



AGENTUR FÜR
QUALITÄTSSICHERUNG DURCH
AKKREDITIERUNG VON
STUDIENGÄNGEN E.V.

EXPERTS' REPORT

**MATHEMATICS EDUCATION
(BACHELOR OF EDUCATION)**

**PHYSICS EDUCATION
(BACHELOR OF EDUCATION)**

**CHEMISTRY EDUCATION
(BACHELOR OF EDUCATION)**

**INFORMATICS AND COMPUTER
ENGINEERING EDUCATION
(BACHELOR OF EDUCATION)**

Universitas Negeri Semarang (UNNES), Indonesia

December 2021

HEI	Universitas Negeri Semarang (UNNES)
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Programme	Mathematics Education
Degree	Bachelor of Education
Extent	144 SKS
Length of studies	8 semesters
Language	Indonesian / English

Concept accreditation	<input type="checkbox"/>
First-time international accreditation	<input checked="" type="checkbox"/>
No. reaccreditation	-

Programme	Physics Education
Degree	Bachelor of Education
Extent	144 SKS
Length of studies	8 semesters
Language	Indonesian / English

Concept accreditation	<input type="checkbox"/>
First-time international accreditation	<input checked="" type="checkbox"/>
No. reaccreditation	-

Programme	Chemistry Education
Degree	Bachelor of Education
Extent	144 SKS
Length of studies	8 semesters
Language	Indonesian / English

Concept accreditation	<input type="checkbox"/>
First-time international accreditation	<input checked="" type="checkbox"/>
No. reaccreditation	-

Programme	Informatics and Computer Engineering Education
Degree	Bachelor of Education
Extent	144 SKS
Length of studies	8 semesters
Language	Indonesian
Concept accreditation	<input type="checkbox"/>
First-time international accreditation	<input checked="" type="checkbox"/>
No. reaccréditation	-
Responsible agency	AQAS e.V.
Responsible consultant(s)	Alexandre Wipf / Corinna Herrmann

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DECISION OF THE AQAS COMMISSION ON THE BACHELOR DEGREE PROGRAMMES

- “MATHEMATICS EDUCATION” (BACHELOR OF EDUCATION)
- “PHYSICS EDUCATION” (BACHELOR OF EDUCATION)
- “CHEMISTRY EDUCATION” (BACHELOR OF EDUCATION)
- “INFORMATICS AND COMPUTER ENGINEERING EDUCATION” (BACHELOR OF EDUCATION)

OFFERED BY UNIVERSITAS NEGERI SEMARANG (UNNES), INDONESIA

Based on the report of the expert panel and the discussions of the AQAS Commission in its 11th meeting on 6 December 2021, the AQAS Commission decides:

1. The study programmes “Mathematics Education” (Bachelor of Education), “Physics Education” (Bachelor of Education), “Chemistry Education” (Bachelor of Education) and “Informatics and Computer Engineering Education” (Bachelor of Education) offered by Universitas Negeri Semarang (UNNES), Indonesia are accredited according to the AQAS criteria for Programme Accreditation.

The accreditation is conditional.

The study programmes essentially comply with the requirements defined by the criteria and thus the Standards and Guidelines for Quality Assurance in the European Higher Education Area (ESG) and the European Qualifications Framework (EQF) in their current version. The required adjustments can be implemented within a time period of twelve months.

2. The conditions have to be fulfilled. The fulfilment of the conditions has to be documented and reported to AQAS no later than **31 December 2022**. The confirmation of the conditions might include a physical site visit within the time period of twelve months.
3. The accreditation is given for the period of **six years** and is valid until **30 September 2027**.

Conditions:

For all programmes

1. The course descriptions (semester learning plans, RPS) of all four study programmes must be improved. The following aspects must be taken into account in the revision:
 - a. The level of detail and the consistency in the quality of the descriptions (e.g. between the subject courses and the education courses).
 - b. The course learning outcomes and the course content must be described in more detail with information specific for each study programme and subject. More details must also be provided for the class accompanying the school internship as well as for the community service programme.
 - c. A course description for the final project/Bachelor thesis must be included.

- d. The type of exam for assignments, for the midterm exam and for the final exam must be defined for all courses.
 - e. The topic of heterogeneity of school pupils and how students are prepared to engage with pupils with diverse backgrounds must be described more clearly in the relevant course descriptions.
 - f. Literature information must be updated.
 - g. The consistency of the semester learning plans must be checked against the other study programme documents (course naming, numbering, credit hours – it should also be indicated consistently in which semester the course is offered etc.).
2. UNNES must clarify if teachers need to conduct experiments together with pupils in schools and if so, UNNES must document for the four study programmes in which courses the corresponding competencies are included. This aspect may require to be dealt with in more depth in each curriculum.

For Physics Education, Chemistry Education & Informatics and Computer Engineering Education

3. UNNES must provide more information on the equipment and features of the laboratories used in the Physics Education, the Chemistry Education and the Informatics and Computer Engineering Education (incl. electronics laboratory) programmes. Additional evidence (detailed listing of the equipment and photographs) and the confirmation of appropriateness (if necessary, through a confirmation visit as defined by AQAS) are required.

For Physics Education & Chemistry Education

4. The aspects of sustainability and environmental science (in line with the profile of UNNES as a Conservation University) must be included more clearly in the Physics Education and the Chemistry Education programmes. The relevant semester learning plans must be updated accordingly.

For Informatics and Computer Engineering Education

5. The Informatics and Computer Engineering Education curriculum must include at least one (if not two) informatics specific education course(s) dealing among others with the history and nature of informatics in schools and special teaching approaches for informatics, how to manage the needs of heterogeneous groups of pupils not only in general but also specifically in informatics classes, especially to engage girls for this topic.
6. The Informatics and Computer Engineering Education curriculum must include at least one course about the general ideas of automata, limitations of computing, Turing machines and complexity.

The following **recommendations** are given for further improvement of the programmes:

For all programmes

1. When dealing with the topic of heterogeneity of school pupils, it is recommended to consider the topic of the inclusion of pupils with special needs.
2. UNNES is encouraged to develop and enhance its cooperation with school teachers. School teachers could be invited to UNNES more often and the exchange regarding the latest teaching methods could be intensified.
3. To support international students coming to UNNES, it is suggested to offer more courses using English as a medium of instruction.

4. It is suggested that UNNES provide more support to its teaching staff in developing its English competencies to support international teaching and learning cooperation as well as international research cooperation.
5. UNNES is encouraged to develop a university-wide strategy to engage, especially in STEM subjects, more female lecturers at all levels including as full professors.
6. UNNES should continue investing in the improvement of its laboratory infrastructure in the future.
7. Especially for the Chemistry Education programme, UNNES should sustain a high training in health and safety procedures in the laboratories, e.g. by introducing a short course on general laboratory safety which serves to integrate this topic in all existing laboratory classes.
8. UNNES is encouraged to develop a mechanism for all study programmes to provide more support including more face-to-face time between the supervisor and the student in the preparation of the Bachelor thesis.

For Mathematics Education

9. It is recommended to increase the number of mathematics education courses as well as offering such courses earlier in the curriculum.
10. It is suggested to offer specific courses for the four different graduate profiles as well as specific courses for future teachers at junior high schools and specific courses for teachers at senior high schools.

For Chemistry Education

11. It is suggested to give more flexibility in the curriculum by e.g. converting one compulsory course to an elective course.

For Informatics and Computer Engineering Education

12. It is recommended to include a compulsory course that addresses the social and ethical implications of informatics or to integrate these aspects in courses of information systems, networks or in the educational courses.
13. It is recommended to include bilingual courses in Indonesian and English, in line with the custom and importance of English in Informatics.

With regard to the reasons for this decision the Standing Commission refers to the attached assessment report.

EXPERTS' REPORT**ON THE BACHELOR DEGREE PROGRAMMES**

- **“MATHEMATICS EDUCATION” (BACHELOR OF EDUCATION)**
- **“PHYSICS EDUCATION” (BACHELOR OF EDUCATION)**
- **“CHEMISTRY EDUCATION” (BACHELOR OF EDUCATION)**
- **“INFORMATICS AND COMPUTER ENGINEERING EDUCATION” (BACHELOR OF EDUCATION)**

OFFERED BY UNIVERSITAS NEGERI SEMARANG (UNNES), INDONESIA

Visit to the university: 10, 16, 17, 20, 22 September 2021

Panel of Experts:

Prof. Dr. Malte Brasholz	University of Rostock Faculty of Mathematics and Natural Sciences, Institute of Chemistry, Professor of Organic Chemistry
Prof. Dr. Ira Diethelm	Carl von Ossietzky Universität Oldenburg Department of Computing Science, Professor of Computing Science Education
Prof. Dr. Andreas Eichler	University of Kassel Faculty of Mathematics and Natural Sciences, Institute of Mathematics, Professor of Mathematics Education with a focus on upper secondary level
Prof. Dr. Susanne Heinicke	University of Muenster Department of Physics, Institute of Physics Education, Professor of Physics Education
Ms. Hesti Handayani	Teacher in SMPN 157 Jakarta, Major Mathematics (labour market representative)
Mr. Daniel Burkhardt	Student of the University of Freiburg (student expert)
Coordinator: Alexandre Wipf & Corinna Herrmann	AQAS, Cologne, Germany

I. Preamble

AQAS – Agency for Quality Assurance through Accreditation of Study Programmes – is an independent non-profit organisation, supported by more than 90 member institutions, both higher education institutions (HEIs) and academic associations. Since 2002, the agency has been accredited by the German Accreditation Council (GAC). It is therefore a notified body for accreditation of higher education institutions and programmes in Germany.

AQAS is a full member of ENQA and also listed in the European Quality Assurance Register for Higher Education (EQAR) which confirms that our procedures comply with the Standards and Guidelines for Quality Assurance in the European Higher Education Area (ESG), on which all Bologna countries agreed as a basis for internal and external quality assurance.

AQAS is an institution founded by and working for higher education institutions and academic associations. The agency is devoted to quality assurance and quality development of both academic studies and teaching in Higher Education Institutions. The activities of AQAS in accreditation are neither restrained to specific academic disciplines or degrees nor to a certain type of Higher Education Institution

II. Accreditation procedure

This report results from the external review of the Bachelor's programmes in Mathematics Education, Physics Education, Chemistry Education, and Informatics and Computer Engineering Education offered by Universitas Negeri Semarang (UNNES).

1. Criteria

The programme is assessed against a set of criteria for programme accreditation developed by AQAS. The criteria are based on the Standards and Guidelines for Quality Assurance in the European Higher Education Area (ESG) 2015. To facilitate the review each criterion features a set of indicators that can be used to demonstrate the fulfilment of the criteria. However, if single indicators are not fulfilled this does not automatically mean that a criterion is not met. The indicators need to be discussed in the context of the programme since not all indicators necessarily can be applied to a programme.

2. Approach and methodology

The initialisation

The university mandated AQAS to perform the accreditation procedure in September 2020.

The University produced a Self-Evaluation Report (SER). In December 2020, the institution handed in a draft of the SER together with the relevant documentation of the study programme and an appendix.

The appendix included e.g.:

- Overview over statistical data of the student body (e.g. number of applications, beginners, students, graduates, student dropouts).
- CVs of the teaching staff
- Information on student services
- Core information on the main library
- Undergraduate/graduate academic regulations

AQAS checked the SER regarding completeness, comprehensibility and transparency. The accreditation procedure was officially initialised by a decision of the AQAS Standing Commission on 22 February 2021. The final version of the SER was handed in June 2021.

The nomination of the panel of expert

The composition of the panel of experts follows the stakeholder principle. Consequently, representatives from the respective discipline/s, the labour market and students are involved. Furthermore, AQAS follows principles for the selection of experts of the European Consortium for Accreditation (ECA).

The Standing Commission nominated in June 2021 the before mentioned expert panel. AQAS informed the university about the members of the expert panel and the University did not raise any concerns against the composition of the panel.

The preparation of the site visit

Prior to the site visit, the experts reviewed the SER and submitted a short preliminary statement including open questions and potential needs for additional information. AQAS forwarded these preliminary statements to the

University and to the panel members in order to increase transparency in the process and the upcoming discussions during the site visit.

The site visit

After a review of the Self Evaluation Report, an online site visit to the University took place on 10, 16, 17, 20 and 22 September 2021. The experts interviewed different stakeholders, e.g. the management of the HEI, the programme management, teaching and other staff, as well as students and graduates, in separate discussions and consulted additional documentation as well as student work. The visit concluded by the presentation of the preliminary findings of the group of experts to the University's representatives.

The report writing

After the site visit had taken place, the expert group drafted the following report, assessing the fulfilment of the AQAS criteria for the programme accreditation. The report included a recommendation to the Standing Commission. The report was sent to the University for comments.

The decision

The report, together with the comments of the department, forms the basis for the AQAS Standing Commission to make a decision regarding the accreditation of the programme. Based on these two documents, on 6 December 2021 the Standing Commission took its decision on the accreditation. AQAS forwarded the decision to the university. The university had the right to appeal against the decision or any of the imposed conditions.

In January 2022, AQAS published the report and the result of the accreditation as well as the names of the panel of experts.

III. General Information on the University

Universitas Negeri Semarang (UNNES) is a state university in Indonesia with its main campus located in Semarang. It was founded in 1965 as a teacher education college and has since then expanded to eight faculties (Linguistics and Arts, Social Sciences, Mathematics and Natural Sciences, Engineering, Sports Science, Economy, Law, Education) offering 90 programmes, including 13 graduate and three doctoral programmes. Over 36,000 students are enrolled at UNNES.

According to its mission and vision statement UNNES is a university with a conservation insight, thus adopting a perspective and behaviour towards the principles of conservation (preservation, maintenance, care, preservation and development) of natural resources and socio-cultural values. The university has developed short, medium and long-term Strategy Plans together with performance indicators for the university as a whole and its constituent faculties. Study programmes set equivalent goals and indicators for their own development. UNNES pursues *Tridharma Perguruan Tinggi* or the three pillars of higher education, namely education, research and community service. Its academic and administrative processes are regulated in an Academic Guidebook.

The programmes Mathematics Education, Physics Education and Chemistry Education are offered at the Faculty of Mathematics and Natural Sciences. This faculty offers 14 undergraduate study programmes to close to 4,900 students. The study programme Informatics and Computer Science Education is offered at the Faculty of Engineering. Approximately 4,800 students study in the faculty's 14 programmes.

IV. Assessment of the study programmes

1. Quality of the Curriculum

The intended learning outcomes of the programme are defined and available in published form. They reflect both academic and labour-market requirements and are up-to-date with relation to the relevant field. The design of the programme supports achievement of the intended learning outcomes. The academic level of graduates corresponds to the requirements of the appropriate level of the European Qualifications Framework. The curriculum's design is readily available and transparently formulated.

[ESG 1.2]

Overarching aspects

Description

Bachelor programmes at UNNES are to be completed in eight semesters; the four programmes cover 144 credits or SKS each. The main language of instruction is Indonesian. According to the SER one international class with English as the medium of instruction is offered every year in the Mathematics Education programme as well as one bilingual class using both English and Indonesian in the Physics Education as well as Chemistry Education programmes. Students who wish to apply must pass an English test as well as a subject-specific test. Curriculum development is subject to defined procedures at UNNES. According to the SER curricula are developed and reviewed using input and feedback from study programme managers, teaching staff, alumni and students. According to the SER the curricula of the four programmes have been reviewed in 2015 and 2018 following policy decisions by the Indonesian authorities regarding teacher training and the composition of curricula in all higher education programmes in Indonesia allowing for more learning to take place outside of the student's study programme. A matrix of programme learning outcomes and corresponding courses has been developed for the study programmes. The four study programmes include a school internship, the Informatics programme includes both a school internship as well as an industry internship.

Experts' Evaluation

Generally and for the four programmes being reviewed, the experts consider that the structures of the curricula are comprehensible and logical (some subject-specific suggestions for improvement are provided in the following sections). The Bachelor's programmes are consistent with the corresponding level of the Indonesian Qualifications Framework, which itself has been aligned to the corresponding level of the European Qualifications Framework. Accordingly, graduates are fully prepared to enter the labour force with competencies at the Bachelor level.

The curricula are documented and there is a semester learning plan for each course. On the whole, the experts consider that the semester learning plans need to be improved because of a lack of consistency and different levels of detail provided in the documents (the specifics are provided in the following sections) (**Finding 1**). One overarching aspect concerns the course descriptions for the Bachelor theses that appear to be missing from the submitted documentation; this has to be remedied (**Finding 1b**). Another overarching topic is the topic of heterogeneity of students/pupils. Information is missing in the documentation made available to the experts as to if and how the study programmes prepare future teachers to deal with heterogeneity in schools, for example, to deal with students with special needs. This is an important topic for future teachers – the experts therefore consider it necessary to describe in more details, in the relevant courses of all programmes, how the overarching topic of heterogeneity is dealt with (**Finding 1d**) and would like to recommend, more specifically within this area, considering the topic of the inclusion of pupils with special needs (and to document this accordingly) (**Finding 2**).

Mathematics Education

Description

Ten generic as well as subject specific learning outcomes have been set for the Mathematics Education programme. After completing their studies, graduates should demonstrate the ability to use a variety of learning techniques and strategies that bring a positive effect to school students. They should also demonstrate a comprehensive understanding of mathematical areas relevant to secondary education units and show broad understanding of the concepts and principles of mathematical thinking for solving problems. Graduates should moreover master the principles of mathematics curriculum preparation at the secondary school level. Mathematics educator, researcher in the field of mathematics education, education management figure and entrepreneur in mathematics education are possible occupations of the programme's graduates according to UN-NES.

The curriculum comprises 135 credits of compulsory courses (54 courses) and 9 credits of electives. Students take university-wide compulsory courses in the amount of 17 credits (e.g. Conservation Education), 27 credits of basis pedagogy courses, 72 credits of mathematics courses, 6 credits of specific pedagogic courses for mathematics and finally 13 credits covering practical courses, community services and their final project. A total of nine elective courses are offered (corresponding to 27 credits, of which 9 credits are to be taken), e.g. Fuzzy logic, Statistical computing, Ethnomathematics. Over their eight semesters students take i.a. Elementary Linear Algebra 1, Calculus 1, Spatial Geometry, Statistics, Advanced Calculus 1, Introduction to Real Analysis 1, Numerical Method and Complex Analysis as well as English Mathematics Education, Educational Psychology, Study of School Mathematics Curriculum, School Management, Guidance and Counselling, and Mathematics Learning Assessment. In their seventh semester students complete a school field experience, community service as well as their final project.

Experts' Evaluation

Overall, the curriculum for Mathematics Education represents a reasonable and rich study programme. The desired qualifications for four profiles (educators, researchers, education managers and entrepreneurs) to be achieved are presented as intended learning outcomes. The intended learning outcomes are shown to be appropriate and are comparable, for example, to learning outcomes for study programmes of mathematics education in Europe at the same level.

The study programme of Mathematics Education has a strong emphasis on courses of mathematics in relation to courses for mathematics education. Overall, the curricular structure of the study programme supports the achievement of the learning outcomes. The order of curricular elements supports, generally, the learner's progression. However, courses for mathematics education are only included starting in the fifth semester. For this reason, the experts recommend considering a strengthening of the study programme referring to mathematics education as well as offering courses for mathematics education earlier in the curriculum (**Finding 3**).

Graduates of the study programme should be prepared for four profiles (educators, researchers, education managers and entrepreneurs). However, the majority of graduates become mathematics teachers in junior high school or in senior high school. The curriculum in mathematics education is the same for the four profiles mentioned above and also the two types of teachers, that is, teachers for junior high-schools and teachers for senior high schools. However, different types of school as well as different profiles require different competencies. For this reason, the experts suggest considering offering specific courses for different profiles and, particularly, offering specific courses for future teachers at junior high schools and specific courses for teachers at senior high schools (**Finding 4**).

The curriculum is described in individual documents that address the different courses of the study programme. These documents contain "Learning Outcomes", "Course Learning Outcomes", a "Course Description" and

references. As mentioned at the beginning of this chapter, the experts consider that these documents need to be improved. A recommendation is, for example, to add the semester for which the course is dedicated. The level of details in the course descriptions is different for different courses. For this reason, a revision of the description of the study programme for Mathematics Education must include steps to unify the description of the courses. Further, especially mathematics courses are clearly described referring to a specific field in the subject, by contrast, the description is less clear for courses for mathematics education. This is particularly the case for the allocation to a specific field within the subject. Therefore, a revision of the description of the study programme should outline in more detail the category of “subject matter”/the specific field within the subject of mathematics education courses. Further, the type of examinations should be described coherently for all courses (**Findings 1a, 1c, 1f**).

Further, the curriculum defines which elements are compulsory and which are electives. The study programme describes specific elements, such as distance education or internships etc. These specifics are reflected in the design of the curriculum with one exception: The study programme of Mathematics Education includes an internship that is supervised by school teachers and representatives of the university staff. However, it is not clear if and how the internship is embedded in the curriculum. For example, it is not clear if a specific course is designated to prepare or to accompany the students before and during the internship or if a course is designated to reflect the students’ practical experiences. For this reason, the description of the internship needs to be improved (**Finding 1a**) and the collaboration of lecturers from the university and teachers from school should be enhanced (see Chapter 2, Finding 12).

Physics Education

Description

The persons responsible for the Physics Education programme have elaborated ten learning outcomes at programme level, both generic and subject specific in nature. Students should be devoted to God Almighty and uphold humanity values based on religion, ethics, and morals, they should master the basic concepts and principles of physics as well as physics learning outcomes assessment. Students should furthermore master the basic physics education research methodology, especially Classroom Action Research (CAR) to support the development of physics learning (both concepts and methods). Graduates should find an occupation either as physics educators, researchers in the field of physics education, managers of educational institutions/units or as businesspersons the field of physics education.

The curriculum includes 130 credits of compulsory courses and 14 credits of elective courses. Out of the overall 144 credits of the programme, 58 credits are related to the area “education and personality development” (including the university-wide courses, pedagogy concept, school management, teaching and learning process) and 86 credits are allocated to courses related to physics. A total of 17 elective courses are offered to students including Astronomy, E-learning in Physics Learning, Microteaching at International Schools. Over their eight semesters students take i.a. Basic Physics 1, Mathematics for Physics 1, Magnetism, School Physics 1, Quantum Physics, Solid Physics, as well as the courses English, Civic Education, Counselling Guidance, Digital Literacy and Humanity, Evaluation of Learning Physics, and Educational Psychology. A community service as well as school field experience is planned for the seventh semester in addition to the students’ final project.

Experts’ Evaluation

The Physics Education study programme holds an overall very valuable, interesting and rich ensemble of classes for teachers’ training. It is well-balanced in terms of courses related to physics content, education, laboratory and school practice. Yet, there are some recommendations to be stated concerning the

improvement of the programme and its description. First, the experts consider that the course descriptions/semester learning plans must be improved: Special attention must be given to the level of detail and the consistency in the quality of the descriptions (e.g. between the subject courses and the education courses) as well as to the aspects of consistency, coherence and transparency. The consistency of the semester learning plans must be checked against the other study programme documents (course naming, numbering, credit hours – it should also be indicated consistently in which semester the course is offered etc.). Some courses from the typical study plan cannot be found in the courses descriptions or differ in title and numbering within the typical study plan. The course learning outcomes and the course content must be described more coherently. More details must also be provided, for example, for the class accompanying the school internship. The type of exam for assignments, for the midterm exam and for the final exam must be defined for all courses. Finally, the experts also consider that literature information must be updated (**Findings 1a, 1c, 1e, 1f**).

Following the discussions with the persons responsible for the programme, the experts consider that UNNES must state more clearly how the aspects of sustainability and environmental physics (in line with its profile as a Conservation University) are included throughout the Physics Education programme. These topics are not very visible in the current documentation – the relevant semester learning plans must therefore be updated accordingly (**Finding 5**). Here, a collaboration with teachers at school is also recommended in order to connect university expertise and everyday experience of teachers (see Chapter 2, Finding 12).

In a similar manner, the topic of heterogeneity of school pupils and how students are prepared to engage with pupils with diverse backgrounds must be described more clearly in the relevant courses – UNNES stated that the topic is addressed but it also needs to be included in the course descriptions (**Finding 1d**).

The Physics Education study programme shows a valuable content of practical training at schools during the project where university teachers supervise the practical training. It is recommended that likewise school teachers are also included as experts in the practical field in university teaching (see Chapter 2, Finding 12).

Despite the intensive exchange during the online site visit it remains unclear to the expert group whether teachers need to conduct experiments together with pupils in schools. UNNES must therefore clarify this aspect and in case teachers do conduct experiments together with pupils in schools, UNNES must document for the study programme in which courses the corresponding competencies are included. This aspect may require to be dealt with in more depth in the curriculum and students might have to be prepared especially for different cases of facilities at their prospective school (**Finding 6**).

The Bachelor thesis seems to be a main challenge for some students in their performance and time scheduling of study. Here, more personal supervision and face-to-face discussion is recommended (see Chapter 6, Finding 19).

Chemistry Education

Description

A total of 10 learning outcomes have been defined for the Chemistry Education programme. After completion of their studies graduates should be responsible, independent and have high social sensitivity and a sense of caring for society and the environment, they should also master students' characteristics comprehensively from physical, psychological, social, and cultural aspects for the value of learning. In addition, they should be able to provide learning services that educate students according to their characteristics and facilitate the development of the students' potential aspect optimally as well as be able to apply knowledge and skills of information technology in the context of science development and chemistry studies related to planning, implementation, and assessment. UNNES notes in its SER that educator at the secondary school level is the

main expected field of employment for graduates. They could otherwise find employment as novice researchers or become entrepreneurs in the field of chemistry education.

According to the SER the curriculum is divided into 134 credits of compulsory and 10 credits of elective courses. 66 credits are allocated to the area “education and personality” (including university-wide courses, electives and 37 credits of pedagogical courses) and 78 credits for chemistry-related subjects. Subject-specific courses include Basic Chemistry 1, Biology, Organic Chemistry 1, Mathematics for Chemists, Basic analytical Chemistry, Physical Chemistry 1, Separation Chemistry, Chemical Dynamics, Biochemistry; pedagogy-related courses as well as general (university-wide) subjects include Entrepreneurship, Introduction to Pedagogy, Laboratory Management, Chemistry Learning strategy, Chemistry Learning Plans, Chemistry Learning Media, Microteaching. In their seventh semester the students complete their community service programme, a school internship as well as their final subject.

Experts' Evaluation

The current study programme conveys competencies to its graduates which are in line with clearly defined learning objectives. General and cross-competence learning outcomes of the graduates have been defined by ministerial decree, which the curriculum is fully compliant with. Detailed course-specific as well as lesson-specific learning outcomes have been outlined in the semester learning plans, and individually for each course. The successful conveyance of learning outcomes is being ensured by recurring evaluations and graduate surveys, and the academic degree awarded upon successful completion of the programme corresponds well to the learning outcomes and the expected level of competencies.

The study programme Chemistry Education is well-structured, and the curriculum follows the typical structure for the scientific discipline, making it comparable with equivalent programmes at other universities internationally. The design of the programme enables the students to acquire subject-specific scientific knowledge as well as the necessary methodological skills in scholar chemical education.

The major chemical disciplines are represented in well-balanced proportions. The basic courses in general, inorganic, organic, analytical and physical chemistry each are succeeded by an advanced course of the respective subject. Several more specialised courses are being offered in semesters 4 to 6, complementing the study programme with recent aspects and subdivisions of chemical science.

The education training aspect is also well-represented in the curriculum, beginning with an introduction to pedagogy in semester 2, followed by courses dedicated to build the graduates' expertise in teaching methods, the concepts of scientific education, laboratory and school management as well as curricula and course development. These educational courses accompany the scientific courses up until semester 6. A two-months internship at a local school is part of the curriculum and intended to provide the graduates with an experience in the daily on-site teaching practices at school.

The programme is completed by an individual Bachelor research project initiated in semester 7 followed by the draft of the Bachelor thesis by the end of semester 8. The compulsory two-months participation in the community service programme is also scheduled in the semester 7. All curricular elements are documented in an idealised study plan as well as in individual course descriptions (apart from the Bachelor thesis, see above). Credit points are allocated for each individual course.

At the same time the experts would like to provide the following suggestions for improvement and recommendations regarding the Chemistry Education study programme.

It is a requirement that all course descriptions in the curriculum are revised to ensure they are consistent in length and homogeneous in their level of detail. Literature information also needs to be updated. Further, it is a requirement that the topic of heterogeneity of school pupils, as well as how the graduates are prepared to

engage with pupils of diverse social and economic backgrounds, must be anchored in the relevant educational courses. In addition, more details need to be provided for the school internship and the community service programme (**Findings 1a, 1d, 1e**). The experts suggest converting at least one of the existing compulsory courses into an elective one with free choice of the subject (**Finding 7**). By implementing this minor change to the curriculum, the students gain more flexibility and can develop their scientific preferences and interests. It is suggested to offer the additional elective module already during semesters 2 to 4.

In an analogous manner to the Physics Education programme, it is recommended that the aspects of environmental science and sustainability in chemistry are further strengthened in the curriculum as these can serve as ideal scientific contributions to underline UNNES' strategic commitment to conservation (**Finding 5**). In addition, it remains unclear whether teachers are trained to conduct experiments together with pupils in schools. It is therefore required that UNNES clarifies this aspect and in case teachers do conduct experiments together with pupils in schools, UNNES must document in which courses the corresponding competencies are included. This aspect may require to be dealt with in more depth in the curriculum (**Finding 6**).

Regarding the laboratory classes it is strongly recommended that UNNES keeps investing in the laboratory infrastructure and equipment so that the availability of equipment is further improved in each of the practical laboratory courses, and current constraints are mitigated (see Chapter 6, Finding 17). UNNES must also provide more information on the equipment and features of the laboratories (see Chapter 6, Finding 16). Finally, and as stated later on in the experts' report, it is recommended to sustain a high training in health and safety procedures in the laboratories (see Chapter 6, Finding 18). Thus, the experts suggest introducing a short course on general laboratory safety which serves to integrate this topic in all the existing laboratory classes. This will ensure to further develop the graduates' expertise in safe handling of chemicals and apparatus, the conception of safe operating procedures in a given environment and situation, and the identification of adequate safety measures for different experimental tasks, including selection of appropriate personal protective gear.

Informatics and Computer Engineering Education

Description

Students of the Informatics and Computer Engineering Education programme should reach a total of ten learning outcomes at programme level, including being able to perform the learning process by recognising the characteristics of students, their resources, and the learning environment. They should also be able to design training programmes in the field of Information Technology based on pedagogical principles and be able to identify, analyse and design computer-based systems to solve problems or conduct educational research by applying their informatics engineering studies. UNNES lists educator in secondary schools, information technology expert, laboratory administrator, designer of information technology training programmes as well as researcher as potential jobs for the programme's graduates.

The curriculum comprises 135 credits of compulsory courses and 9 credits of elective courses. 58 credits cover the area "education and personality" and 86 credits cover informatics subjects including Information Technology Fundamentals, Maths and Statistics, Information Management Systems, Programming Language, Human Computer Interaction, Computer Networks, Computer Systems, Social and Professional Issues, Web Technologies. Of the total credit number, pedagogical courses amount to 24 credits (e.g. Introduction to Education, School Management, Educational Psychology, Learning Strategy and Management, Vocational Curriculum and Learning, Instructional Media) and 10 credits are allocated to university-wide subjects within the "education and personality" block.

Towards the end of their studies, students complete an industry internship, community service and a school-field internship in their seventh semester. In their eighth semester they complete their final project/thesis.

Experts' Evaluation

The presented goals of this study programme are depicted in a quite abstract manner. The specific choice of courses offered and their content areas for informatics in the curriculum are comprehensible, appropriate, and comparable to European Bachelor's programmes for informatics education. The choice and order of most courses show a good alignment to national and international recommendations. The feedback from industry and schools are considered wisely when designing the curriculum. Beginning with hands-on experiences with electronics strengthens students' confidence and is also a very good decision. It gives a positive impression to students and raises their motivation for studying informatics.

The experts would like to stress the role and importance of the internships. They are especially for informatics a very important part of the study programme as they offer an occasion for cooperation with schools and an opportunity for the transfer of research. This is a clear strength of this programme, but how and where these internships are prepared and reflected in other courses before and after these internships must be made more obvious in the course descriptions (**Finding 1a**). This could be a part of courses for computing education (like it is done in Mathematics Education and the other programmes) where the history and nature of informatics in schools are discussed. Other usual topics in the for computing education are special teaching approaches for informatics, how to manage the needs of heterogeneous groups of pupils not only in general but also specifically in informatics classes, especially to engage girls for this topic. These are missing, however. In addition to the large number of scientific courses on the different topics of informatics there should be at the very least one, if not two courses that focus on this (**Finding 8**). As literature for this the experts recommend three books: *Sentence, Barendsen and Schulte: Computer Science Education, Bloomsbury Press, 2018* and *Guzdial: Learner-centered Design of Computing Education, Morgan&Claypool Publishers, 2016* and also *Hazzan, Lapidot and Ragonis: Guide to Teaching Computer Science, Springer, 2011*.

Another missing field in the curriculum that must be filled is the theory of computation. There should be at least one course about the general ideas of automata, limitations of computing, Turing machines and complexity so that students also learn not only about the possibilities but also about general limitations of computing (see e.g. *Sipser, M: Introduction to the Theory of Computation, 2014*) (**Finding 9**). To integrate these new courses other courses that now are compulsory could be changed to elective courses. Additionally, the experts would like to recommend a compulsory course that addresses the social and ethical implications of informatics or to integrate these aspects in courses of information systems, networks or in the educational courses (**Finding 10**).

Generally, and as is the case for the other programmes, the course descriptions for informatics must be improved regarding the competences of the students and the assignments used to prove them. Also, the literature of the courses must be updated (**Finding 1a, 1c, 1e**), as it appears at times outdated. The experts also recommend for all study programmes considering the topic of the inclusion of pupils with special needs when dealing with the topic of heterogeneity of school pupils, e.g. in the (new) educational courses (see above) (**Finding 2**).

Finally, the experts recommend including bilingual courses in the Informatics and Computer Engineering Education programme, in line with the custom and importance of that language in Informatics (**Finding 11**).

Conclusion

The criterion is partly fulfilled.

Summary of the findings of the experts:

For all programmes:

- The course descriptions (semester learning plans, RPS) of all four study programmes must be improved. Special attention must be given to the level of detail and the consistency in the quality of the descriptions (e.g. between the subject courses and the education courses) as well as to the following aspects:
 - The course learning outcomes and the course content must be described in more details with information specific for each study programme and subject. More details must also be provided for the class accompanying the school internship as well as for the community service programme.
 - A course description for the final project / Bachelor thesis must be included.
 - The type of exam for assignments, for the midterm exam and for the final exam must be defined for all courses.
 - The topic of heterogeneity of school pupils and how students are prepared to engage with pupils with diverse backgrounds must be described more clearly in the relevant courses.
 - Literature information must be updated.
 - The information in the semester learning plans must be consistent with the information in the other study programme documents (course naming, numbering, credit hours – it should also be indicated consistently in which semester the course is offered etc.).
- When dealing with the topic of heterogeneity of school pupils, the experts recommend for all study programmes considering the topic of the inclusion of pupils with special needs.
- UNNES must clarify if teachers need to conduct experiments together with pupils in schools and if so, UNNES must document for the four study programmes in which courses the corresponding competencies are included. This aspect may require to be dealt with in more depth in the curriculum.

For Mathematics Education:

- In the Mathematics Education programme the experts recommend increasing the number of mathematics education courses as well as offering such courses earlier in the curriculum.
- In the Mathematics Education programme the experts suggest offering specific courses for the four different graduate profiles as well as specific courses for future teachers at junior high schools and specific courses for teachers at senior high schools.

For Physics Education & Chemistry Education:

- The aspects of sustainability and environmental science (in line with the profile of UNNES as a Conservation University) must be included more clearly in the Physics Education and the Chemistry Education programmes. The relevant semester learning plans must be updated accordingly.

For Chemistry Education:

- The experts suggest giving more flexibility in the curriculum of the Chemistry Education programme by e.g. converting one compulsory course to an elective course.

For Informatics and Computer Engineering Education:

- The Informatics and Computer Engineering Education curriculum must include at least one (if not two) informatics specific education course dealing among others with the history and nature of informatics in schools and special teaching approaches for informatics, how to manage the needs of heterogeneous groups of pupils not only in general but also specifically in informatics classes, especially to engage girls for this topic.
- The Informatics and Computer Engineering Education curriculum must include at least one course about the general ideas of automata, limitations of computing, Turing machines and complexity.
- The experts recommend including a compulsory course in the Informatics and Computer Engineering Education programme that addresses the social and ethical implications of informatics or to integrate these aspects in courses of information systems, networks or in the educational courses.
- The experts recommend including bilingual courses in the Informatics and Computer Engineering Education programme, in line with the custom and importance of that language in Informatics.

2. Procedures for Quality Assurance

The programme is subject to the higher education institution's policy and associated procedures for quality assurance, including procedures for the design, approval, monitoring, and revision of the programmes. A quality-oriented culture, focusing on continuous quality enhancement, is in place. This includes regular feedback mechanisms involving both internal and external stakeholders.

The strategy, policies, and procedures have a formal status and are made available in published form to all those concerned. They also include roles for students and other stakeholders.

Data is collected from relevant sources and stakeholders, analysed, and used for the effective management and continuous enhancement of the programme.

[ESG 1.1, 1.7 & 1.9]

Description

Quality assurance procedures at UNNES are based on specific regulations by the national authorities as well as Regulations from the Rector and defined processes at university level. The university has adopted policies on quality assurance, on academic freedom and on scientific autonomy as laid down in its Academic Guidebook.

According to its SER, internal quality assurance at UNNES is built on the principle of Continuous Quality Improvement. UNNES' internal quality assurance system has been developed to control and improve the implementation and delivery of academic services as well as other supporting activities within the university. It relies on data on student progression and quantitative targets and indicators. Data on alumni is gathered and fed into a specific database. According to the SER, the quality assurance system of the university has been reviewed against ISO 9001. A Quality Assurance Board has been set up as a body under the Rector to carry out and coordinate internal quality assurance processes in the area of education (a separate body deals with research and community services). Quality Assurance Boards/Groups are also set up at faculty level and are led by Quality Assurance Coordinators; in each department within the faculties there are Quality Assurance Units.

Subject specific curriculum reviews should take place every four years; curricula are adapted as required depending on new national policies. Quality assurance procedures have been mapped out and defined. Each study programme is evaluated annually through an Internal Quality Audit performed by an internal independent

auditor. This includes lecturer assessment in teaching and learning, faculties and study programmes performance evaluation as well as students' satisfaction. According to its policy, all UNNES lecturers should report annually on their educational, research and community service activities. Specific staff development activities are organised based on specific goals set at faculty/programme level.

A meeting of alumni is organised annually with the aim of gathering feedback and monitoring their progress. Tracer studies at university level also offer insights into the situation of graduates. This should feed into the preparation of accreditation procedures. A curriculum review includes the evaluation of the students' workload, their progression as well as the number of credits they have reached. Lecturers, the coordinators of the study programmes, alumni and stakeholders are involved in this process i.a. through focus group discussions. According to the SER, input has also been gathered from professional organisations such as the Indonesian Chemical Association, the Indonesian Physics Association, the Indonesian Vocational Association and the Indonesian Vocational Association of Information Technology.

Experts' Evaluation

The procedures of quality assessment and quality assurance are well-established at UNNES, they are comprehensive and exemplary. There is a quality-oriented culture with mechanisms for continuous quality improvement as well as established evaluations, university-wide, at departmental and at course level on a regular basis. All the programmes also underwent national accreditation and have received the highest grade. The students' progression is being monitored, both overall and within individual courses, through the university's numerous ICT tools. Data on student progression, completion rates and other key figures are continuously being monitored. Available data does not show any structural problems in completing the study programmes in the foreseen timeframe of eight semesters.

The procedures for quality assurance are well defined and made transparent; the Academic Guidebook of UNNES holds guidelines of quality assessment. The curriculum reviews have been transparently documented. Students as well as alumni and stakeholder are included into the assessment processes. UNNES gathered feedback and remarks on necessary future developments and implemented them, where possible. The experts commend the established quality evaluation cycles (comprehensive review every four years, continuous review annually) and the efforts to include all stakeholders including alumni.

Evaluations are conducted through surveys of the students. Lecturers at UNNES are informed about the overall assessments' results. Still, the experts would suggest that feedback given by the students to a particular class is collected and passed to the lecturers during the course of the class so that adaptations and improvements can be administered directly – this would speed up the enhancement processes.

As mentioned, there are contacts with all stakeholders including the world of work. Students, staff and representatives of local schools confirmed in the online site visit that there are exchanges between UNNES lecturers and schools. Still, the experts encourage UNNES to develop further its cooperation with school teachers (**Finding 12**). School teachers could be invited to UNNES more often and the exchange regarding the latest teaching methods could be intensified. In-service teachers could support and complement the university teaching staff with their everyday experience of school teaching, in different areas including the area of Conservation. A further development of the cooperation could also be helpful in developing the accompanying measures (support, supervision) of the school internships (see Chapter 1).

Conclusion

The criterion is fulfilled.

Summary of the findings of the experts:

- UNNES is encouraged to develop and enhance its cooperation with school teachers. School teachers could be invited to UNNES more often and the exchange regarding the latest teaching methods could be intensified.

3. Learning, Teaching and Assessment of Students

The delivery of material encourages students to take an active role in the learning process. Students are assessed using accessible criteria, regulations, and procedures, which are made readily available to all participants and which are applied consistently. Assessment procedures are designed to measure the achievement of the intended learning outcomes.

[ESG 1.3]

Description

General academic provisions (e.g. details on the credit system), the generic structure of study programmes or the teaching and learning process as well as assessments guidelines are laid down in the university's Academic Guidebook.

The four Bachelor's programmes cover eight semesters each, they include periods of study on campus as well as off-campus through teaching practice and community service. A semester comprises of 16 weeks including the mid-term and final examination phases. According to the typical study plans, students take subjects totalling between 18 and 24 credits each semester – expect in their last two semesters which are reserved for field learning and their final project as well as electives (in most cases). Each course ranges from 2 to 6 credits. The actual maximum number of credits students can take in one semester depends on the achieved Grade Point Average (GPA) in the previous semester, i.e. students with lower grades can only take a limited number of courses. The credit system is based on study hours in various formats including face-to-face lectures, seminars, structured tasks and independent studies (1 SKS corresponds to 42 hours, each programme covers 144 SKS or 6,048 hours – ca. 201 credits according to the ECTS). There is an attendance requirement to at least 75 % of the programmes' classes.

For each programme the persons responsible have developed a teaching and learning strategy. Each course coordinator is responsible for the alignment of the course's content to the programme's learning outcomes; for each course there is a semester learning plan. Procedures for the organisation of online meetings as well as regarding the number of sessions within courses are defined as part of standard operating procedures. Teaching and learning is embedded in the information system of the university. The university's ICT apps and platforms include tools aiming at monitoring the students' progression throughout their studies and in each course. It includes i.a. data on attendance, grades, supervision notes. According to the SER, lecturers use this data in providing guidance to students. The Academic Guidebook provides a framework for teaching and learning methods with the aim of implementing an interactive, holistic, integrative, scientific, contextual, thematic, effective, collaborative, and student-centred learning process. According to the SER, the learning process is supported by e-learning elements and/or blended learning. Direct instruction, discussion, project-based and problem-based learning, field work as well as lab work are examples given by UNNES of the learning and teaching methods used in the four programmes. Students have access to learning material, including videos, and collaborative spaces on one of the online platforms of UNNES. UNNES states that lecturers should involve students in their research activities; this should help them in conducting their final project.

Course coordinators draft the exams that are then approved by the coordinator of the study programme. According to the SER, there is an examination committee for each programme tasked with i.a. the organisation

of the exam schedule. According to the Academic Guidebook, observation, participation, performance, written tests, oral tests, and questionnaires can be used as assessment methods. Oral exams, quizzes, assignments, essays, portfolios, written tests, multiple choice exams, practice tests as well as research reports and online tests are modes of assignment used. Weekly tests, mid-terms as well as final exams are organised. A comprehensive online test is carried out before students take their final exam. The students' final grade is determined based on their daily test scores, their mid-term exam score and their final semester examination score. The relevant data is accessible through the ICT platforms of the university.

Practice elements within all curricula are also regulated through the Academic Guidebook and quality requirements are defined by the Board of Quality Assurance. Students are required to complete teaching practices in all four programmes – in the Physics Education as well as the Chemistry Education programmes there are also practicum courses. In the Informatics and Computer Engineering Education programme students also complete an industry internship. The university has established a Field Practice Center and a Community Service Center to support students in both these activities.

Experts' Evaluation

Concerning the teaching methods and modes of assessment of students the experts found that the students were quite satisfied with the methods and skills they learn during their studies at the science education programmes at UNNES. They also seemed to handle the workload well – including the number of exams planned each semester. The experts concur and consider that the four programmes can be completed in the proposed framework.

The students mentioned some courses numerous times with which they were very pleased: the microteaching courses as well as the field studies and the laboratory-subjects in Chemistry Education and Physics Education. Generally, the four programmes are student-centred, and the teaching methods chosen correspond well to the intended learning outcomes. UNNES stated, that it wishes to attract more foreign students. The experts thus consider that it would be really helpful for UNNES to offer more courses in English in trying to reach this goal (**Finding 13**).

The experts also recognised that UNNES provides many different techniques and styles of exams for their students. The students and the teachers mentioned among others projects, weekly tests, mid-term tests, oral exams and exams in a laboratory setting. Furthermore, the rules for the grading of exams are accessible to students. There are also regulations regarding appeals, which are possible university wide. The exams seem to be very well organised and structured. In the beginning of the semester each student is handed a semester learning plan in which the different courses as well the exams are listed. This way UNNES ensures that there are no time-related struggles or overlaps between the single courses. The experts as well as the students acknowledge and praise these measures.

Conclusion

The criterion is fulfilled.

Summary of the findings of the experts:

- To support international students coming to UNNES the experts suggest offering more courses using English as a medium of instruction.

4. Student Admission, Progression, Recognition and Certification

Consistently applied, pre-defined, and published regulations are in place which cover student admission, progression, recognition, and certification.

[ESG 1.4]

Description

Rules regarding students' admission, progression, recognition and certification are provided for in UNNES' Academic Guidebook. These are completed by specific Rector's Regulations, e.g. regarding Ethics. Admission to a study programme at UNNES is possible through three specific schemes: National Selection for Public Universities, Joint Selection for Public Universities, institution-managed selection. The first scheme takes into account academic achievements at secondary school level, whereas the second scheme is based on the results of a computer-based written examination as well as a portfolio submitted by the candidates. The last scheme managed by UNNES includes a written test and/or an arts/sports skills test. Specific language skills are required to enrol in international classes. Specific requirements are set for the Chemistry and Physics Education programmes, namely that students graduated in high school in science and are preferably not colour blind.

UNNES indicates that equal opportunity is given to students with disabilities and that financial support can be afforded to students from a low-income background. Information on the enrolment requirements is published on the university's website. UNNES also gathers data on the number of places, of applications and of successful candidates and publishes it on its university-wide platform.

According to the SER, recognition and mobility regulations are laid down in specific Rector's Regulations. UNNES states that it encourages its students to actively take part in activities off-campus. Information on student mobility programmes is made available by the university through a specific university or faculty collaboration group. Partnerships have been established at the faculties with higher education institutions both within Indonesia and abroad; students of the four programmes have spent time in Malaysia, Vietnam or the Philippines either for their studies or for their community service activities. A specific national exchange programme allows for study periods at other Indonesian universities.

Graduation guidelines are set in the Academic Guidebook. The students' GPA is supplemented by a classification (e.g. cum laude for a GPA of 3.51-4.00). Students receive with their Bachelor certificates academic transcripts. UNNES states that in addition to their academic transcripts, students receive a supporting certificate on which informal or non-formal learning activities are listed.

Experts' Evaluation

The formal requirements for the administration and organisation of the studies are clearly defined as evidenced by all the rules regarding student admission, advancement, recognition and certification provided by UNNES. UNNES points out that equal opportunities are given to all students. The university also offers financial support to student with lower financial means. The information can also be found on the university's website. This is a positive aspect to consider.

Enrolment in the four study programmes at UNNES is possible on the basis of 1. SNMPTN (National Selection to Enter State University) Pathway invitation, 2. SBMPTN (Joint Selection of State Higher Education Students) Written Test and 3. SM-UNNES (Independent Selection of UNNES) which is held after an Invitation-SNMPTN and/or a Written-SBMPTN. Students can also transfer from similar study programmes from other universities with the same or higher national accreditation grade. The selection procedure for the study programmes follows the predetermined criteria and the admission requirements; these are transparent and accessible to the

students. The criteria generally support the goals of each study programme. Qualitative and quantitative data on student admissions – as well as graduate data – are well available.

UNNES has science education programmes that it can be proud of, especially in view of its campus ranking, the teaching methods for students, the fact that all students are given the same treatment in learning and are given the opportunity to provide feedback and input to UNNES. The students who experience difficulties in their studies in all programmes are accompanied by UNNES and faculty staff to help solve their problems so that all students can finish their studies on time.

UNNES graduates can immediately take part in the world of education because the courses given by the university have been designed in such a way that students can apply their knowledge directly when they finish their studies. But graduates are not limited to the world of education, there are also those who can enter the industrial world. Graduates receive with their Bachelor certificates academic transcripts and a supporting certificate with information on additional learning activities. These documents are clear and transparent.

Conclusion

The criterion is fulfilled.

5. Teaching Staff

The composition (quantity, qualifications, professional and international experience, etc.) of the staff is appropriate for the achievement of the intended learning outcomes.

Staff involved with teaching is qualified and competent to do so.

Transparent procedures are in place for the recruitment and development of staff.

[ESG 1.5]

Description

Faculties are responsible for human resource planning proposals, which are decided upon centrally, either subject to ministry approval for civil servant positions or solely in the remit of the university for contract-based positions. Rector's Regulations regarding such positions as well as on staff development and further training provide a framework. Recruitment criteria are based on national and/or university regulations.

Based on information in the SER, the ratio of teaching staff to students in the four programmes varies between 1:14 and 1:18. There are a total of 26 lecturers in the Mathematics Education programme, 22 in the Physics Education programme, 14 in the Chemistry Education programme and 24 in the Informatics and Computer Engineering Education programme. They range from professors to associate professors, assistant professors and lecturers. According to the SER, visiting professors as well as external lecturers (e.g. tutor teachers during the school field practices) and guest lecturers are also invited to contribute to the programmes.

According to UNNES policies, each lecturer is allocated a specific amount of time (expressed in credits) for each activity including teaching, research, community service, academic development, and administration and management. Part of the university staff performance system includes the review of teaching staff in which the head of one's study programme is involved. Evaluation is conducted every semester by assessors from the Quality Assurance Board at the faculty level. According to the SER, research activities are mandatory for teaching staff, research should thus feed into the teaching process. It is stated in the SER that each lecturer receives specific didactical training and that additional staff development offers are made.

Experts' Evaluation

The ratios between students and lecturers are adequate, the number of faculty staff fits the size of the student body and appears sufficient to cover the needs of each programmes in the coming years. Generally, the experts have developed a positive view of the available human resources at UNNES. At the same time the expert group recommends that UNNES continues developing the English competencies for all of its teaching staff, so that the numbers of courses held in English can be further increased gradually. This will also help attracting more international students to participate in the study programmes and further enhance the scientific activities at UNNES (**Finding 14**). As already mentioned above, it is also recommended that in-service teachers complement the university teaching staff with their everyday experience of (e.g. but not limited to) physics teaching at schools in Indonesia (see Chapter 2, Finding 12). Regarding the overarching procedures and measures in place, the expert group considers the process of recruiting new members of the teaching staff appropriate. Yet, the faculty might consider in the future describing the recruitment process in more details and might also describe the possible professional backgrounds of members of the teaching staff, especially as far as the Mathematics Education programme is concerned, in more details. A staff continuity plan is in place at university level as well as for the department (e.g. Chemistry) at the faculty level. Staff gender balance is mostly reached in the subjects being reviewed in this procedure, however with differences regarding the various positions. The experts would therefore like to encourage UNNES to develop a university-wide strategy to engage, especially in STEM subjects, more female lecturers at all levels including as full professors (**Finding 15**).

The number of teaching staff and teaching hours for the study programme of Mathematics Education are clearly documented. The background of the members of the teaching staff is different. Some members of the teaching staff have a pure mathematical background whereas other members are formerly mathematics teachers at schools. For this reason, the teaching staff for the study programme of Mathematics Education meets all requirements of the study programme.

As for the Physics Education programme the ratio between teachers / lecturers and students seems adequate for the programme's requirements. Teachers are assigned with well-defined teaching responsibilities. As far as the accreditation process allowed to assess, the teaching staff is appropriately qualified for their responsibilities.

The department of Chemistry and its study programmes are comprised and being maintained by an outstanding team of faculties, in which both younger and more senior as well as female and male colleagues are equally well-represented. The number of teaching staff is suitable for the study programmes at the department and the broadness of expertise among the department members ensures that all intended learning outcomes of the study programmes can be guaranteed.

The relation between staff and courses taught in the Informatics and Computer Engineering Education programme is good and the ratio is appropriate. The relation between students and lecturers is also suitable. It is positive to note that all contracts seem to be lifetime positions, as this is an important factor to be able to provide a constant quality of the study programme and reliable offers e.g., for elective courses.

Conclusion

The criterion is fulfilled.

Summary of the findings of the experts:

- The experts suggest that UNNES provide more support to its teaching staff in developing its English competencies to support international teaching and learning cooperation as well as international research cooperation.

- UNNES is encouraged to develop a university-wide strategy to engage, especially in STEM subjects, more female lecturers at all levels including as full professors.

6. Learning Resources and Student Support

Appropriate facilities and resources are available for learning and teaching activities.

Guidance and support is available for students which includes advice on achieving a successful completion of their studies.

[ESG 1.6]

Description

Information regarding the university and its teaching and learning arrangements are provided to new students through a campus and academic orientation both at university and faculty level – an online orientation is also available. According to the SER, information and support services are made available to ensure that students complete their studies in the foreseen timeframe. Academic supervisors provide academic counselling at programme level, UNNES states that such sessions take place three times per semesters. In all four programmes there are peer tutoring groups, such as the Chemistry Study Club that provide new students with support and tutoring in their first semesters.

Each semester students receive a Semester Learning Plan detailing teaching, learning and assessment procedures and providing an overview of the content of the courses, exam specifications and learning material. This information is made available on the ICT platforms and apps of UNNES. Specific information and support are provided to international students by the university's international office. Students can also consult with the university's career and counselling service centre.

Students have access to the university's library which also provides online services. Each faculty has a so-called Reference Room with topic-specific literature and resources, they include study places for students.

The Faculty of Mathematics and Natural Sciences is located in four buildings, courses can also take place in the facilities of other faculties. The faculty has laboratory rooms for practicum courses as well as meeting rooms for seminars and workshops. Specific laboratories for the Mathematics Education programme include a computer laboratory, a network laboratory, a microteaching laboratory, a multimedia laboratory and a workshop laboratory; according to the SER, students have access to 77 computers with software licences. 36 rooms are available for the Physics Education programme including an electronics laboratory, a wave laboratory and an optics laboratory. The laboratories of basic chemistry, inorganic chemistry, organic chemistry, computational chemistry (with 25 computers) as well as the instrumentation laboratory are used in the Chemistry Education programme. The Faculty of Engineering has 13 buildings for its study programmes, including laboratories and meeting rooms. The programming laboratory, the network computer laboratory, the integrated computer laboratory as well as the image processing laboratory are used in the Informatics and Computer Engineering Education programme.

Both faculties are supported by technical and administrative staff, a total of 44 staff at the Faculty of Mathematics and Natural Sciences and a total of 42 staff at the Faculty of Engineering. According to the SER, most facilities are accessible to students with special needs. The IT infrastructure at UNNES covers the aforementioned online platforms/apps and the provision of e-learning resources. IT support is provided by a central unit of the university. Further, UNNES offers students sports as well as health, social and religious facilities. Entrepreneurship support and guidance are provided by UNNES' Business Centre. The university has defined

standards for environment, health and safety and considers the needs of students and people with disabilities according to the SER.

Experts' Evaluation

Concerning the topic of learning resources, the students seemed to be very satisfied with the equipment provided by UNNES in the laboratories and gave a positive assessment of the learning material. The entire curricula as well as semester learning plans are available to all students in advance. Especially the semester learning plans include the necessary information (learning outcomes, workload, teaching methods, assessment modes etc. – with some areas for improvement, see Chapter 1, Finding 1) at course level in order for students to complete their studies. Especially working in the laboratories as well as the microteaching course was praised very frequently by the students. The microteaching module is considered by students to be a very helpful course in learning to become a teacher.

Even though UNNES provided some information in the framework of the online site visit, the experts still found it difficult to get a detailed overview of the settings of the laboratories and ask UNNES to provide more information about the equipment and features of the laboratories used in the study programmes Physics Education, Chemistry Education and Informatics and Computer Engineering Education (incl. electronics laboratory). This must be documented with a detailed listing of the equipment and numerous photographs – additional evidence and the confirmation of appropriateness (if necessary, through a confirmation visit as defined by AQAS) are required (**Finding 16**).

Furthermore, the experts encourage UNNES to continue investing in the improvement of its laboratory infrastructure in the future since especially in science related studies, as mentioned by the students, laboratories are the backbone of their education (**Finding 17**). Especially for the Chemistry Education programme the experts encourage UNNES to sustain a high training in health and safety procedures in the laboratories for their staff and students (**Finding 18**). For the students it could be achieved by implementing a short course on general laboratory safety which serves to integrate this topic for all the existing laboratory classes (see Chapter 1).

For the student support the experts saw that there are many bodies and institutions of UNNES providing help to students during their studies. Some points that were mentioned often by students were the academic supervisors all students is assigned to at the beginning of their studies, the many counselling-opportunities students can get support from as well as the close contact to their parents if a student has trouble graduating their curriculum in under 12 semesters. Furthermore, the faculties seem to make a huge effort in developing new ways to help the students and in adjusting their methods according to the feedback they receive from students and alumni. UNNES also considers the diversity of its student population in its support services.

A topic which was mentioned by students as well as teachers alike is that students often seem to struggle in terms of motivation when writing their Bachelor thesis, which seemed to be the main reason for students prolonging their studies. The experts therefore encourage UNNES to develop a mechanism for all study programmes to provide more support, including more face-to-face time between the supervisor and the student, in the preparation of the Bachelor thesis (**Finding 19**).

Conclusion

The criterion is partially fulfilled.

Summary of the findings of the experts:

- UNNES must provide more information on the equipment and features of the laboratories used in the Physics Education, the Chemistry Education and the Informatics and Computer Engineering Education (incl. electronics laboratory) programmes. Additional evidence (detailed listing of the equipment and

photographs) and the confirmation of appropriateness (if necessary, through a confirmation visit as defined by AQAS) are required.

- UNNES should continue investing in the improvement of its laboratory infrastructure in the future.
- Especially for the Chemistry Education programme UNNES should sustain a high training in health and safety procedures in the laboratories, e.g. by introducing a short course on general laboratory safety which serves to integrate this topic in all the existing laboratory classes.
- UNNES is encouraged to develop a mechanism for all study programmes to provide more support including more face-to-face time between the supervisor and the student in the preparation of the Bachelor thesis.

7. Information

Impartial and objective, up-to-date information regarding the programme and its qualifications is published regularly. This published information is appropriate for and available to relevant stakeholders.
[ESG 1.8]

Description

UNNES provides information on its study programmes on its website, the websites of the faculties as well as on social media platforms. The websites include information i.a. on the curricula, course descriptions, assessment methods, student support services. Academic regulations as laid down in its Academic Guidebook are also available to prospective and current students.

Experts' Evaluation

The experts note that UNNES provides prospective students (as well as enrolled students) and the wider community ample and comprehensive information on its activities and all its programmes on its website. Interested parties have access to the full curricula and intended learning outcomes of the programmes. The selection procedure and the qualification awarded are described transparently. The teaching, learning and assessment procedures are regulated centrally in the Academic Guidebook and are accessible to all. It is positive to note that information on the website is also available in English.

Conclusion

The criterion is fulfilled.

V. Recommendations of the panel of experts

The panel of experts recommends

- to accredit with conditions

the study programmes “**Mathematics Education**” (**Bachelor of Education**), “**Physics Education**” (**Bachelor of Education**), “**Chemistry Education**” (**Bachelor of Education**) and “**Informatics and Computer Engineering Education**” (**Bachelor of Education**) offered by **Universitas Negeri Semarang (UNNES)**.

Findings:

1. The course descriptions (semester learning plans, RPS) of all four study programmes must be improved. Special attention must be given to the level of detail and the consistency in the quality of the descriptions (e.g. between the subject courses and the education courses) as well as to the following aspects:
 - a. The course learning outcomes and the course content must be described in more details with information specific for each study programme and subject. More details must also be provided for the class accompanying the school internship as well as for the community service programme.
 - b. A course description for the final project / Bachelor thesis must be included.
 - c. The type of exam for assignments, for the midterm exam and for the final exam must be defined for all courses.
 - d. The topic of heterogeneity of school pupils and how students are prepared to engage with pupils with diverse backgrounds must be described more clearly in the relevant courses.
 - e. Literature information must be updated.
 - f. The consistency of the semester learning plans must be checked against the other study programme documents (course naming, numbering, credit hours – it should also be indicated consistently in which semester the course is offered etc.).
2. When dealing with the topic of heterogeneity of school pupils, the experts recommend for all study programmes considering the topic of the inclusion of pupils with special needs.
3. In the Mathematics Education programme the experts recommend increasing the number of mathematics education courses as well as offering such courses earlier in the curriculum.
4. In the Mathematics Education programme the experts suggest offering specific courses for the four different graduate profiles as well as specific courses for future teachers at junior high schools and specific courses for teachers at senior high schools.
5. The aspects of sustainability and environmental science (in line with the profile of UNNES as a Conservation University) must be included more clearly in the Physics Education and the Chemistry Education programmes. The relevant semester learning plans must be updated accordingly.
6. UNNES must clarify if teachers need to conduct experiments together with pupils in schools and if so, UNNES must document for the four study programmes in which courses the corresponding competencies are included. This aspect may require to be dealt with in more depth in the curriculum.
7. The experts suggest giving more flexibility in the curriculum of the Chemistry Education programme by e.g. converting one compulsory course to an elective course.

8. The Informatics and Computer Engineering Education curriculum must include at least one (if not two) informatics specific education course dealing among others with the history and nature of informatics in schools and special teaching approaches for informatics, how to manage the needs of heterogeneous groups of pupils not only in general but also specifically in informatics classes, especially to engage girls for this topic.
9. The Informatics and Computer Engineering Education curriculum must include at least one course about the general ideas of automata, limitations of computing, Turing machines and complexity.
10. The experts recommend including a compulsory course in the Informatics and Computer Engineering Education programme that addresses the social and ethical implications of informatics or to integrate these aspects in courses of information systems, networks or in the educational courses.
11. The experts recommend including bilingual courses in the Informatics and Computer Engineering Education programme, in line with the custom and importance of that language in Informatics.
12. UNNES is encouraged to develop and enhance its cooperation with school teachers. School teachers could be invited to UNNES more often and the exchange regarding the latest teaching methods could be intensified.
13. To support international students coming to UNNES the experts suggest offering more courses using English as a medium of instruction.
14. The experts suggest that UNNES provide more support to its teaching staff in developing its English competencies to support international teaching and learning cooperation as well as international research cooperation.
15. UNNES is encouraged to develop a university-wide strategy to engage, especially in STEM subjects, more female lecturers at all levels including as full professors.
16. UNNES must provide more information on the equipment and features of the laboratories used in the Physics Education, the Chemistry Education and the Informatics and Computer Engineering Education (incl. electronics laboratory) programmes. Additional evidence (detailed listing of the equipment and photographs) and the confirmation of appropriateness (if necessary, through a confirmation visit as defined by AQAS) are required.
17. UNNES should continue investing in the improvement of its laboratory infrastructure in the future.
18. Especially for the Chemistry Education programme UNNES should sustain a high training in health and safety procedures in the laboratories, e.g. by introducing a short course on general laboratory safety which serves to integrate this topic in all the existing laboratory classes.
19. UNNES is encouraged to develop a mechanism for all study programmes to provide more support including more face-to-face time between the supervisor and the student in the preparation of the Bachelor thesis.