme's strengths within the assessment criterion and briefly describe them, preferably in bullet points. **Under the heading Areas for improvement:** The assessment panel should identify areas that are assessed to need improvement and briefly describe them, preferably in bullet points. **Under the heading Evaluation:** The assessment panel should explain their assessment and motivate their conclusion. The evaluation should be specified in one of four levels of fulfilment: *Meets/Meets to a large extent/Meets to some extent/Does not meet*.
Strengths: • The evaluation committee agrees with the conclusions that are drawn in the self-evaluation. • It is good that a wide range of channels exists for student influence. **Areas for improvement:** • Mandatory course councils could improve student influence. It is unclear if course councils are mandatory or encouraged to be formed for courses. • Relative low response rate on exit poll VT23 (50%) may introduce bias. **Evaluation:** Overall, it is the evaluation that the programme meets the requirements of the assessment criterion. The justification for that evaluation is that there exists a wide range of opportunities for students to give feedback and

influence the content of the programme. However, there could be some improvements on the procedures of how the feedback is reported e.g. to increase response rates of polls.

4 Assessment area: Working life and collaboration

4.1 Assessment criterion Working life and collaboration

Working life and collaboration concerns whether the education is useful in the labour market and in what way the education prepares the student for a changing working life. This means that after graduation, a student should be able to use the knowledge and skills that the student has gained through their education and develop them throughout their professional life and in different work contexts. This requires that the student acquires both subject-specific knowledge and general skills and abilities during the education. Within this assessment area, the programme shall describe the way in which the education is updated and adapted to working life, and in what way information is obtained that is relevant to the quality assurance and development of the education regarding the education's usability and preparation for working life. The programme should also describe how collaboration with the surrounding society takes place in order to ensure high quality in the education. This assessment area also includes how the programme works to utilise alumni's experiences in the development of the programme.

Assessment criterion Working life and collaboration
The programme is designed and implemented in such a way that it is useful and develops the student's preparedness to meet changes in working life. Relevant collaboration takes place with the surrounding community.

Describe, analyse, and evaluate. Outline the strengths and challenges, as well as how these are addressed to ensure high quality in the programme. Illustrate with examples. The description should be between 1-3 pages, using font size 11 and single line spacing.

Programme description:

Description

In order to ascertain where the programme’s alumni were currently working, in which fields and at which level of competence, the Biomedicine Programme Committee conducted an alumni survey in 2017. The survey was sent to as many alumni as could be traced since the programme started in 2007, using contact details the programme had on record, or that could be found online. However, coverage was far from complete, and some contact information transpired to be out of date. Although the response rate was poor (approximately 25% of the total alumni pool, mainly attributable to difficulties in contacting alumni due to the lack of a central register at KI), the survey revealed that approximately 70% of the respondents had continued with PhD studies after graduation, and over 80% had worked in the field of biomedicine since graduating. Amongst the first 10 batches of graduates from the programme (2007-2016), each year 25-60% registered as PhD students at KI alone. This data, together with that from our alumni survey, demonstrate that the vast majority of graduates proceed into doctoral education. Informal follow up (eg via LinkedIn) of the relatively small pool of alumni who do not perform a PhD finds them in the life science industry (from start-ups to large pharmaceutical companies), research, and with some extra training, marketing, clinical trials, government agencies,

organisations linked to biomedicine, and media. When students are asked at the start of the programme what they hope to do after completion of their Master's degree, almost 100% answer that they would like to continue with a PhD and then either stay in academia or move into industry, within the life science sector. This is a good match with the aim of the programme to prepare students for future PhD studies and a career in biomedical research. This was a guiding principle during the development of the new curriculum (with start autumn 2021). Alumni of the programme were included in this development, including those who had continued with PhD studies at KI, as well as stakeholders ("avnämare": representatives from academia, companies, clinical laboratories, and regulatory authorities), teachers and experts, from both within KI and from other Master's Programmes in Biomedicine (both from the Nordic region and wider Europe). The work was focused on launching a curriculum that was modern, provided students with the skills necessary for a professional career in biomedicine (which most commonly starts with PhD studies), and delivered graduates that were attractive candidates for employment/enrolment into doctoral education.

The new curriculum was launched in autumn 2021 and the first batch of students graduated in June 2023. These students have completed a programme that provided them with broad training in, and contact with, the research environment at KI. They have performed three research projects in laboratories/research fields of their choice (which can be performed in an academic environment at either KI or at another university, or in industry, although the latter is not common), which together comprise half of the programme, thereby providing extensive training in an authentic environment and one into which many return as PhD students. Indeed, there is great interest amongst KI's research community in recruiting these students for projects and as subsequent PhD students (evidenced not least by the high participation of research groups in a research project fair organised in the "*Frontiers in Biomedicine*" course, which provides an opportunity for students to approach research groups advertising projects of interest). Furthermore, the elective courses (6 hp) in semester 3 are organised in collaboration with KI's doctoral education and the Master's students in Biomedicine participate in doctoral courses together with PhD students. This ensures the education is well aligned with the requirements for doctoral education. Indeed, for graduates who proceed with a PhD, these elective courses, and a number of other credits from the Programme, are routinely accredited towards their doctoral studies.

In addition to time spent performing research projects (most commonly wet lab research), students are trained comprehensively in essential biomedical skills with courses in "*Applied Biostatistics*", "*Bioinformatics*", "*Bioethics and Laboratory Animal Science*", and communication in written and oral formats and to different audiences ("*Applied Biomedical Communication and Professional Development*" and "*Biomedical Research Literacy*"). To meet the challenges central to biomedical research and development, students are well versed in critical analysis and teamwork/collaboration during the programme, and examination formats have been developed to mirror real life situations, such as critical discussion of articles in journal club format ("*Frontiers in Biomedicine*"), reviewing a biomedical research manuscript and writing a research proposal ("*Biomedical Research Literacy*"). The "*Bioentrepreneurship*" course provides training in entrepreneurship and design thinking, which is a complement to the focus on quantitative biomedical research in the rest of the Programme. However, there has been a misalignment in student expectations for the course compared to its contents leading to poor ratings. The unique skill sets that the "*Bioentrepreneurship*" course contribute to the programme need to be clarified at an early stage to ensure students appreciate its purpose and value, emphasising its role in promoting generic skills, including analytical thinking, and reasoning.

The "*Degree Project in Biomedicine*" (30 hp, semester 4) completes the programme and prepares the students to meet the challenges they will encounter in working life. Setbacks and obtaining confounding/surprising data are a natural part of research, and students are thereby required to address these challenges, adapt, and develop a revised strategy in order to proceed and contribute knowledge and understanding of the topic of their thesis. The Master's thesis provides an excellent all-round preparation for the student's progression into a professional career in biomedicine, as attested by the extensive skill sets covered in the course's ILOs.

One of the representatives in the Programme Committee is appointed by Region Stockholm. Currently this position is filled by the Head of Cytogenomics at Clinical Genetics at Karolinska Universitetslaboratoriet, thereby delivering expertise from routine laboratories and clinical contact. This provides an extremely valuable source of input into the Committee's ongoing work to keep the programme relevant for careers outside of academia and in the rapidly developing field of personalised medicine.

The Programme Committee established an "Advisory Board" composed of 10 alumni from KI's Biomedicine Programmes with roles outside of KI and, with the exception of one member, outside of academia, with representatives from the life science sector (primarily biotech companies), investment management and authorities. The board has served as a sounding board during discussions of the contents and direction of the Biomedicine Programmes and was invited to participate in the stakeholder survey with representatives from industries within the life science sector (the survey was performed in the format in-depth focus group interviews to understand better the future needs and desired skills of biomedical students). Two additional stakeholder survey interviews were performed with representatives from clinical laboratories and from academic research, to cover highly relevant workplaces for graduates of the programme. Importantly, a large proportion of the teachers within the programme are stakeholders in that they lead research projects/teams and recruit PhD students. This contributes to ensuring that the content and approach of the programme are strongly aligned with the desired future knowledge and skill sets of graduates, and that there is strong collaboration with the relevant working life community.

Questions from the exit poll provide an assessment of the student perspective on their preparedness to progress into working life and meet the necessary challenges.

Exit poll VT2023 (21/42 responses, 50.0% response rate)	Mean ± SD (median)
The programme contributed to my learning and development in understanding biomedical science, including knowledge of previous and current research questions within biomedical science	5.1 ± 1.2 (5.0)
I feel well-prepared to work within the area I have studied at KI	5.0 ± 1.0 (5.0)
I feel well-prepared for my future role's requirements to:	
• work independently	5.2 ± 0.9 (5.0)
• search for necessary information	5.1 ± 0.8 (5.0)
• solve problems independently	5.0 ± 0.7 (5.0)
• keep up to date with knowledge development within my field	4.8 ± 1.0 (5.0)
Overall – how was your experience of the quality of education you have completed at KI?	
• Overall, I am satisfied with my study period at KI	5.4 ± 1.1 (6.0)
• I would recommend KI to prospective students	5.6 ± 1.2 (6.0)

Answers on a 6-point scale: To a very small degree (1) – To a very high degree (6).

Analysis

The programme has been designed to deliver a rigorous preparation for future doctoral studies or a career related to biomedical research. Skills and knowledge are taught that will be necessary for graduates in their future working life, and students are trained to work independently, search for information, solve problems and keep up to date within their field. The curriculum has been designed in consultation with stakeholders to ensure its contents are aligned with the needs of the surrounding community. As such the programme is well placed to prepare students to be able to perform well in their future workplace and make them seen as attractive recruits. Furthermore, the students assess themselves to be well prepared for their future role(s) and to have obtained skills and competences necessary to tackle the challenges they will face. Their overall high satisfaction and willingness to recommend the education indicates that they believe the programme has been an excellent preparation for the next step in their career.

Evaluation

Strengths

The programme has very strong connections to the research environment (labs and researchers) and to doctoral education at KI, thereby ensuring its contents are well aligned with the needs of the major stakeholder (doctoral studies and academic research). Indeed, the surrounding community is closely involved in the programme, both in the design of the curriculum and in the teaching. Importantly, graduates feel well prepared for their future careers and assess that they have developed relevant and sought-after skill sets.

Weaknesses/Areas for improvement

The programme has a strong bias towards academia, both in terms of content and teacher background. While this is an active choice, given that the programme is run in the context of the extremely strong biomedical research environment at KI, strengthening contact with the life science sector and providing students with better insight into the opportunities this sector offers is an area that the programme should address. One way to achieve this is through introducing interaction with relevant alumni (eg establishing an alumni seminar series with “meet the speaker” sessions). Updating the Advisory Board, re-activating its work (since the board is not currently active), defining its role more clearly, and strengthening contact with this group is also an area for future development. Since the programme does not currently organise a career day for students, the instigation of such an event and inviting participants from industry (including members of the Advisory Board) is an activity to consider to improve collaboration with working life.

Renewed in depth interviews with different stakeholders (stakeholder survey) should be performed as soon as possible to ensure the programme remains aligned with the needs and expectations of the future workplaces of graduates. The programme’s content needs to be kept updated, not least regarding the rapid developments in the field of AI/machine learning, and regarding climate change and its impact on human health. Finally, the purpose of the *Bioentrepreneurship* course and the different approaches and skill sets that it brings to the programme needs to be better clarified and communicated to students and teachers so that the current misalignment with student expectations is eliminated.

Assessment panel's evaluation

Instruction
For each assessment criterion, the assessment panel should describe their evaluation under the following three headings below: **Under the heading Strengths:** The assessment panel should highlight the programme's strengths within the assessment criterion and briefly describe them, preferably in bullet points. **Under the heading Areas for improvement:** The assessment panel should identify areas that are assessed to need improvement and briefly describe them, preferably in bullet points. **Under the heading Evaluation:** The assessment panel should explain their assessment and motivate their conclusion. The evaluation should be specified in one of four levels of fulfilment: *Meets/Meets to a large extent/Meets to some extent/Does not meet*.
Strengths: • The design and content of the programme are tailored for doctoral studies which could be a steppingstone for advanced roles in industry, academia, government agencies or in health care. • Use of an advisory board to ask for the future needs and desired skills of biomedical students. **Areas for improvement:** • A plan for preparing students on what they can work with if you are not having a PhD exam. • Introduce students to alumni working outside academia (short talks or site visits). • Add more discussions for the need of graduated Biomedicine students in health care and the role of biomedicine in personalized medicine. **Evaluation:** Overall, it is the evaluation that the programme meets to a large extent the requirements of the assessment criterion. The justification for that evaluation is that the content of the courses is in line with most students' expectations of obtaining a PhD and continuing with a career as a researcher. However, students may also after the degree course wish to work in industry, governmental agencies, health care or regulatory bodies. Hence to fulfil the assessment criterion of collaborating with the surrounding community the programme could expand interactions with professionals in the different sectors outside academia, e.g. by alumni presentations or site visits. This action is also supported by interviews conducted with students.

4.2 Assessment criterion Internationalisation

According to Chapter 1 § 5 of the Higher Education Act, the overall international activities at each university shall contribute to strengthening the quality of education and research, as well as promoting sustainable development both nationally and globally in the areas of higher education. The challenges of the future are global and must be solved in collaboration across national borders. Working in healthcare, in

business or in academia requires intercultural competences. KI therefore has a responsibility to prepare all students for global citizenship, i.e. a global social responsibility and an ability and willingness to contribute. This requires a well-integrated education in global health and training in intercultural competences.

Internationalisation at home (IaH), which involves integrating intercultural and global perspectives into education, provides good conditions for sustainable and integrated internationalisation that reaches everyone. This can be done, for example, by utilising and sharing the experiences of students and teaching staff from different international contexts. The environment at KI is international and this in itself can be used as a resource. The rapid development of digitalisation offers great opportunities for international teaching without physical travel, for example through guest lectures digitally or group work online with students from partner universities. However, mobility remains an important part of internationalisation and programmes should actively create opportunities for this. Teaching in English provides an opportunity to receive and integrate exchange students and local students, but above all it strengthens students in their profession, prepares them for research, a global job market and a professional life in a multicultural society.

Assessment criterion: Internationalisation
The programme is designed and implemented in such a way that it develops the student's intercultural competence and the student's readiness to work in a global labour market.

Describe, analyse, and evaluate. Outline the strengths and challenges, as well as how these are addressed to ensure high quality in the programme. Illustrate with examples. The description should be between 1-3 pages, using font size 11 and single line spacing.

Programme description:

Description

The Master's Programme in Biomedicine is one of the global master's programmes at KI and has an internationalisation component at its core. Below lies a description/discussion of several areas, where design and implementation of the programme supports students' development of intercultural competence and readiness to work in a global labour market.

Multicultural and multilingual background of the students:

The students enrolled in the programme come from all over the world. First and second year students registered in the programme during VT2023 came from 21 and 19 countries, respectively (based on the country of their Bachelor's degree). This creates a multicultural and international environment in the class, providing possibilities for development of intercultural competence. Students work in mixed groups throughout the programme (for group assignments) and have the possibility to learn about, reflect on and analyse cultural differences brought from different countries, universities and working environments.

Multicultural and multilingual background of the staff, invited international speakers:

KI is an international university therefore our teaching staff is also multicultural and international. In addition, many courses involve lecturers from abroad who participate in teaching both via digital platforms and by visiting KI. For example, the semester 3

electives are given in collaboration with doctoral programmes that include lectures and mini symposia given by international speakers.

***Collaboration with Nordic partner universities**:*

The programme collaborates with partners in a Nordic network of international Master's programmes in biomedicine, which includes KI, University of Eastern Finland, University of Southern Denmark, and Turku University. The network, which has received funding through Nordplus and Erasmus+, has developed web-based methodology-orientated courses in translational pathology (Turku), computational proteomics (Southern Denmark), and clinical genomics (Eastern Finland) that are now offered to our master students as elective courses in semester 1. The topic of each elective course is based on the expertise at the partner university. Although these courses are given online, they add an important additional international dimension to the programme and learning environment. The network, which recently expanded to include Åbo Akademi University and Vilnius University, and renamed itself "BalticSeaBioMed", will offer a Baltic Sea sustainability-orientated summer school to biomedicine master students from all six partner universities in August 2024.

Exchange possibilities during research project courses:

Furthermore, internationalisation is stimulated by exchange possibilities with partner universities, where students can undertake their thesis project. In addition, students have the possibility to travel as "free movers" (using Erasmus+ funds within Europe) and perform their "*Frontiers in Biomedicine: Research Projects 1 and 2"* as well as their "*Degree Project in Biomedicine"* in laboratories of their choice, which further contributes to the possibilities for internationalisation within the programme and where the students get acquainted with challenges in the global labour market. Around 20 – 30% of students go on exchange for the "*Degree Project in Biomedicine"* and an additional 20% go as "free movers" for "*Frontiers in Biomedicine: Research Projects 1 and 2"*.

Support for student-initiated activities related to internationalisation:

The Programme Committee encourages and supports student-initiated activities concerning global health, multicultural and international perspectives in biomedicine. During HT2022, our students organized the event "Global health in research: Dealing with crisis", where different perspectives of biomedicine research were discussed together with representatives of health authorities from Lebanon.

Internationalization included into course content:

Though the participation of the Bachelor's and Master's Programmes in Biomedicine in the STINT-funded project Internationalisation of the Curriculum (IoC) from 2017 to 2020 led by Jennifer Valcke, there has been continued efforts to further integrate cultural, linguistic and global perspectives in the delivery of our curricula. The programmes engage at regular intervals with Jennifer Valcke to strengthen this work. Below are a few examples illustrating how internationalisation is incorporated into ILOs, TLAs and assessment of different courses.

ILO	**Teaching and learning activities**	**Examination**
Semester 1 – *Frontiers in Biomedicine*		
Identify current challenges in the biomedical field and propose ways to advance research in these areas	Integration of the global perspective into the topics covered in lectures and workshops, including differences in the geographical spread of disease	"Tasks" presented in written and oral forms, eg describing how a specific topic in immunology effects society
Semester 2 - Applied Biomedical Communication and Professional Development		

Reflect on the various dimensions of intercultural competence and their importance for group work	Workshops to foster growth of students' cultural and global competences: "creating brave spaces together" using UNESCO-endorsed story circles; and dispelling myths surrounding SDGs.	Reflective assignments on own values, expectations, and potential impact on group work, exploring dimensions of intercultural competence and their relevance in collaborative efforts.
Semester 3 - *Bioentrepreneurship*		
Apply entrepreneurial skills to address problems within a global context of biomedicine	Lecture including discussion of transferable generic skills and "wicked problems" (hard to solve and affect society at global level), specifically regarding health equity. Lecture on entrepreneurial process /entrepreneurship theory, responsible innovation and societal impact.	Presentation of project work on how to approach the wicked problem of equitable heath for all. Mandatory parts include which SDGs that are affected by the proposed solution.

Analysis

The description above illustrates the multiple aspects of internationalisation that are included in the programme's teaching activities and course content. Besides having international students and teaching staff, the programme also collaborates with Nordic universities providing elective courses in semester 1 that are led by teachers in Finland and Denmark. This provides the students with an additional level of international and multicultural perspectives. However, this can also come with challenges since teaching platforms and/or pedagogical tools may be organized differently to the ones used at KI (for example there is a Canvas template for all Biomedicine courses at KI, but a different set-up is used at other universities). At the same time students get a broader perspective on teaching/learning tools and cultures. Exchange possibilities during the "*Degree Project in Biomedicine"* offer an excellent opportunity to gain an international perspective and provide possibilities to prepare for the global work market. Indeed, during an exchange, some students find their future PhD supervisors. However, the challenge remains to ensure that students fulfil all the ILOs for the course, since contact between the course director and lab supervisors is more difficult and if issues arise regarding completion of the research project, opportunities to support the student are more restricted. Therefore, it is important to have a structured and continuous monitoring of students who perform part of their studies abroad.

Furthermore, during multiple courses students analyse biomedical problems in light of global contexts and are required to reflect on different aspects (see example ILOs above). They also reflect on dimensions of working in international and multicultural settings. We therefore conclude that internationalization is well-incorporated into the programme's content.

Analysis of the exit poll (below), which provides an assessment of how well students evaluate their education to have trained them in internationalization aspects, indicates that students consider themselves to be rather well-prepared to cooperate in multicultural environments and are able to encourage equal treatment based on ethical background, religion, social class, age etc. However, they feel less confident in understanding how international events shape the world. The latter question does not clearly indicate which "international events" are meant and this might affect the

response of the students, given that the answers to other internationalization-related questions were scored very highly.

Exit poll VT23 (21/42 responses, 50.0% response rate)	Mean ± SD (median)
I feel well-prepared for my future role's requirements to: • cooperate in diverse cultural environments • communicate in English • have a broad understanding of international events shaping the world	 5.5 ± 0.8 (6.0) 5.7 ± 0.7 (6.0) 4.4 ± 1.4 (4.0)
I feel well-prepared for my future role's requirement to be able in my work to encourage: • equal treatment based on ethnic background, religion, social class, age etc	 5.3 ± 1.1 (6.0)

Answers on a 6-point scale: To a very small degree (1) – To a very high degree (6).

Evaluation

Strengths

Students are constantly exposed to international environments: the study environment is multicultural and international (regarding the group of students, the teaching staff and KI as an international university).

The design of the programme contributes to multicultural learning: collaborations with Nordic partner universities for semester 1 elective courses; invited international speakers in multiple courses, broad exchange and "free mover" possibilities to perform research project courses at other international universities and companies outside Sweden.

In addition, international aspects are included in course ILOs and examined.

Weaknesses/Areas for improvement

While incorporated in teaching/learning activities, internationalisation is often not clearly visible in course ILOs. During the curriculum mapping for this self-evaluation, several course directors realized that while they do have internationalisation aspects in their courses, they are not visible in the course's ILOs. Thus, visualization and representation of activities reflecting teaching to work in multicultural and global environments in course ILOs can be improved. Additionally, progression in internationalisation throughout the programmes is not visible.

Although students feel well-prepared to work in diverse cultural environments (data from exit poll above), they assess their understanding of international events shaping the world as low. Therefore, teaching aspects of a global perspective in Biomedicine can be more structured and made visible for the students.

Assessment panel's evaluation

Instruction
For each assessment criterion, the assessment panel should describe their evaluation under the following three headings below: **Under the heading Strengths:** The assessment panel should highlight the programme's strengths within the assessment criterion and briefly describe them, preferably in bullet points. **Under the heading Areas for improvement:** The assessment panel should identify areas that are assessed to need improvement and briefly describe them, preferably

in bullet points.

Under the heading Evaluation: The assessment panel should explain their assessment and motivate their conclusion. The evaluation should be specified in one of four levels of fulfilment: *Meets/Meets to a large extent/Meets to some extent/Does not meet*.

Strengths:

- The programme offers a natural international environment.

Areas for improvement:

- Improve the work with cultural intelligence. Based on experience and academic publications, there are challenges in collaborations for students /groups with a diverse cultural background. By visualizing this in “cultural intelligence” you can improve productivity. This is good for the program but also for their life experience in the future.
- The broad perspective on international events shaping the world may be addressed by integrating it with global health and sustainable development with real world examples (technological breakthroughs, Nobel prizes etc).

Evaluation: Overall, it is the evaluation that the programme meets the requirements of the assessment criterion. The justification for that evaluation is that the structure and content of this international master programme result in a natural mix of cultures in the classroom. The opportunity of performing the degree projects abroad also contributes to fulfilling the assessment criterion.

4.3 Assessment criterion: Interprofessional competence

Interprofessional competence is part of the generic competence that is necessary for employees, not only in current and future health and medical care, but also in other areas of employment relevant to KI's education. KI's vision is that the education is designed and implemented in such a way that the student, after completing the education, has the best possible conditions to work within and continuously develop an activity in close collaboration with other professions and disciplines. Intended learning outcomes and educational activities to achieve interprofessional knowledge, competence and approach must therefore be included and assessed within KI's programmes at first and second cycle.

Interprofessional competencies include: Communication, collaboration, teamwork, roles and responsibilities, conflict resolution, patient safety and patient/client centeredness.

Assessment criterion: Interprofessional competence
The programme is designed and carried out in such a way that it develops the student's competence to work within and continuously develop an activity in close collaboration with other professions and disciplines.

Describe, analyse, and evaluate. Outline the strengths and challenges, as well as how these are addressed to ensure high quality in the programme. Illustrate with examples. The description should be between 1-3 pages, using font size 11 and single line spacing.

Programme description:

Description

The overarching aim of the programme is to prepare students to be able to work in an interprofessional, multidisciplinary and multicultural environment since biomedicine is, by its nature, a subject that requires collaboration, communication, teamwork and the ability to work with colleagues from different areas of expertise and/or professions. Many of the skills required for interprofessional competence are described and analysed in previous sections of this evaluation and hence there is overlap with the current section.

Half of the programme (60 hp) is comprised of research projects performed in active research laboratories (15 hp in semester 2, 15 hp in semester 3, and 30 hp in semester 4). This requires students to work in interprofessional and diverse environments and collaborate with a range of other professions, depending on the specific nature of their project(s), and includes laboratory technicians, statisticians, bioinformaticians, clinicians, research nurses, clinical geneticists, animal technicians, administrators, and of course experts in the field of biomedicine (at a range of levels: BSc/MSc students, PhD students, post docs, research specialists, principal investigators etc). This provides students with an opportunity to learn and train together with other professionals in an authentic environment. In other courses in the programme, emphasis is placed on communication (written and verbal), team/group work, and on students taking responsibility for the different roles required to complete assignments (performed both individually and in groups).

Examples of ILOs and corresponding teaching-and-learning activities and examinations that cover aspects of interprofessional competence are given below.

ILO	Teaching and learning activities	Examination
Semester 2 - Applied Biomedical Communication and Professional Development		
Identify the skills required in seeking different professional careers	Workshops on: - identification of transferable skills attained - careers in and outside of academia - writing CV, letter of motivation, LinkedIn profile	Create a LinkedIn profile
Semester 2 - Frontiers in Biomedicine: Research Project 1		
Demonstrate realistic time planning and appropriate attitude regarding collaboration	- Perform project in a research lab and work with colleagues from different professions and disciplines - Organise progress meetings with other students within a given time frame	- Strict deadlines for submission of written work (including after student progress meeting) - Supervisor assesses “Social skills: the student is able to function adequately in the research group”
Semester 3 – Bioentrepreneurship		
Apply entrepreneurial skills to address problems within a global context of biomedicine	Design thinking and effectuation workshop; wicked problems and health equity in design thinking process; lecture on overview of stakeholders and data collection methods	Project work on how to approach wicked problem of equitable health for all, including identification of stakeholders affected by proposed solution
Semester 4 - Degree Project in Biomedicine		
Show a professional approach regarding	Perform project in a research lab and interact/work with colleagues	- Strict deadlines for submission of written work

time planning and collegial cooperation	from different professions and disciplines	- Supervisor assesses academic social skills including communication and collaboration within research group

The programme starts with a joint kick-off together with Master's Programmes in Toxicology, Nutrition Science, Translational Physiology and Pharmacology, and Molecular Techniques in Life Science. Students discuss their programmes in mixed groups to reflect on and discuss similarities and differences, eg regarding methodologies employed and future careers.

In the course "*Bioethics and Laboratory Animal Science*" (first course in semester 2) an interprofessional learning activity is performed around the ethics of drug development. Entitled "Getting Down to Business!", the full-day activity involves students from the Master's Programmes in Biomedicine, Toxicology and Bioentrepreneurship. Working in small mixed groups, students have to represent their own area of expertise to discuss and reason around the case that develops throughout the day. Group reflections are written at three stages and discussions with other groups/teachers are held. This activity challenges the students to work together with other professions and contribute their specialist knowledge in order to understand the intricacies of the case and decide on a course of action. Indeed, in the "*Bioethics and Laboratory Animal Science*" course, 4.5 hp (out of a total of 7.5hp) is taken together with students from the Master's Programme in Toxicology. Group work strengthens the collaboration between the two student groups, develops their ability to work in teams, and trains them in different aspects of biomedical research involving animals, thereby placing the learning in the context in which it is to be used.

Communication and teamwork are central pillars of the Programme. The tone is set in the first course ("*Frontiers in Biomedicine*") with multiple group assignments and presentations (different groups and assignments each week for 5 weeks). In semester 2, the course "*Applied Biomedical Communication and Professional Development*" highlights communication with different audiences, and different careers. In semester three, interaction and cooperation with other disciplines takes place in the elective courses (6 hp), which are all run in collaboration with KI's doctoral education. The Master's students in Biomedicine participate in doctoral courses together with PhD students from across KI (and potentially even from other universities). The "*Bioentrepreneurship*" course (semester 3) introduces students to working with teachers from the Unit for Bioentrepreneurship with expertise in innovation and entrepreneurship, thereby developing the students' skills sets in these areas and fostering collaboration with a different discipline.

Finally, the Programme has teachers from a range of backgrounds, disciplines, and professions. While the majority are academic researchers, they span a range of disciplines. However, teaching and learning activities are also led by teachers from the life science sector, as well as with expertise in specific competences such as academic writing and rhetoric.

Questions from the exit poll provide an assessment of the student perspective on their training and skills in aspects of interprofessional competence.

Exit poll VT2023 (21/42 responses, 50.0% response rate)	Mean ± SD (median)
I feel well-prepared to work within the area I have studied at KI	5.0 ± 1.0 (5.0)
I feel well-prepared for my future role's requirements to:	

• co-operate	5.5 ± 0.6 (6.0)
• communicate in writing (present information, problems and solutions in writing)	5.1 ± 0.9 (5.0)
• communicate verbally (verbally present information, problems and solutions)	5.4 ± 0.8 (6.0)
• communicate in English	5.7 ± 0.7 (6.0)
• work with other professions	4.5 ± 1.4 (5.0)
• cooperate in interprofessional teams	4.9 ± 1.2 (5.0)
• cooperate in diverse cultural environments	5.5 ± 0.8 (6.0)

Answers on a 6-point scale: To a very small degree (1) – To a very high degree (6).

Analysis

The Master's Programme in Biomedicine trains and examines students in the competences necessary to work in an interprofessional and interdisciplinary fashion, and this is visible in the intended learning outcomes included in the programme's courses. Students interact and collaborate with students from other programmes, requiring them to represent their professional expertise. The extensive time devoted to research projects (50% of the programme) ensures students gain considerable experience of working in an interprofessional/interdisciplinary environment. Training and examination in communication in different formats and to different audiences is a recurring theme throughout the programme and this supports the students' ability to work together with colleagues from diverse backgrounds and areas of expertise. Finally, the students assess that they are well prepared to work in the area they have studied (and biomedicine is a collaborative discipline) and possess relevant skills. However, their responses to the two questions in the exit poll that specifically refer to working with other professions and cooperating in interprofessional teams are lower, indicating that the programme can consolidate formal training and examination in this area, as well as emphasising the interprofessional nature of the research projects (since the students may not have considered this).

Evaluation

Strengths

The programme provides extensive training and examination in communication (written and verbal), collaboration and teamwork, which are essential skills when working with different professions and/or disciplines. Additionally, the three research projects (50% of the programme) provide training in an authentic interprofessional environment. Finally, the programme contains interprofessional activities (both formal and informal) with different student groups and teachers from different disciplines.

Weaknesses/Areas for improvement

There is a lack of progression in the ILOs for the three research projects. This needs to be addressed (in combination with corresponding assessment criteria). While the "*Bioethics and Laboratory Animal Science*" course contains a full interprofessional activity (Getting Down to Business!) together with two other master's programmes, there is no corresponding ILO. Indeed, overall, the programme lacks ILOs that specifically refer to interprofessional competence, although many ILOs address proficiencies that are relevant/necessary in order to be able to work with other professions and disciplines. This needs to be addressed. The students enjoy the interprofessional activity "Getting Down to Business!" and have requested more such events. Possibilities for extending the range of interprofessional activities in the programme should be investigated, for example a learning activity together with students attending the "FOLÄK" courses, which are research introductory courses for

medical students. However, the challenges of scheduling should not be underestimated!

Assessment panel's evaluation

Instruction
For each assessment criterion, the assessment panel should describe their evaluation under the following three headings below: **Under the heading Strengths:** The assessment panel should highlight the programme's strengths within the assessment criterion and briefly describe them, preferably in bullet points. **Under the heading Areas for improvement:** The assessment panel should identify areas that are assessed to need improvement and briefly describe them, preferably in bullet points. **Under the heading Evaluation:** The assessment panel should explain their assessment and motivate their conclusion. The evaluation should be specified in one of four levels of fulfilment: *Meets/Meets to a large extent/Meets to some extent/Does not meet*.
Strengths: • A good mix of activities is offered during the programme for interprofessional learning. **Areas for improvement:** • Improve visibility for working together with quadruple helix. Reflections from students might be improved if this reflection will come both years in the program. • Learning activities for communication to lay audience could be made more visible throughout. • If possible, the students could take elective courses from the other master programmes including mixed groups. • Include reflections/discussions after project courses about the different roles in a research group with mixed composition. **Evaluation:** Overall, it is the evaluation that the programme meets the requirements of the assessment criterion. The justification for that evaluation is that there is clear progression and use of different assignments to train students in communication, teamwork and critical thinking as well as working with different professions within a research group setting. We have identified some areas for improvement. One of them is activities aiming for communication to lay audience which is a key skill in many workplaces both for conveying a clear message but also to minimise misunderstandings. The programme could reflect on whether activities regarding writing and speech to the lay audience and to professions that are not experts in biomedicine are given adequate time in the courses.

Other aspects

The programme can describe areas that are relevant to highlight but are not included in any of the assessment criterion, such as other generic competencies and forward-looking development work to increase the quality of the programme. Scope 1-3 pages with font size 11 points and single line spacing.

Programme description of other aspects:

Preparation of this self-evaluation

The writing group was composed of the Programme Director and the Director of Studies. Text was reviewed by the Chairman of the Biomedicine Programme Committee. Progress with the self-evaluation and a description of the process employed was a standing point on the agenda at Programme Committee meetings from August 2023 up until submission in February 2024. A draft of the self-evaluation was sent to all members of the Programme Committee prior to the meeting in January 2024, and a pre-final version was circulated prior to the meeting in February 2024. In addition to current student representatives in the Programme Committee, input was also sought from former student representatives, including an alumnus of the programme. The process of programme evaluations at KI was initially introduced to course directors at the retreat in November 2022, with updates/reminders included in "dialogue meetings" during 2023. The Programme Director and the Director of Studies held regular meetings with the programme's course directors throughout autumn 2023: a session at the course director retreat in October and Zoom meetings in November and December (all with high attendance). Meetings were held in workshop form, requiring active participation by course directors, to gather specific information needed for the self-evaluation and to inform course directors of the process and status. Administrative support was provided by the Education Office for the Medical and Biomedical Programmes. Meetings between the Programme Director, the Director of Studies, the Chairman of the Programme Committee, and administrative support were held every second week from August 2023 (when writing started) up until February 2024 to discuss the self-evaluation, review progress and plan the work.

Benchmarking of exit poll

Results from the exit poll for the Master's Programme in Biomedicine performed in spring 2023 are presented in this self-evaluation. We have not "bench marked" the results through comparison with the average score from the other global programmes at KI (international programmes given in English) since differences may be dependent upon the specific focus areas of the programmes, and furthermore, we do not have robust data in the form of exit polls over several years where we can identify trends, since we present only the data for the current curriculum (currently available from only one year). Nonetheless, this comparison is shown in the table below. In general, the results from the Master's Programme in Biomedicine are extremely similar to the aggregated score for the other global programmes. There are a few instances in which the Master's Programme in Biomedicine has somewhat lower scores: feedback on examination results, a common thread from learning outcomes to examination, collaboration with other professionals/working in interprofessional teams, a global health perspective, and understanding of international events. Potential weaknesses of the programme in these areas are all independently identified and discussed in the self-evaluation.

	Exit poll VT23	All KI's global programmes		Master's Programme in Biomedicine	
		n	Mean ± SD (median)	n	Mean ± SD (median)

1a	I regularly received useful feedback on: - Theoretical activities (lectures, group work, seminars, oral presentations / presentations, etc.)	146	5.0 ± 1.2 (5.0)	21	5.0 ± 1.0 (5.0)
1b	I regularly received useful feedback on: - Practical activities (e.g., on-site training VFU, laboratory work, interprofessional learning, observations, KTC training)	129	4.5 ± 1.5 (5.0)	19	4.7 ± 1.5 (5.0)
1c	I regularly received useful feedback on: - Examination results (written examinations, OSCE, etc.)	144	4.5 ± 1.4 (5.0)	20	4.1 ± 1.4 (4.0)
2	There is a clear common thread from learning outcomes to examination in the education	144	5.0 ± 1.1 (5.0)	21	4.8 ± 1.0 (5.0)
3	The education was structured with a clear progression (i.e., the content was broadened and became more advanced over the course of the education)	147	4.8 ± 1.3 (5.0)	21	4.3 ± 1.6 (5.0)
4	The education's content was based on current research	144	5.3 ± 1.0 (5.0)	21	5.5 ± 0.7 (6.0)
5a	I learnt about ongoing research during: - Theoretical learning activities	140	4.9 ± 1.1 (5.0)	20	5.0 ± 0.8 (5.0)
5b	I learnt about ongoing research during: - Practical and/or clinical learning activities	134	4.5 ± 1.5 (5.0)	20	5.0 ± 1.2 (5.0)
6	Criteria for assessment of examinations were provided in advance	145	5.2 ± 1.0 (6.0)	21	5.0 ± 1.2 (6.0)
7	Over the course of the education, I received information on my opportunities to influence the programme's courses	145	4.8 ± 1.3 (5.0)	21	4.8 ± 1.1 (5.0)
8	I was encouraged by the teachers to participate in the development of the courses in the programme	145	4.6 ± 1.4 (5.0)	21	4.9 ± 1.0 (5.0)
9a	The physical study environment (classrooms/lecture halls, study areas, IT, breakrooms/informal etc.) at Campus Solna has worked well for my needs on the whole	145	5.3 ± 0.9 (6.0)	21	5.5 ± 0.7 (6.0)
9b	The physical study environment (classrooms/lecture halls, study areas, IT, breakrooms/informal etc.) at Campus Flemingsberg/Huddinge has worked well for my needs on the whole	42	5.0 ± 1.1 (5.0)	19	5.1 ± 1.0 (5.0)
10	The digital learning environment such as Canvas, Zoom etc. during the web-based teaching has worked well for my needs on the whole	143	5.1 ± 1.0 (5.0)	21	5.0 ± 1.1 (5.0)
11	The psychosocial study environment (psychosocial environment refers to, among other things, comfort, support, stress, equal treatment and discrimination) has worked well based on my needs on the whole	145	4.7 ± 1.4 (5.0)	21	4.8 ± 1.3 (5.0)
12	A variety of teaching methods were used during the education in a way which encouraged me to be active in my learning (for example, lectures, seminars, practical skills training, e-learning)	146	4.9 ± 1.2 (5.0)	21	5.0 ± 1.0 (5.0)
13	The structure of the education encouraged independence in my learning	145	5.1 ± 1.2 (5.0)	21	5.1 ± 0.7 (5.0)
14	I received guidance and support from teachers or supervisors in my learning	147	4.9 ± 1.2 (5.0)	21	5.0 ± 1.1 (5.0)
15	I feel well-prepared to work within the area I have studied at KI	146	4.7 ± 1.2 (5.0)	21	5.0 ± 1.0 (5.0)
16a	I feel well-prepared for my future role's requirements to: - co-operate	145	5.4 ± 1.0 (6.0)	21	5.5 ± 0.6 (6.0)
16b	I feel well-prepared for my future role's requirements to: - critically review information	147	5.3 ± 1.0 (5.0)	21	5.0 ± 1.1 (5.0)
16c	I feel well-prepared for my future role's requirements to: - communicate in writing (present information, problems and solutions in writing)	147	5.3 ± 1.0 (6.0)	21	5.1 ± 0.9 (5.0)
16d	I feel well-prepared for my future role's requirements to: - communicate verbally (verbally present information, problems and solutions)	147	5.3 ± 1.0 (6.0)	21	5.4 ± 0.8 (6.0)
16e	I feel well-prepared for my future role's requirements to: - communicate in English	145	5.7 ± 0.6 (6.0)	21	5.7 ± 0.7 (6.0)
16f	I feel well-prepared for my future role's requirements to: - work independently	146	5.4 ± 1.0 (6.0)	21	5.2 ± 0.9 (5.0)
16g	I feel well-prepared for my future role's requirements to: - search for necessary information	147	5.3 ± 0.9 (6.0)	21	5.1 ± 0.8 (5.0)
16h	I feel well-prepared for my future role's requirements to: - solve problems independently	146	5.1 ± 1.0 (5.0)	21	5.1 ± 0.7 (5.0)
16i	I feel well-prepared for my future role's requirements to: - being able to use scientific methods	147	5.1 ± 1.1 (5.0)	21	5.0 ± 1.0 (5.0)

16j	I feel well-prepared for my future role's requirements to: - apply research-based evidence in my work	145	5.3 ± 0.9 (6.0)	21	5.4 ± 0.7 (5.0)
16k	I feel well-prepared for my future role's requirements to: - apply practical skills	145	4.8 ± 1.3 (5.0)	21	5.2 ± 0.9 (5.0)
16l	I feel well-prepared for my future role's requirements to: - work with other professions	142	5.0 ± 1.2 (5.0)	21	4.5 ± 1.4 (5.0)
16m	I feel well-prepared for my future role's requirements to: - keep up to date with knowledge development within my field	147	5.0 ± 1.1 (5.0)	21	4.8 ± 1.0 (5.0)
16n	I feel well-prepared for my future role's requirements to: - cooperate in interprofessional teams	145	5.3 ± 1.0 (6.0)	21	4.9 ± 1.2 (5.0)
16o	I feel well-prepared for my future role's requirements to: - cooperate in diverse cultural environments	147	5.5 ± 0.9 (6.0)	21	5.5 ± 0.8 (5.0)
16p	I feel well-prepared for my future role's requirements to: - apply a global health perspective on a variety of issues	144	5.0 ± 1.3 (5.0)	21	4.6 ± 1.4 (5.0)
16q	I feel well-prepared for my future role's requirements to: - have a broad understanding of international events shaping the world	147	4.8 ± 1.4 (5.0)	21	4.4 ± 1.4 (4.0)
16r	I feel well-prepared for my future role's requirements to: - promote sustainable development	145	4.6 ± 1.5 (5.0)	21	4.0 ± 1.5 (4.0)
16s	I feel well-prepared for my future role's requirements to: - be able to deal with the ethical considerations I face	147	5.0 ± 1.2 (5.0)	21	4.8 ± 1.1 (5.0)
17a	I feel well-prepared for my future role's requirement to be able in my work to encourage: - Gender equality (female, male, non-binary)	140	5.3 ± 1.2 (6.0)	20	5.2 ± 1.0 (5.5)
17b	I feel well-prepared for my future role's requirement to be able in my work to encourage: - Equal treatment based on ethnic background, religion, social class, age etc	141	5.3 ± 1.1 (6.0)	20	5.3 ± 1.1 (6.0)
17c	I feel well-prepared for my future role's requirement to be able in my work to encourage: - Equal rights from LGBTQIA+ perspectives (Lesbian, Gay, Bisexual, Transgender, Queer, Intersex and Asexual/Aromantic)	136	5.2 ± 1.3 (6.0)	18	5.3 ± 1.1 (6.0)
17d	I feel well-prepared for my future role's requirement to be able in my work to encourage: - Equal treatment of people with functional variations (sensory, physical and cognitive abilities)	139	5.1 ± 1.3 (6.0)	20	4.8 ± 1.4 (5.0)
18	Overall, I am satisfied with my study period at KI	147	5.2 ± 1.2 (6.0)	21	5.4 ± 1.1 (6.0)
19	I would recommend KI to prospective students	145	5.3 ± 1.2 (6.0)	21	5.6 ± 1.2 (6.0)

The assessment panel's reflection

Instruction
Under the heading *Reflection*, the assessment panel shall present the assessment panel's reflections on the programme's description of other aspects.
Reflection: The assessment panel recognize that since there is only one year of data since the curriculum update it is not possible to benchmark the exit poll compared to previous years. In general, the students are satisfied with the programme judging by the scores in the exit poll. However, the response rate is low. The programme should consider actions to increase the response rate in the exit poll to receive usable data for future evaluations. In general, timely feedback on examinations can be improved including feedback on written examinations.

Summary of the assessment panel

Instruction
The assessment panel's summary should begin with a reflection on the conditions provided by the self-evaluation to assess the quality of the programme, i.e. whether the self-evaluation was easy to read, well-structured, provided answers to the

questions asked and followed the instructions. The summary should also briefly summarize the program's key strengths and areas for improvement. The assessment panel can also add other points of view that the assessment panel wishes to present.
The assessment panel agrees that the provided self-assessment contained sufficient information for assessment and reflection on the assessment criterions. Although some texts were repeated in several points in the self-assessment, we think it was easy to read and some gaps could be filled after interviews. The program's key strength is the research-focused learning outcomes and a clear progression of learning throughout the program ending with a degree project in which the students can demonstrate what they have learned after two years in the master programme. By being an international masters, the programme can benefit from the student's different background and cultures in discussions and reflections. However, due to the diverse background of the students there is a risk of mismatching between the student's expectations and the learning goals during the courses. The teachers need to be clear in explaining the purpose of the different pedagogic methods used because some methods may not have been used during some of the students' bachelor programmes. There are also some minor concerns regarding the process of evaluation that could be improved. For instance, the exit poll is not controlled by the programme, its response rate varies and is generally quite low, most likely due to it being administered after the master ends. The assessment panel suggests interacting with students and KI central to find a way to increase the response rate of polls. Overall, the quality work would probably be more efficient if the programme committee were given more authority in relation to the departments. If the system does not allow this the programme committee could be more involved, for example take a more active role in the course evaluations and course analyses coupled to the course assignments.